10
CBSE
TERM-2

SCIENCE

(As per the latest CBSE Syllabus)

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Note from the Publisher

Full Marks Science-10 has been thoroughly revised and updated as per the latest CBSE Syllabus. Apart from the other changes the book includes, **Value-Based Questions, Test Your Skills** and many more to strengthen the confidence of the students in such a way that they can master the subject with easy method

The book has been divided into two volumes separately for SA-I and SA-II. The chapters have been serialised as they figure in the Termwise Syllabus. It provides the students an opportunity to have a clear and concentrated view of the Task they have to learn during two different Terms.

The book is, thus, an up-to-date, dependable and learner-friendly resource. The support website **www.fullmarks.org** is an added benefit for the users where one can get much more and also an opportunity to share one's academic complexities.

SYLLABUS

FIRST TERM **Marks: 90**

S. No.	Units	Marks
1.	I. Chemical Substances—Nature and Behaviour	33
2.	II. World of Living	21
3.	IV. Effects of Current	29
4.	V. Natural Resources	07
	Total	**90**

THEME: MATERIALS (30 Periods)

Unit I: Chemical Substances—Nature and Behaviour

Chemical reactions: Chemical equation, Balanced chemical equation, implications of a balanced chemical equation, types of chemical reactions : combination, decomposition, displacement, double displacement, precipitation, neutralization, oxidation and reduction.

Acids, bases and salts: Their definitions in terms of furnishing of H^+ and OH^- ions, General properties, examples and uses, concept of pH scale (Definition relating to logarithm not required), importance of pH in everyday life; preparation and uses of Sodium Hydroxide, Bleaching powder, Baking soda, Washing soda and Plaster of Paris.

Metals and non metals: Properties of metals and non-metals; Reactivity series; Formation and properties of ionic compounds; Basic metallurgical processes; Corrosion and its prevention.

THEME: THE WORLD OF THE LIVING (20 Periods)

Unit II: World of Living

Life Processes: "Living Being". Basic concept of nutrition, respiration, transport and excretion in plants and animals.

Control and Co-ordination in Animals and Plants: Tropic movements in plants; Introduction of plant hormones; Control and co-ordination in animals: Nervous system; Voluntary, involuntary and reflex action; Chemical co-ordination: animal hormones.

THEME: HOW THINGS WORK (32 Periods)

Unit IV: Effects of Current

Electric current, potential difference and electric current. Ohm's law; Resistance, Resistivity, Factors on which the resistance of a conductor depends. Series combination of resistors, parallel combination of resistors and its applications in daily life. Heating effect of electric current and its applications in daily life. Electric power, Interrelation between P, V, I and R.

Magnetic effects of current: Magnetic field, field lines, field due to a current carrying conductor, field due to current carrying coil or solenoid; Force on current carrying conductor, Fleming's Left Hand Rule. Electromagnetic induction. Induced potential difference, Induced current. Fleming's Right Hand Rule, Direct current. Alternating current: frequency of AC. Advantage of AC over DC. Domestic electric circuits.

THEME: NATURAL RESOURCES (08 Periods)

Unit V: Natural Resources

Sources of energy: Different forms of energy, conventional and non-conventional sources of energy: fossil fuels, solar energy; biogas; wind, water and tidal energy; Nuclear energy. Renewable versus non-renewable sources of energy.

SECOND TERM **Marks: 90**

S. No.	Units	Marks
1.	I. Chemical Substances—Nature and Behaviour	23
2.	II. World of Living	30
3.	III. Natural Phenomena	29
4.	V. Natural Resources	08
	Total	**90**

THEME: MATERIALS (25 Periods)

Unit I: Chemical Substances—Nature and Behaviour

Carbon compounds: Covalent bonding in carbon compounds. Versatile nature of carbon. Homologous series. Nomenclature of carbon compounds containing functional groups (halogens, alcohol, ketones, aldehydes, alkanes and alkynes), difference between saturated hydrocarbons and unsaturated hydrocarbons. Chemical properties of carbon compounds (combustion, oxidation, addition and substitution reaction). Ethanol and Ethanoic acid (only properties and uses), soaps and detergents.

Periodic classification of elements: Need for classification, Modern periodic table, gradation in properties, valency, atomic number, metallic and non-metallic properties.

THEME: THE WORLD OF THE LIVING (30 Periods)

Unit II: World of Living

Reproduction: Reproduction in animals and plants (asexual and sexual) reproductive health—need and methods of family planning. Safe sex vs HIV/AIDS. Child bearing and women's health.

Heredity and Evolution: Heredity; Mendel's contribution- Laws for inheritance of traits: Sex determination: brief introduction; Basic concepts of evolution.

THEME: NATURAL PHENOMENA (23 Periods)

Unit III: Natural Phenomena

Reflection of light by curved surfaces; Images formed by spherical mirrors, centre of curvature, principal axis, principal focus, focal length, mirror formula (Derivation not required), magnification.

Refraction; Laws of refraction, refractive index.

Refraction of light by spherical lens, Image formed by spherical lenses; Lens formula (Derivation not required); Magnification. Power of a lens; Functioning of a lens in human eye, defects of vision and their corrections, applications of spherical mirrors and lenses.

Refraction of light through a prism, dispersion of light, scattering of light, applications in daily life.

THEME: NATURAL RESOURCES (12 Periods)

Unit V: Natural Resources

Conservation of natural resources.

Management of natural resources. Conservation and judicious use of natural resources. Forest and wild life. Coal and Petroleum conservation. Examples of People's participation for conservation of natural resources.

Regional environment: Big dams: advantages and limitations; alternatives, if any. Water harvesting. Sustainability of natural resources.

Our environment: Eco-system, Environmental problems, Ozone depletion, waste production and their solutions. Biodegradable and non-biodegradable substances.

QUESTION PAPER DESIGN

Time: 3 hours **Max. Marks: 90**

S. No.	Typology of Questions	Learning outcomes and testing competencies	Very Short Answer (VSA)	Short Answer-I (SA-I)	Short Answer-II (SA-II)	Long Answer (LA)	Total Marks	% Weightage
			1 Mark	2 Marks	3 Marks	5 Marks		
1.	**REMEMBERING** (**Knowledge based-** Simple recall questions, to know specific facts, terms, concepts, principles, or theories, identify, define, or recite, information)	• Reasoning • Analytical Skills • Critical Thinking Skills etc.	3	—	1	1	11	15%
2.	**UNDERSTANDING** (**Comprehension-** to be familiar with meaning and to understand conceptually, interpret, compare, contrast, explain, paraphrase, or interpret information)		—	1	4	1	19	25%
3.	**APPLICATION** (Use abstract information in concrete situation, to apply knowledge to new situations. Use given content to interpret a situation, provide an example, or solve a problem)		—	—	4	1	17	23%
4.	**HIGH ORDER THINKING SKILLS** (**Analysis & Synthesis-** Classify, compare, contrast or differentiate between different pieces of information. Organize and/or integrate unique pieces of information from a variety of sources)		—	2	—	1	9	12%
5.	**EVALUATION AND MULTI-DISCIPLINARY** (Appraise, judge, and/or justify the value or worth of a decision or outcome, or to predict outcomes based on values)		—	—	3	2	19	25%
Total (Theory Based Questions)			**3×1=3**	**3×2=6**	**12×3=36**	**6×5=30**	**75(24)**	**100%**
Practical Based Questions (PBQs)			**9×1=9**	**3×2=6***	**—**	**—**	**15(12)**	
TOTAL			**12×1=12**	**6×2=12**	**12×3=36**	**6×5=30**	**90(36)**	

* One question of 3 marks will be included to assess the values inherent in the texts.

CONTENTS

SYLLABUS

CLASS X

Second Term	**Marks: 90**
Units	**Marks**
I. Chemical Substances—Nature and Behaviour	23
II. World of Living	30
III. Natural Phenomena	29
V. Natural Resources	08
TOTAL	**90**

DIVISION OF CHAPTERS

Sl. Nos. and Names of Chapters in NCERT Book

4. Carbon and its Compounds
5. Periodic Classification of Elements
8. How do Organisms Reproduce?
9. Heredity and Evolution
10. Light—Reflection and Refraction
11. Human Eye and Colourful World
16. Management of Natural Resources
15. Our Environment

4 Carbon and its Compounds

SYLLABUS

Covalent bonding in carbon compounds. Versatile nature of carbon, Homologous series, Nomenclature of carbon compounds containing functional groups (halogens, alcohol, ketones, aldehydes, alkanes and alkynes), Difference between saturated hydrocarbons and unsaturated hydrocarbons, Chemical properties of carbon compounds (combustion, oxidation, addition and substitution reaction), Ethanol and Ethanoic acid (only properties and uses), Soaps and detergents.

Facts that Matter

Carbon

Symbol – C

Electronic configuration – 2, 4

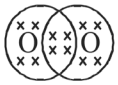
Valency – 4 (tetravalency)

Occurrence in nature → Earth's crust → 0.02% in the form of minerals like carbonates, coal, petroleum.

In atmosphere – 0.03% of carbon dioxide (gaseous form).

Carbon forms **covalent bonding** and **covalent compounds** which do not conduct electricity. A covalent bond is formed by mutual sharing of electrons. This mutual sharing of electrons occurs in such a way that each of the combining atom acquires the stable electronic configuration of the nearest noble gas. A single bond is formed when each of the two combining atoms share 1 electron each, a double bond is formed when atoms contribute 2 electrons each and triple bond is formed when each atom contributes 3 electrons.

Single bond →  H—H → H_2 Single covalent bond

Double bond →  O=O → O_2 Double covalent bond

Triple bond →  N≡N → N_2 Triple covalent bond

Allotropy ⟶ Some elements exist in two or more different forms. This phenomenon is known as allotropy.

Allotropes of Carbon ⟶ Carbon has 3 allotropes: diamond, graphite and fullerenes. In diamond carbon atoms are bonded together in tetrahedral lattice arrangement. In graphite carbon atoms are bonded together in sheets of hexagonal lattice.

In fullerenes, carbon atoms are bonded together in spherical, tubular, or ellipsoidal forms.

Organic compounds: The tetravalency of carbon gives a possibility of large number of compounds. Earlier it was thought carbon compounds can be extracted from organisms only. Hence carbon compounds are also called organic compounds.

NCERT IN-TEXT ACTIVITIES SOLVED

Activity 4.1

List of ten things used or consumed daily

Things	*Metals*	*Glass/Clay*	*Other materials*
Fan	Aluminium/Iron	—	—
Bed	—	—	Wood (*C*)
Toothbrush			Plastic, nylon (*C*)
Spoon	Stainless steel		
Tumbler		Glass	
Clothes			Cotton (*C*)
Pencil		Graphite	Wood (*C*)
Pen			Plastic (*C*)
Books			Paper-obtained from wood (*C*)
Bread			Wheat (*C*)

(*C*) ⟶ indicates carbon

Most substances contain carbon in it.

Activity 4.2

Calculate the difference in the formulae and molecular masses for (*a*) CH_3OH and C_2H_5OH (*b*) C_2H_5OH and C_3H_7OH, and (*c*) C_3H_7OH and C_4H_9OH.

(*a*) CH_3OH, C_2H_5OH } differ by CH_2

Mass CH_3OH

$12 + 1 \times 3 + 16 + 1 = 32\ u$

C_2H_5OH

$(12 \times 2) + (1 \times 5) + 16 + 1 = 46\ u$

Difference → $46 - 32 = 14\ u$

(*b*) C_2H_5OH, C_3H_7OH } differ by CH_2

Mass C_2H_5OH

$(12 \times 2) + (1 \times 5) + 16 + 1 = 46\ u$

C_3H_7OH

$(12 \times 3) + (1 \times 7) + 16 + 1 = 60\ u$

Difference → $60 - 46 = 14\ u$

(*c*) C_3H_7OH, C_4H_9OH } differ by CH_2

Mass C_3H_7OH 60 *u*

C_4H_9OH
$(12 \times 4) + (1 \times 9) + 16 + 1 = 74$ *u*
Difference $\rightarrow 74 - 60 = 14$ *u*

All 3 groups given above show a similarity→Two consecutive members differ by CH_2 group and mass 14 u.

Homologous Series

Chloro alkane	*Alcohol*	*Aldehyde*	*Ketone*	*Carboxylic acid*
CH_3Cl	$CH_3—OH$	HCHO	$CH_3—\overset{\overset{O}{\|\|}}{C}—CH_3$	HCOOH
C_2H_5Cl	$C_2H_5—OH$	CH_3CHO	$C_2H_5—\overset{\overset{O}{\|\|}}{C}—CH_3$	CH_3COOH
C_3H_7Cl	$C_3H_7—OH$	C_2H_5CHO	$C_3H_7—\overset{\overset{O}{\|\|}}{C}—CH_3$	C_2H_5COOH
C_4H_9Cl	$C_4H_9—OH$	C_3H_7CHO	$C_4H_9—\overset{\overset{O}{\|\|}}{C}—CH_3$	C_3H_7COOH

Activity 4.3

Heating of different carbon compounds, observing the flame and smoke.

Carbon Compounds	*Nature of flame*	*Deposits on Metal*
Camphor	Smoky flame	Carbon deposits on metal
Alcohol	Non-sooty flame	No carbon
Acetone	Non-sooty flame	No carbon
Naphthalene	Smoky flame	Carbon deposits on metal

Alcohol and acetone burns with non-sooty flame—complete combustion takes place.

Camphor, naphthalene burns with sooty flame—incomplete combustion takes place.

Activity 4.4

Bunsen burner is used to study the different types of flame by adjusting the holes at the base of the burner.

(*i*) When hole is closed—Yellow, sooty flame is formed, black deposits of carbon is obtained on spoon when placed above the flame.

(*ii*) When the hole is open—Blue flame is formed, no black deposits of carbon is obtained on spoon when placed above the flame.

Activity 4.5

Take 3 ml of ethanol in a test tube and warm it gently in a water bath.

Add 5% solution of alkaline potassium permanganate drop by drop to this solution.

- The colour of $KMnO_4$ slowly fades and disappears completely. When excess of $KMnO_4$ is added, the colour will not disappear as alcohol gets oxidised to form carboxylic acid.

  In this case ethanol gets oxidised to form ethanoic acid due to $KMnO_4$ but the excess $KMnO_4$ will not decolourise.

Activity 4.6

Take a test tube with ethanol in it and drop a small piece of sodium metal in it. The reaction takes place and hydrogen gas is evolved.

To test the presence of hydrogen gas, bring a burning match stick near the mouth of the test tube, it will burn with pop sound.

$$\underset{\text{Sodium}}{2Na} + \underset{\text{Ethanol}}{2CH_3CH_2OH} \longrightarrow \underset{\text{Sodium ethoxide}}{2CH_3CH_2ONa} + \underset{\text{Hydrogen}}{H_2}$$

Activity 4.7

pH test and litmus test of acetic acid and dilute hydrochloric acid and litmus test.

	Litmus test	*pH*
dil. CH_3COOH	Blue litmus turns red	5 – 6 less acidic
dil. HCl	Blue litmus turns red	2 – 3 more acidic

Activity 4.8

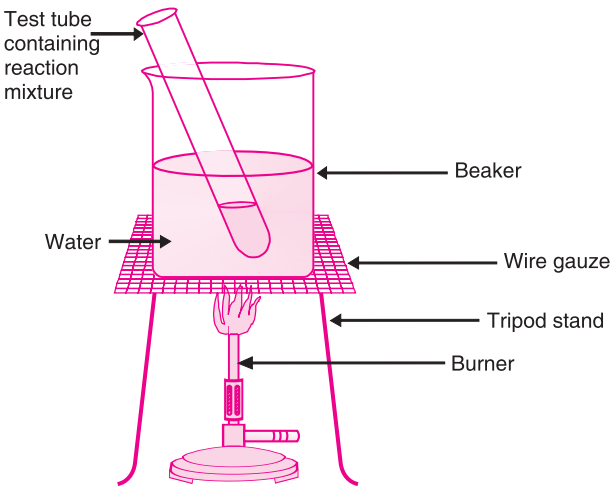
Take 1 ml ethanol and 1 ml glacial acetic acid along with a few drops of concentrated sulphuric acid in a test tube.

Warm in a water-bath for at least five minutes. Pour into a beaker containing 20–50 ml of water.

- Pleasant fruity smelling compound is obtained called ester.

  Such a chemical reaction is called esterification.

$$\underset{\text{Ethanoic acid}}{CH_3—COOH} + \underset{\text{Ethanol}}{CH_3—CH_2OH} \xrightarrow[\text{dehydrating agent}]{\text{Conc. } H_2SO_4} \underset{\text{Ester}}{CH_3COOC_2H_5} + \underset{\text{Water}}{H_2O}$$



Formation of ester

Activity 4.9

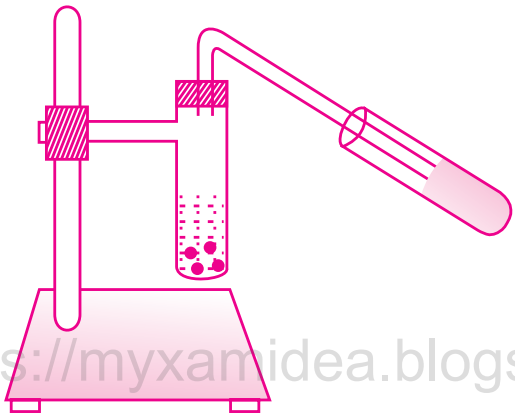
Take a spatula full of sodium carbonate in a test tube and add 2 ml of dilute ethanoic acid. Pass the gas produced through freshly prepared lime water. Repeat the above procedure with sodium hydrogen carbonate.

- Following reactions take place

  $2CH_3COOH + Na_2CO_3 \longrightarrow 2CH_3COONa + H_2O + CO_2$

  $CH_3COOH + NaHCO_3 \longrightarrow CH_3COONa + H_2O + CO_2$

The brisk effervescence of CO_2 gas is obtained which when pass through lime water turns it milky.



Activity 4.10

Take about 10 ml of water each in two test tubes. Add a drop of oil (cooking oil) to both the test tubes and label them as A and B. To test tube B, add a few drops of soap solution. Now, shake both the test tubes vigorously for the same period of time.

Shake the test tubes and then leave it undisturbed for some time. This shows how soap cleans dirt. Dirt is oily in nature. Hydrophobic part of soap bonds with dirt and dirty clothes are cleaned.

Activity 4.11

Take about 10 ml of distilled water and 10 ml of hard water in separate test tubes.

Add a couple of drops of soap solution to both. Shake the test tubes vigorously for an equal period of time.

The test tube which contains distilled water produces foam and the test tube with hard water forms curdy white precipitate.

Activity 4.12

Take two test tubes with 10 ml of hard water in each. Add five drops of soap solution to one and five drops of detergent solution to the other. Shake both the test tubes for the same period.

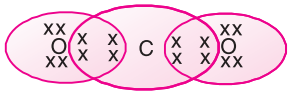
- Solution of hard water and soap forms curdy white precipitate.

  The hard water and detergent forms foam.

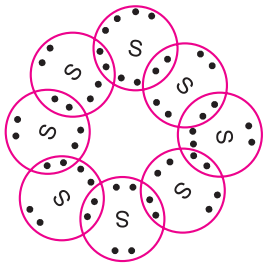
NCERT IN-TEXT QUESTIONS SOLVED

Q1. *What would be the electron dot structure of carbon dioxide which has the formula CO_2?*

Ans. The electron dot structure of CO_2 is



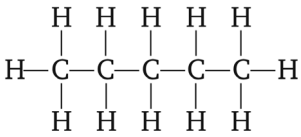
Q2. *What would be the electron dot structure of a molecule of sulphur which is made up of eight atoms of sulphur?*



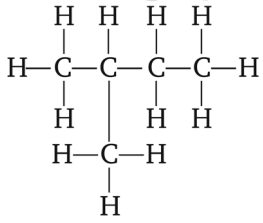
Q3. *How many structural isomers can you draw for pentane?*

Ans. Three structural isomers can be drawn from pentane.

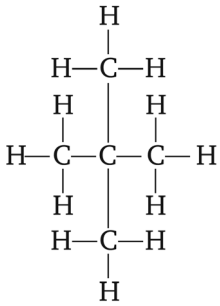
Pentane : C H



n-Pentane



Iso-Pentane



Neo-Pentane

Q4. *What are the two properties of carbon which lead to the huge number of carbon compounds we see around us?*

Ans. Carbon form large number of compounds due to the following properties:

(*a*) Catenation → Carbon shows the property of catenation that is the ability to form bonds with other carbon atoms forming long chains both branched and unbranched chains, and even rings.

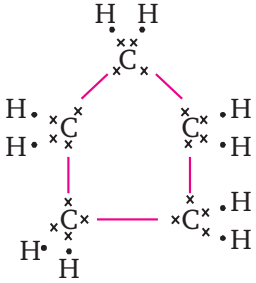
(*b*) Tetravalency → Carbon has valency 4, it is capable of bonding with 4 other carbon atoms or atoms of other non-covalent elements, giving rise to compounds with specific properties depending on the elements present in the compound.

(*c*) Isomerism → Carbon compounds show the property of isomerism that is compounds having same molecular formula but different structural formula.

Q5. *What would be the formula and electron dot structure of cyclopentane?*

Ans. The formula of cyclopentane is C_5H_{10}.

The electron dot structure is



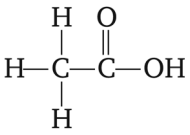
Q6. *Draw the structures for the following compounds.*

(*i*) *Ethanoic acid* (*ii*) *Bromopentane*

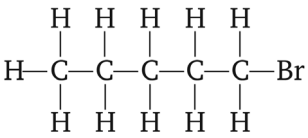
(*iii*) *Butanone* (*iv*) *Hexanal*

Are structural isomers possible for bromopentane?

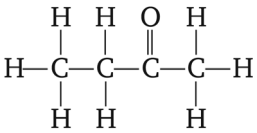
Ans. (*i*) Ethanoic acid CH_3COOH



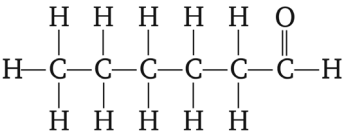
(*ii*) Bromopentane $C_5H_{11}Br$



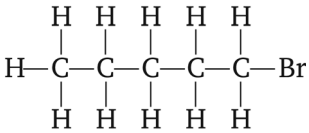
(*iii*) Butanone $C_2H_5COCH_3$



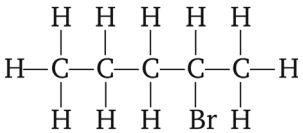
(*iv*) Hexanal $[C_5H_{11}CHO]$



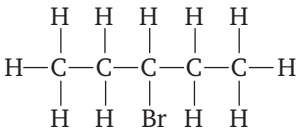
Isomers of Bromopentane



1-Bromopentane

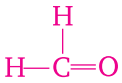


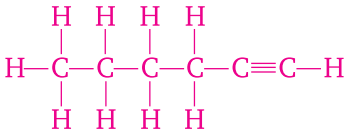
2-Bromopentane



3-Bromopentane

Q7. *How would you name the following compounds:*

(*i*) $CH_3—CH_2—Br$ (*ii*) 

(*iii*) 

Ans. (*i*) Bromo ethane (*ii*) Methanal

(*iii*) Hex-1-yne

Q8. *Why is the conversion of ethanol to ethanoic acid an oxidation reaction?*

Ans. Conversion of ethanol to ethanoic acid is an oxidation reaction because oxygen is added to ethanol to convert it to ethanoic acid.

$$\underset{\text{Ethanol}}{CH_3 - CH_2OH} \xrightarrow[\text{(or) Acidified } K_2Cr_2O_7 + \text{heat}]{\text{Alk. } KMnO_4 + \text{heat}} \underset{\text{Ethanoic aci}}{CH_3COOH_d}$$

In the above reaction alk. $KMnO_4$/acidified $K_2Cr_2O_7$ add oxygen to ethanol hence they are called oxidising agent.

Q9. *A mixture of oxygen and ethyne is burnt for welding. Can you tell why a mixture of ethyne and air is not used?*

Ans. If air is used, incomplete combustion will take place giving a sooty flame and less heat is produced. When pure oxygen is used ethyne burns completely producing large amount of heat and blue flame. This heat is sufficient for a metal to melt and welding is done.

Q10. *How would you distinguish experimentally between an alcohol and a carboxylic acid?*

Ans. (*a*) **Acid test:** Reaction with carbonates/hydrogen carbonates.

Take samples of alcohol and carboxylic acid in 2 test tubes, and add sodium carbonate or sodium bicarbonate solution to each. The compound which will produce brisk effervescence of CO_2 gas will be acid.

(*b*) **Alcohol test:** Take small amount of ethanol and ethanoic acid in test tube A and B. Add 5% solution of alkaline potassium permanganate drop by drop to this solution and warm the test tube.

The colour of potassium permanganate will disappear in test tube containing alcohol.

Q11. *What are oxidising agents?*

Ans. The compounds which add oxygen to other substance are known as oxidising agent.

For example, alkaline potassium permanganate solution and acidified potassium dichromate, both can convert alcohol into carboxylic acid, *i.e.*, ethanoic acid.

$$\underset{\text{Ethanol}}{CH_3 - CH_2OH} \xrightarrow[\text{Acidified } K_2Cr_2O_7 + \text{heat}]{\text{Alk. } KMnO_4 + \text{heat}} \underset{\text{Ethanoic acid}}{CH_3COOH} + H_2O$$

Q12. *Would you be able to check if water is hard by using detergent?*

Ans. No, because detergent forms lather in both, hard and soft water.

Q13. *People use variety of methods to wash clothes. Usually after adding the soap, they 'beat' the clothes on a stone, or beat it with a paddle, scrub with a brush or the mixture is agitated in a washing machine. Why is agitation necessary to get clean clothes?*

Ans. Soap lowers the surface tension of water. The long chain non-ionic hydrocarbon group in soap gets attached to the oil or grease droplets and loosens them from the fibres of cloth along with the dirt. However this loosening is insufficient to remove the grease with dirt completely. Hence the clothes are agitated to remove the grease droplets completely.

QUESTIONS FROM NCERT TEXTBOOK

Q1. *Ethane, with the molecular formula C_2H_6 has*

(*a*) *6 covalent bonds.* (*b*) *7 covalent bonds.*

(*c*) *8 covalent bonds.* (*d*) *9 covalent bonds.*

Ans. (*b*) 7 covalent bonds.

Q2. *Butanone is a four-carbon compound with the functional group*

(*a*) *carboxylic acid.*

(*c*) *ketone.* (*d*) *alcohol.*

Ans. (*d*) ketone.

Q3. *While cooking, if the bottom of the vessel is getting blackened on the outside, it means that*

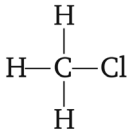
(*a*) *the food is not cooked completely.* (*b*) *the fuel is not burning completely.*

(*c*) *the fuel is wet.* (*d*) *the fuel is burning completely.*

Ans. (*b*) The fuel is not burning completely.

Q4. *Explain the nature of the covalent bond using the bond formation in CH_3Cl.*

Ans. Bond formation in CH_3Cl



Carbon forms single covalent bond by sharing one electron pair with three hydrogen atoms and one chlorine atom. Chlorine being more electronegative adds polar nature to C—Cl bond.

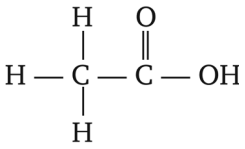
Q5. *Draw the electron dot structure for*

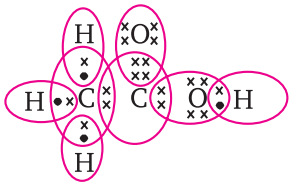
(*a*) *ethanoic acid.* (*b*) *H_2S.*

(*c*) *propanone.* (*d*) *F_2.*

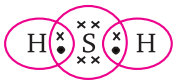
Ans. The electron dot structure are as follows:

(*a*) Ethanoic acid – CH_3COOH

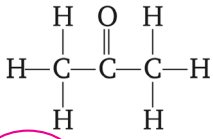


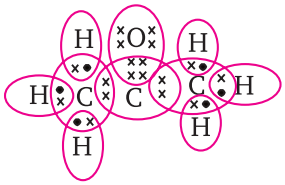


(*b*) H_2S

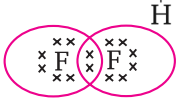


(*c*) Propanone





(*d*) F_2



Q6. *What is an homologous series? Explain with an example.*

Ans. It is a group of members of same class of organic compound having similar chemical properties, they have same general formula.

They have same functional group, when arranged in the ascending order of molecular mass they differ by 14 a.m.u. or —CH group.

Example: Alkane General formula — C_nH_{2n+2}

Methane	CH_4	$-CH_2$
Ethane	C_2H_6	
Propane	C_3H_8	
Butane	C_4H_{10}	

Q7. *How can ethanol and ethanoic acid be differentiated on the basis of their physical and chemical properties?*

Ans. **Physical Properties**

Ethanoic acid	Ethanol
1. Pungent smell	Pleasant smell
2. Melting point 290 K	M.P. is 156 K
3. Boiling point 391 K	B.P. is 351 K

Chemical Properties

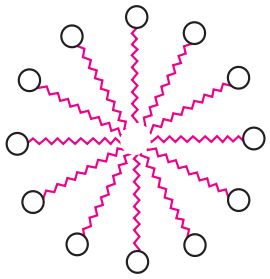
Ethanoic acid	Ethanol
1. Ethanoic acid + Sodium bicarbonate gives CO_2 gas.	No CO_2 gas produced.
2. On addition of alk. $KMnO_4$ the colour does not disappear.	On addition of alk. $KMnO_4$ the colour disappear.

Q8. *Why does micelle formation take place when soap is added to water? Will a micelle be formed in other solvents such as ethanol also?*

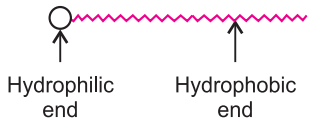
Ans. Soap molecules have two ends with different properties. One end is hydrophilic, which dissolves in water and other end is hydrophobic, it dissolves in hydrocarbons. When soap is added to water, the ionic end of soap will form a unique orientation and keep the hydrocarbon tail away from it.

The cluster of molecules is formed in which the hydrophobic tails are in the interior of the cluster and the ionic ends are on the surface of the cluster. Hence, micelle formation takes place.

Soap is soluble in ethanol hence the micelle formation will not take place.



Micelle



Q9. *Why are carbon and its compounds used as fuels for most applications?*

Ans. Carbon and its compounds undergo combustion to produce heat, the amount of heat released can be handled and used so they are used as fuels for most applications.

Q10. *Explain the formation of scum when hard water is treated with soap.*

Ans. Hard water contains salts of calcium and magnesium. When soap molecule comes in contact with these salts it forms a curdy white precipitate (compound insoluble in water) called scum.

$$\text{Soap} + \text{Hard water} \longrightarrow \text{scum}$$

Q11. *What change will you observe if you test soap with litmus paper (red and blue)?*

Ans. Soap is alkaline in nature, hence it will turn red litmus into blue, blue litmus will remain blue.

Q12. *What is hydrogenation? What is its industrial application?*

Ans. When unsaturated hydrocarbons (double/triple bond) are reacted with hydrogen in presence of a catalyst like nickel, the hydrogen gets added across the double/triple bond and converts the unsaturated hydrocarbon into saturated hydrocarbon. Such reaction is called addition reaction or hydrogenation.

Example : $\underset{\substack{\text{alkene}\\\text{(unsaturated)}}}{H_2C=CH_2} + H_2 \xrightarrow[\text{catalyst}]{Ni} H_2C(H)-CH_2(H) \longrightarrow \underset{\substack{\text{alkane}\\\text{(saturated)}}}{CH_3-CH_3}$

Industrial use: It is used to convert vegetable oil into vanaspati ghee.

$$\text{Vegetable oil} + H_2 \xrightarrow[473K]{Ni} \text{Vanaspati ghee}$$

Q13. *Which of the following hydrocarbons undergo addition reactions?*

C_2H_6, C_3H_8, C_3H_6, C_2H_2 and CH_4.

Ans. Addition reaction takes place in unsaturated hydrocarbons.

Hence C_3H_6 and C_2H_2 are unsaturated hydrocarbons and will show addition reaction.

Q14. *Give a test that can be used to differentiate chemically between butter and cooking oil.*

Ans. Butter is saturated compound and oil is unsaturated compound.

Test

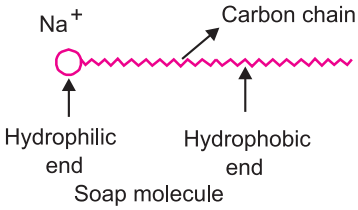
alk. potassium permanganate (Pink colour) + Unsaturated hydrocarbon → Pink colour disappear.

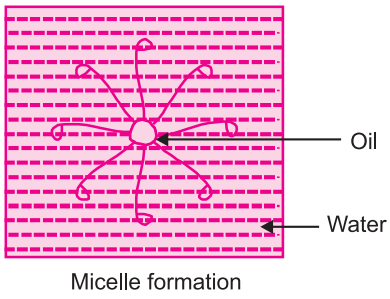
Therefore, when we add oil to a test tube containing alkaline potassium permanganate solution, the pink colour of the solution disappear. Colour of alkaline potassium permanganate will not disappear in the test tube containing butter.

Q15. *Explain the mechanism of cleaning action of soaps.*

Ans. Soap molecule has two ends, the charged end that gets attracted towards water is called hydrophilic and the long carbon chain that repels water is called hydrophobic end. When soap is dissolved in water, the carbon chain *i.e.*, hydrophobic end gets attracted towards the oil, dirt and grease. The hydrophilic end stays away from this. The micelle formation takes place.

The tail entangles dirt, oil or grease, if required the agitation is done. Lot of rinsing is a done with water so that water molecules attract charged (Na^+) end and carries the soap molecules with dirt attached to it and clean the clothes, utensils, etc.





MORE QUESTIONS SOLVED

I. MULTIPLE CHOICE QUESTIONS

1. The isomeric pair is

(*a*) ethane and propane (*b*) propane and butane

(*c*) ethane and ethane (*d*) butane and 2-methyl propane

2. The structural formula of ethyl ethanoate

(*a*) $CH_3-\overset{\overset{O}{\|}}{C}-OCH_3$ (*b*) $CH_3-\overset{\overset{O}{\|}}{C}-OCH_2CH_3$

(*c*) $CH_3-CH_2-\overset{\overset{O}{\|}}{C}-OCH_2CH_3$ (*d*) $CH_3-CH_2-\overset{\overset{O}{\|}}{C}-OCH_3$

3. Which of the following is used to oxidise ethanol to ethanoic acid?

(*a*) Alkaline $KMnO_4$ (*b*) Conc. H_2SO_4

(*c*) Acidified $K_2Cr_2O_7$ (*d*) All of above

4. The compound which gives a brisk effervescence with sodium metal and not with sodium hydrogen carbonate is

(*a*) ethanol (*b*) ethanoic acid

(*c*) both ethanoic acid and ethanol (*d*) none of these

5. Identify the product formed when methane reacts with chlorine in the presence of sunlight is

(*a*) C_2Cl_6 (*b*) CH_3Cl

(*c*) $CHCl_4$ (*d*) None of these

6. Which is denatured spirit?

(*a*) ethanol only (*b*) ethanol and methanol (50%)

(*c*) ethanol and methanol (5%) (*d*) methanol only

7. Drinking alcohol and driving may cause serious accidents. To discourage this, police randomly test drivers for alcohol using a breath analyser. The breath analyser works because

(*a*) Alcohol makes the breath dry and the machine registers moisture

(*b*) Alcohol makes the breath hotter which changes the machine reading

(*c*) Alcohol causes more saliva which the machine checks.

(*d*) Alcohol in the breath cause a chemical change registered by the machine.

8. Tertiary butane gets oxidised with oxidising agents like alkaline $KMNO_4$ to

(*a*) Isobutane (*b*) Ter-butyl alcohol

(*c*) Secondary-propyl alcohol (*d*) All of above

9. According to IUPAC system, the correct name of the organic compound is

$$CH_3-\underset{\underset{Br}{|}}{CH}-CH_2-\overset{\overset{O}{\|}}{C}-OH$$

(*a*) 2-bromobutanoic acid (*b*) 2-bromobutysis acid

(*c*) 3-bromobutanoic acid (*d*) 3-bromo-2-hydroxybutan-2-one

10. The substance not responsible for the hardness of water is

(*a*) sodium nitrate (*b*) calcium hydrogen carbonate

(*c*) calcium carbonate (*d*) magnesium carbonate

11. The by product of soap is

(*a*) isoprene (*b*) glycerol

(*c*) butene (*d*) ethylene glycol

12. Covalent compounds

(*a*) have high melting and boiling points

(*b*) are mostly soluble in water

(*c*) are formed between atoms of metals and non-metals

(*d*) are formed by the sharing of electrons in the bonding atoms.

13. The heteroatoms present is

$CH_3 - O - CH_2 - CH_2$ (Br)

(*a*) oxygen (*b*) carbon

(*c*) hydrogen (*d*) bromine

14. Vinegar is a solution of

(*a*) 30% – 40% acetic acid in alcohol (*b*) 5% – 8% acetic acid in alcohol

(*c*) 5% – 8% acetic acid in water

15. Which of the following can be used for the denaturation of ethyl alcohol?

(*a*) Methyl alcohol (*b*) Pyridines

(*c*) Copper sulphate (*d*) All of above

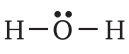
16. Soaps are formed by saponification of

(*a*) alcohols (*b*) glycosides

(*c*) simple esters (*d*) carboxylic acids

17. The correct electron dot structure of a water molecule is

(*a*)  (*b*) 

(*c*)  (*d*) 

18. Acetic acid was added to a liquid X kept in a test tube. A colourless and odourless gas Y was evolved. The gas was passed through lime water which turned milky. It was concluded that:

(*a*) Liquid X is sodium hydroxide and the gas Y is CO_2

(*b*) Liquid X is sodium carbonate and the gas Y is CO_2

(*c*) Liquid X is sodium acetates and the gas Y is CO_2

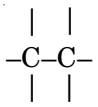
(*d*) Liquid X is sodium chloride and the gas Y is SO_2.

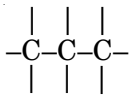
19. For gas welding used for welding broken pieces of iron, we normally use a mixture of

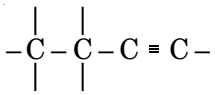
(*a*) Ethane and oxygen (*b*) Ethene and oxygen

(*c*) Ethyne and oxygen (*d*) Ethene and air

20. Identify the compound that undergoes bromination reaction:

(*a*) 

(*b*) 

(*c*) 

(*d*) All of above

21. Bromine reacts with saturated hydrocarbon at room temperature in the

(*a*) absence of sunlight (*b*) presence of water

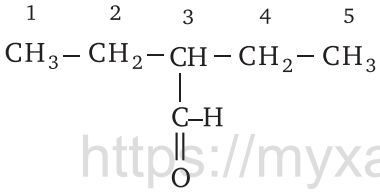
(*c*) presence of sunlight (*d*) presence of hydrochloric acid

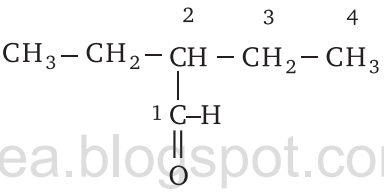
22. The number of single and double bonds present in benzenes are

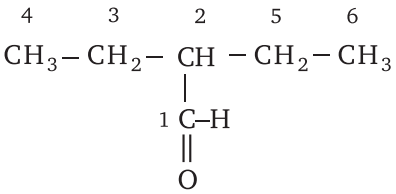
(*a*) 9 and 6 (*b*) 9 and 3

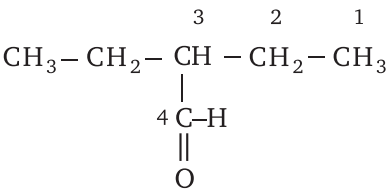
(*c*) 12 and 3 (*d*) 12 and 6

23. Identify the correct way of numbering an organic compound (according to IUPAC)

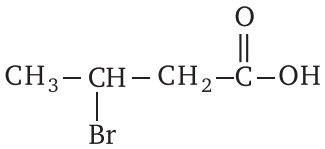
(*a*) 

(*b*) 

(*c*) 

(*d*) 

24. Identify the functional group present in the following compound



(*a*) aldehyde (*b*) bromine

(*c*) carboxylic (*d*) both bromine and carboxylic group

25. The upper and lower homologue of C_2H_5OH are respectively

(*a*) methyl alcohol and butyl alcohol (*b*) ethyl alcohol and propyl alcohol

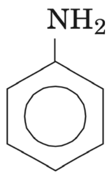
(*c*) butyl alcohol and propyl alcohol (*d*) propyl alcohol and methyl alcohol

26. Which is not true about homologous series?

(*a*) They have same general formula. (*b*) They differ from other by CH_3 group.

(*c*) They have same functional group. (*d*) They have same chemical properties.

27. Name the following aromatic compound



(*a*) toluene (*b*) aniline

(*c*) phenol (*d*) furan

28. Ethanoic acid was added to sodium carbonate solution and the gas evolved was tested with a burning splinter. The following four observations were reported. Identify the correct observation.

(*a*) The gas burns with pop sound and the flame gets extinguished

(*b*) The gas does not burn but the splinter burns with pop sound

(*c*) The flame extinguishes and the gas does not burn

(*d*) The gas burns with a blue flame and the splinter burns brightly

29. Which of the following is not a straight chain?

(*a*) $CH_3 - CH_2 - CH_2 - CH_2$
$\qquad\qquad\qquad\qquad |$
$\qquad\qquad\qquad\quad CH_3$

(*b*) $CH_3 - CH_2 - CH_2 - CH_2 - CH_3$

(*c*) CH_3
$\quad |$
$H_2C - H_2C - CH_2 - CH_3$

(*d*) CH_3
$\quad \backslash$
$\qquad CH - CH_2 - CH_3$
$\quad /$
H_3C

30. The general formula for alkanes is C_nH_{2n+1}–CHO. The value of '*n*' for the first member.

(*a*) 1 (*b*) 0 (*c*) 0.5 (*d*) 1.1

31. An organic compound 'X' has the molecular formula $C_3H_6O_2$. It has a pleasant smell but does not turn blue limus red. It has structural formula

(*a*) $H_3C - C - OH$
$\qquad\quad \|$
$\qquad\quad O$

(*b*) $\qquad\quad O$
$\qquad\quad \|$
$CH_3 - C - O\ CH_3$

(*c*) both (*a*) and (*b*) (*d*) None of the above

Answers

1. (*d*)	**2.** (*b*)	**3.** (*d*)	**4.** (*a*)	**5.** (*b*)	**6.** (*c*)	**7.** (*b*)
8. (*b*)	**9.** (*c*)	**10.** (*a*)	**11.** (*b*)	**12.** (*d*)	**13.** (*d*)	**14.** (*c*)
15. (*d*)	**16.** (*c*)	**17.** (*c*)	**18.** (*b*)	**19.** (*a*)	**20.** (*d*)	**21.** (*c*)
22. (*b*)	**23.** (*a*)	**24.** (*d*)	**25.** (*d*)	**26.** (*b*)	**27.** (*a*)	**28.** (*c*)
29. (*d*)	**30.** (*b*)	**31.** (*b*)				

II. VERY SHORT ANSWER TYPE QUESTIONS (*1 Mark*)

Q1. *What is a hydrocarbon?*

Ans. It is a compound of hydrogen and carbon.

Q2. *Give different forms in which carbon occurs in nature.*

Ans. Carbon occurs in free form e.g., graphite and diamond in combined form like carbon dioxide, carbonates, etc.

In earth's crust–0.02% and in atmosphere–0.03%.

Q3. *Name two types of hydrocarbon.*

Ans. Hydrocarbon – Saturated and unsaturated.

Q4. *What are covalent bonds?*

Ans. Bond which are formed by sharing of a pair of electrons between two atoms is called covalent bonds.

Q5. *What is catenation?*

Ans. Carbon has the unique ability to form bonds with the other atoms of carbon which gives rise to large molecules. This property of self linking is called catenation.

Q6. *Name two allotropes of carbon.*

Ans. Two allotropes are – Crystalline and amorphous

Crystalline form – Diamond and graphite.

Amorphous form – Charcoal, coal, coke.

Q7. *Why covalent compounds have low melting and boiling points?*

Ans. As the bond is formed by sharing of electrons between two atoms. Intermolecular forces are small between the covalent compounds. These bonds break easily.

Q8. *Define oxidising agents.*

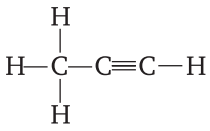
Ans. Some substances are capable of adding oxygen to others. These substances are known as oxidising agents.

Example: alkaline $KMnO_4$ and acidified $K_2Cr_2O_7$.

Q9. *Give the reaction to show how alcohol is converted into carboxylic acid.*

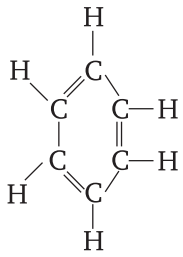
Ans. $\underset{}{CH_3 - \underset{\text{Alcohol}}{CH_2OH}} \xrightarrow[\text{acidified } K_2Cr_2O_7]{\text{alk. } KMnO_4 + \text{heat}} \underset{\text{Carboxylic acid}}{CH_3COOH}$

Q10. *Identify the compound*



Ans. Propyne.

Q11. *Name the compound*



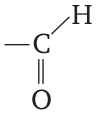
Ans. Benzene, C_6H_6.

Q12. *Give two properties of ethanol.*

Ans. (*a*) Liquid at room temperature

(*b*) Soluble in H_2O in all proportions

Q13. *Give the formula for the functional group of aldehyde.*

Ans. 

Q14. *What are heteroatoms?*

Ans. An element or group of elements which replaces one or more hydrogen (H) atoms from hydrocarbon, such that valency of carbon remains satisfied.

Example: $CH_4 \longrightarrow CH_3 - OH$

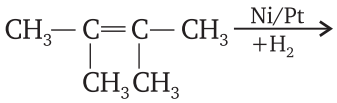
Hence, —OH is a heteroatom.

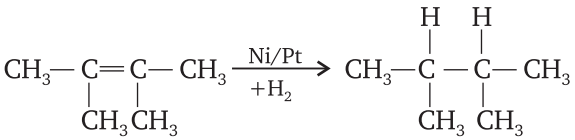
Q15. *Define catalyst.*

Ans. Catalyst are substances that cause a reaction with a change in rate of reaction, without itself undergoing any change.

Example: Micelle acts as a catalyst to convert unsaturated hydrocarbon into saturated hydrocarbon.

Q16. *Complete the following reaction:*



Ans. 

Q17. *Give the full form of IUPAC.*

Ans. IUPAC → International Union of Pure and Applied Chemistry.

Q18. *How can esters be converted into soap?*

Ans. By saponification reaction, by adding/reacting ester with NaOH.

Q19. *How can we convert CH_3CH_2OH into C_2H_4 ?*

Ans. By adding conc. sulphuric acid into it which acts as dehydrating agent and removes water from it.

$$CH_3-CH_2OH \xrightarrow[H_2SO_4]{\text{Conc.}} CH_2=CH_2 + H_2O$$

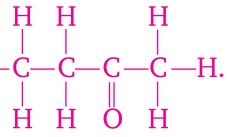
Q20. *Give two properties of ionic compounds.*

Ans. (*i*) High melting point and high boiling point.

(*ii*) Can conduct electricity.

Q21. *What is the melting point of acetic acid?*

Ans. M.P. = 290 K.

Q22. *Name the given compound* 

Ans. 2-Butanone.

Q23. *How can you convert ethene into ethane?*

Ans. By adding hydrogen to ethene in the presence of a catalyst.

Q24. *What is addition reaction? Give one example.*

Ans. The process of adding hydrogen across the double bonds of unsaturated hydrocarbons is called addition reaction.

For example : $H_2C=CH_2 + H_2 \xrightarrow[\text{Catalyst}]{Ni} H_3C-CH_3$

Ethene Ethane

Q25. *What is esterification reaction?*

Ans. The reaction in which alcohol reacts with carboxylic acid to produce a new compound called ester is called esterification.

Q26. *Give two uses of methane gas.*

Ans. (*i*) It is used as a fuel (*ii*) It is the major component of biogas and CNG.

Q27. *What is isomerism?*

Ans. A property in which a compound can exist in different structural formula but its molecular formula remains the same.

Q28. *Why can't we test hard water with detergents?*

Ans. Detergents form lather with both hard and soft water hence we cannot distinguish between them.

Q29. *What is hydrophilic?*

Ans. The substance showing attraction towards water is called hydrophilic.

Q30. *Name the second member of alkyne series.*

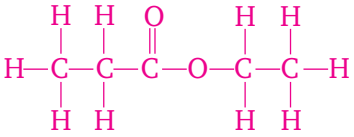
Ans. Propyne

Q31. *Give the names of the functional group*

(i) —*CHO* *(ii)* —*C*==*O*

Ans. (*i*) —CHO → Aldehyde (*ii*) → Ketone

Q32. *The structural formula of an ester is*



Name the alcohol and the acid from which it would have been formed.

Ans. Alcohol is C_2H_5OH ethanol

Acid is $H_3C—H_2C—COOH$ propanoic acid.

Q33. *Give the IUPAC name of acetic acid and propyl alcohol.*

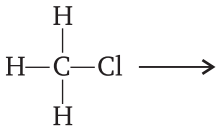
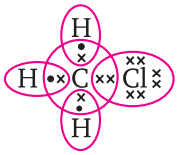
Ans. Acetic acid – Ethanoic acid

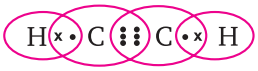
Propyl alcohol – Propanol

Q34. *What will happen to the litmus solution in carboxylic acid?*

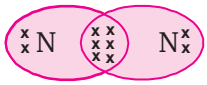
Ans. Red litmus remains the same but blue litmus changes to red.

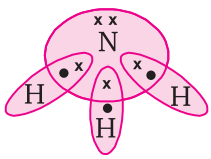
Q35. *Give the electron dot structure of CH_3Cl and C_2H_2.*

Ans. CH_3Cl  

C_2H_2 H—C≡C—H ⟶ 

Q36. *Draw the electron dot structure of N_2 and NH_3.*

Ans. N_2 ⟶ 

NH_3 ⟶ 

Q37. *Why do soaps form scum when added to hard water?*

Ans. Hard water contains carbonate and sulphate salts of magnesium or sodium ions which react with the soap molecule to form a compound which is insoluble in water. Hence soaps form scum with hard water.

Q38. *What happens when ethanol burns in air?*

Ans. Ethanol burns to form carbon dioxide and water.

Q39. *Give the IUPAC name and write the functional group present in vinegar.*

Ans. Vinegar IUPAC name is acetic acid CH_3COOH

Functional group –COOH

Q40. *A compound has a molecular formula C_2H_6O. It is used as a fuel. Name the compound and name its functional group.*

Ans. C_2H_6O is an alcohol, i.e. ethanol C_2H_5OH

Functional group is —OH.

III. SHORT ANSWER TYPE QUESTIONS (*2 or 3 Marks*)

Q1. *What is the reactive site in the given hydrocarbon? Write its name.*

$$H_3C—CH_2—CH=CH—CH_3$$

Ans. The reactive site is at a place where double bond is present.

Name of the compound is 2-pentene.

Q2. *What is the difference in the number of carbon and hydrogen atoms between two successive members of a homologous series? Also give the difference in their atomic masses.*

Ans. The difference is of 1 carbon and two hydrogen atoms *i.e.*, $—CH_2$ and mass difference is 14 a.m.u.

Q3. *Name the peculiar/specific chemical property exclusive in case of saturated hydrocarbons and unsaturated hydrocarbons.*

Ans. Saturated hydrocarbons show *substitution reaction* in which hydrogen atom gets substituted by other elements or atoms. Unsaturated hydrocarbons show addition reaction, in which hydrogen atom gets added across the double bond or triple bond of the compound.

Q4. *Why acetic acid is called glacial acetic acid?*

Ans. Acetic acid has very low melting point *i.e.* 290 K, hence it freezes during winters in cold countries. So it is called glacial acetic acid.

Q5. *Why does carbon forms large number of compounds?*

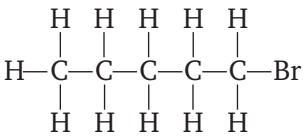
Ans. Carbon forms large number of compounds because of tetravalency and catenation property.

Tetravalency – Carbon has valency 4, to attain noble gas configuration carbon share its valence electrons with other elements like hydrogen, chlorine, etc.

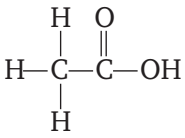
Catenation – Carbon also shows the property of self-linking in which it forms long, branched or cyclic chains to form large number of compounds.

Q6. *Write the structural formula for bromopentane and ethanoic acid.*

Ans. Bromopentane ($C_5H_{12}Br$)



Ethanoic acid (CH_3COOH)



Q7. *How does ethanoic acid react with carbonates and hydrogen carbonates? Show it with the equation.*

Ans. Ethanoic acid reacts with carbonates and hydrocarbonates to form salt, CO_2 and H_2O. The salt formed is sodium acetate.

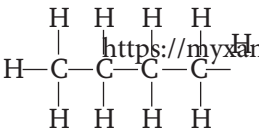
$2CH_3COOH + Na_2CO_3 \longrightarrow 2CH_3COONa + H_2O + CO_2$

$CH_3COOH + NaHCO_3 \longrightarrow CH_3COONa + H_2O + CO_2$

Q8. *Draw the structures of two isomers of butane.*

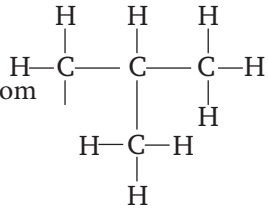
Ans. Butane C_4H_{10}

(*i*)



n-butane

(*ii*)



iso-butane

Q9. *A student burns a hydrocarbon in air and obtains sooty flame. Give two reasons for this observation.*

Ans. Sooty flame could be obtained due to

(*i*) Incomplete combustion of saturated hydrocarbons.

(*ii*) Combustion of unsaturated hydrocarbon.

Q10. *Differentiate between saturated and unsaturated hydrocarbons. Give one example for each.*

Ans.

Saturated hydrocarbon	***Unsaturated hydrocarbon***
1. It consist of single bond in carbon–carbon.	Double or triple bond in carbon–carbon is present.
2. It burns with blue flame.	It burns with sooty flame.
3. Show substitution reaction	Show addition reaction.
4. Less reactive Eg. CH_4 Methane C_2H_6 Ethane	More reactive E.g. $H_2C=CH_2$ Ethene $HC\equiv CH$ Ethyne

Q11. *Write the general formula for each of the following hydrocarbons and give one example for each.*

(i) Alkene *(ii) Alkyne*

Ans. (*i*) Alkene C_nH_{2n} *e.g.,* C_2H_4 ethene

(*ii*) Alkyne C_nH_{2n-2} *e.g.,* C_2H_2 ethyne

Q12. *Name the functional groups of the following:*

(*a*) $CH_3—Cl$ (*b*) $CH_3—\overset{\overset{O}{\|}}{C}—OH$

(*c*) $CH_3—\overset{\overset{O}{\|}}{C}—CH_3$ (*d*) C_2H_5OH

Ans. (*a*) Chloro (Halogen) (*b*) Carboxylic acid

(*c*) Ketone (*d*) Alcohol

Q13. *Explain substitution reaction with example.*

Ans. The reaction of saturated hydrocarbon with chlorine in which each hydrogen atom slowly gets substituted with chlorine atom is called substitution reaction.

$$\underset{\text{Methane}}{CH_4} + Cl_2 \longrightarrow \underset{\substack{\text{Methyl}\\\text{chloride}}}{CH_3Cl} + \underset{\substack{\text{Hydrochloric}\\\text{acid}}}{HCl}$$

Q14. *Diamond and graphite show different physical properties although they are made up of carbon and shows same chemical properties. What is this property called?*

Ans. This property is allotropy.

The physical properties are different because the carbon-carbon bonding in both the cases varies. In diamond one carbon atom is bonded with four other carbon atoms with strong covalent bond so it is hard, while in case of graphite each carbon forms two strong bonds with other two carbon atoms and one weak bond is formed with third carbon atom and forms hexagonal rings which slide over each other, so it is soft.

Q15. *What is denatured alcohol?*

Ans. When ethanol is mixed with methanol or some poisonous substances such as copper sulphate, pyridine which makes it unfit for drinking such alcohol is called denatured alcohol.

Q16. *What is esterification and give its uses?*

Ans. It is the reaction in which esters are formed by reacting carboxylic acid with alcohol in the presence of concentrated sulphuric acid.

$$\text{Carboxylic acid} + \text{alcohol} \longrightarrow \text{Ester} + \text{water}$$

$$\underset{\text{Ethanol}}{C_2H_5OH} + \underset{\text{Ethanoic acid}}{CH_3COOH} \longrightarrow \underset{\text{Ester}}{CH_3COOC_2H_5} + H_2O$$

Uses: (*i*) It is used as flavour in ice-cream and sweets.

(*ii*) It is a sweet smelling substance.

Q17. *Give difference between soap and detergent.*

Ans.

Soap	***Detergent***
1. Soaps are the sodium salts of the long chain carboxylic acids.	Detergents are generally ammonium or sulphonate salts of long chains carboxylic acid.
2. Soaps are not suitable for washing with hard water as it forms insoluble scum.	Detergents do not form insoluble scum with hard water.
3. Soaps are prepared from fats or vegetable oils.	Detergents are not prepared from fats or vegetable oils.
4. Biodegradable	Non-biodegradable.

Q18. *Differentiate between ethanol and ethanoic acid on basis of the following test:*

(i) Blue litmus test (ii) Reaction with sodium bicarbonate (iii) Sodium metal test

Ans.

Test	***Ethanol***	***Ethanoic acid***
(*i*) Blue litmus test	→ turns red	turns red
(ii) $NaHCO_3$	$C_2H_5OH + NaHCO_3 \longrightarrow$ C H ONa + H O + CO	$CH_3COOH + NaHCO_3 \longrightarrow$ CH COONa + H O + CO_2
(iii) Na test	2C H OH + 2Na ⟶ $2C_2H_5ONa + H_2$	2CH COOH + 2Na ⟶ $2CH_3COONa + H_2$

Q19. *Giving chemical equations of the reactions write what happens when*

(i) Ethanol is heated with excess of concentrated sulphuric acid at 443 K.

(ii) Ethanoic acid reacts with ethanol in presence of an acid.

(iii) Ester with molecular formula $CH_3COOC_2H_5$ reacts with sodium hydroxide.

Ans. (*i*) $\underset{\text{ethanol}}{C_2H_5OH} \xrightarrow[\text{Conc. } H_2SO_4]{\text{heat}} \underset{\text{ethene}}{H_2C{=}CH_2} + H_2O$

(*ii*) $\underset{\text{Ethanol}}{C_2H_5OH} + \underset{\text{Ethanoic acid}}{CH_3COOH} \xrightarrow{\text{acid}} \underset{\text{Ester}}{CH_3COOC_2H_5} + H_2O$

(*iii*) $CH_3COOC_2H_5 + NaOH \longrightarrow C_2H_5OH + CH_3COOH$

$CH_3COOH + NaOH \longrightarrow CH_3COONa + H_2O$

Q20. *How can you obtain the following from pure ethanol:*

(i) Ethene (ii) Ethanoic acid (iii) Ester?

Ans. (*i*) **Ethene:** Ethanol when heated with excess of concentrated sulphuric acid will form ethene.

$\underset{}{C_2H_5OH} \xrightarrow[\text{Conc. } H_2SO_4]{\text{heat}} \underset{\text{Ethene}}{H_2C{=}CH_2} + H_2O$

(*ii*) **Ethanoic acid:** On oxidation of ethanol with an oxidising agent like alkaline $KMnO_4$ or acidified $K_2Cr_2O_7$, ethanoic acid is formed.

$$CH_3—CH_2OH \xrightarrow[\text{acidified } K_2Cr_2O_7]{\text{alk. } KMnO_4} \underset{\text{ethanoic acid}}{CH_3COOH}$$

(*iii*) **Ester:** To get esters, ethanol is reacted with any carboxylic acid.

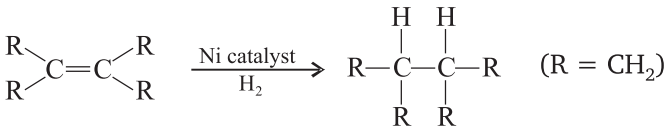
Example: $\underset{\text{Ethanol}}{C_2H_5OH} + \underset{\text{Ethanoic acid}}{CH_3COOH} \xrightarrow{\text{acid}} \underset{\text{Ester}}{CH_3COOC_2H_5} + H_2O$

The above reaction takes place in the presence of an acid.

Q21. *Write the chemical equations for the following reactions:*

(i) Conversion of oils into fats *(ii) Oxidation of ethanol*

(iii) Ethanoic acid with sodium hydroxide.

Ans. (*i*) 

Oil (unsaturated) Fats (saturated)

(*ii*) Oxidation of ethanol

$$\underset{\text{Ethanol}}{C_2H_5OH} \xrightarrow{\text{alk. } KMnO^4} \underset{\text{Ethanoic acid}}{CH_3COOH}$$

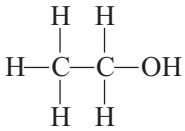
(*iii*) $\underset{\text{Ethanoic acid}}{CH_3COOH} + \underset{\substack{\text{Sodium}\\\text{hydroxide}}}{NaOH} \longrightarrow \underset{\substack{\text{Sodium}\\\text{acetate}}}{CH_3COONa} + H_2O$

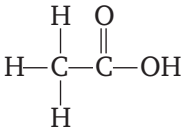
Q22. *An organic compound 'X' which is also called antifree mixture has the molecular formula C_2H_6O 'X' on oxidation gives a compound 'Y' which gives effervescence with a baking soda solution. What can X and Y be? Write their structural formula.*

Ans. X is ethanol, (C_2H_5OH)

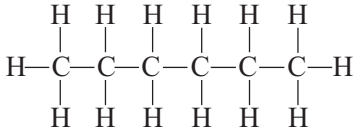
Y is ethanoic acid (CH_3COOH)

Structural formula

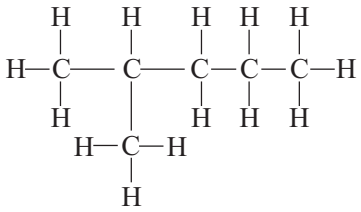
Ethanol 

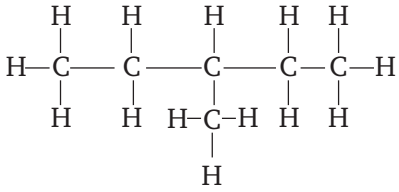
Ethanoic acid 

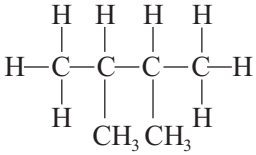
Q23. *Write the structures of isomers of hexane.*

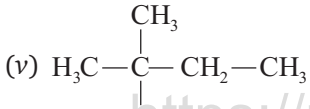
Ans. (*i*) 

n-Hexane

(*ii*)  2-Methyl pentane

(*iii*)  3-Methyl pentane

(*iv*)  2, 3-Dimethyl butane

(*v*)  2, 2-Dimethyl butane

Q24. *Complete and balance the following equations:*

(*a*) $CH_3CH_2OH + O_2 \longrightarrow$

(*b*) $Na + CH_3CH_2OH \longrightarrow$

(*c*) $CH_3–CH_2OH \xrightarrow{\text{conc. } H_2SO_4}$

Ans. (*a*) $2CH_3CH_2OH + 6O_2 \longrightarrow 4CO_2 + 6H_2O$ + heat + light

(*b*) $2Na + 2CH_3CH_2OH \longrightarrow 2CH_3CH_2ONa + H_2$

(*c*) $CH_3–CH_2OH \xrightarrow{\text{conc. } H_2SO_4} H_2C{=}CH_2 + H_2O$

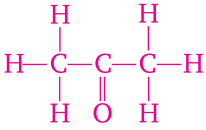
Q25. *Give two uses of ethanol and one harmful effect of it.*

Ans. Ethanol is a good solvent so it is used in making medicines such as tincture iodine, cough syrups and many tonics. Ethanol is also used in making alcoholic drinks.

Harmful effects: Intake of small amount of ethanol leads to drunkenness. Intake of even small amount of ethanol can be lethal. Long-term use or consumption can lead to severe health problems.

Q26. (*a*) *Why are covalent compounds generally poor conductors of electricity?*

(*b*) *Name the following compound:*



(c) Name the gases evolved when ethanoic acid is added to sodium carbonate. How would you prove the presence of this gas?

Ans. (a) Covalent compound do not form ions.

(b) Propanone

(c) Ethanoic acid reacts with sodium carbonate to produce carbon dioxide gas. To prove the presence of this gas allow it to pass through lime water (freshly prepared). It turns lime water milky.

Equation

$$2CH_3COOH + 2Na_2CO_3 \longrightarrow 2CH_3COONa + H_2O + CO_2$$

Test for the gas evolved $\rightarrow$ $\underset{\text{Lime water}}{Ca(OH)_2} + CO_2 \longrightarrow \underset{\text{Milky ppt.}}{CaCO_3} + H_2O$

Q27. *(a) Complete the following equations:*

(i) $CH_3CH_2OH \xrightarrow[\text{Heat}]{\text{Conc. } H_2SO_4}$

(ii) $CH_3COOH + NaHCO_3 \longrightarrow$

(iii) $CH_4 + Cl_2 \xrightarrow{\text{Sunlight}}$

(b) Write the name of the following:

(i) CH_3CH_2COOH

(c) Draw the electron dot structure of ethene(C_2H_4). (CBSE 2008 C)

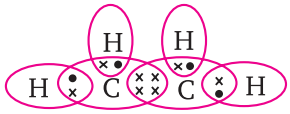
Ans. (a) (i) $CH_3CH_2OH \xrightarrow[\text{Heat}]{\text{Conc. } H_2SO_4} \underset{\text{ethene}}{H_2C{=}CH_2} + H_2O$

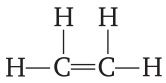
(ii) $CH_3COOH + NaHCO_3 \longrightarrow \underset{\text{Sodium ethanoate}}{CH_3COONa} + H_2O + CO_2$

(iii) $CH_4 + Cl_2 \xrightarrow{\text{Sunlight}} \underset{\text{Chloromethane}}{CH_3Cl} + HCl$

(b) (i)Propanoic acid (ii) Bromoethane

(c) Electron dot structure of ethene





Q28. *(a) Name the compound CH_3CH_2OH and identify its functional group.*

(b) Give a chemical test to distinguish between ethanol and ethanoic acid.

(c) Name the product formed when an organic acid reacts with an alcohol in presence of an acid catalyst. What is the name assigned to this type of reaction? (AI CBSE 2008 C)

Ans. (a) CH_3CH_2OH – Ethanol

Functional group: alcohol (–OH)

(*b*) Take two test tubes, add ethanol and ethanoic acid in test tube A and B respectively. Add sodium carbonate/sodium hydrogen carbonate solution in both the test tubes, the test tube which will produce brisk effervescence of CO_2 gas will contain ethanoic acid. Ethanol do not evolve CO_2 gas when reacted with Na_2CO_3/ $NaHCO_3$.

(*c*) When an organic acid reacts with an alcohol in presence of an acid as catalyst, it produces fruity smelling compound called **ester**. Such a reaction is called esterification.

Example: $CH_3COOH + C_2H_5OH \xrightarrow{\text{Conc. } H_2SO_4} CH_3COOC_2H_5 + H_2O$

Q29. (*a*) *Name the compound CH_3COOH and identify its functional group.*

(*b*) *Give a chemical test to identify this compound.*

(*c*) *Name the gas evolved when this compound acts on solid sodium carbonate. How would you identify this gas?* (AI CBSE 2008 C)

Ans. (*a*) Ethanoic acid, functional group is—COOH (Caboxylic/group)

(*b*) Take few drops of ethanoic acid in a test tube and add sodium hydrogen carbonate solution to it. Brisk effervescence of CO_2 gas is formed.

(*c*) CO_2 gas is evolved. To identify the gas, pass it through freshly prepared lime-water, it turns milky due to the formation of milky white precipitate of $CaCO_3$.

$Ca(OH)_2 + CO_2 \longrightarrow \underset{\text{White ppt.}}{CaCO_3} + H_2O$

Q30. (*a*) *Give a chemical test to distinguish between saturated and unsaturated hydrocarbons.*

(*b*) (*i*) *Name the products formed when ethanol burns in air.*

(*ii*) *What two forms of energy are liberated on burning alcohol?*

(*c*) *Why is the reaction between methane and chlorine considered a substitution reaction?* (AI CBSE 2008 C)

Ans. (*a*) On adding bromine water, the unsaturated hydrocarbon decolourises the bromine water but the saturated hydrocarbon will not decolourise bromine water.

(*b*) (*i*) Ethanol burns in air to produce carbon dioxide and water.

$C_2H_5OH + 3O_2 \longrightarrow 3CO_2 + 3H_2O + \text{heat}$

(*ii*) Two forms of energy obtained are heat energy and light energy.

(*c*) When methane reacts with chlorine, the hydrogen atom of methane is replaced by chlorine atom step by step and hence it is termed as substitution reaction.

$CH_4 + Cl_2 \longrightarrow CH_3Cl + HCl$

Q31. *Give reason for the following observations:*

(*a*) *The element carbon forms a very large number of compounds.*

(*b*) *Air holes of a gas burner have to be adjusted when the heated vessels get blackened by the flame.*

(*c*) *Use of synthetic detergents causes pollution of water.* (CBSE 2009)

Ans. (*a*) Carbon forms large number of compounds due to its property of catenation, *i.e.* self linking. They form **isomeric** compounds i.e. compounds with same molecular formula but different structural formula.

(*b*) The vessels blacken due to deposits of black carbon particles on it which is caused due to incomplete combustion of fuel. Air holes are adjusted so that air enters through the holes and helps in complete combustion of the fuel.

(*c*) Synthetic detergent is non-biodegradable, it remains in the water thereby causing water pollution.

Q32. (*a*) *What is a 'homologous series' of substances?*

(*b*) *In an organic compound, which parts largely determine its physical and chemical properties?*

(*c*) *Write a chemical equation to represent the reaction of ethanol with acidified solution of potassium dichromate.* (AI CBSE 2009)

Ans. (*a*) Homologous series is a series of organic compounds having same general formula,

(*b*) Functional group.

(c) $\underset{\text{Ethanol}}{CH_3CH_2OH} + 2[O] \xrightarrow[K_2Cr_2O_7]{\text{acidified}} \underset{\text{Ethanoic acid}}{CH_3COOH} + H_2O$

Q33. (*a*) *What is vinegar?*

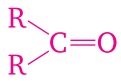
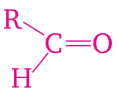
(*b*) *Describe with a chemical equation, what happens when sodium hydrogen carbonate reacts with ethanoic acid.* (AI CBSE 2009)

Ans. (*a*) The 5% – 10% aqueous solution of acetic acid is called vinegar.

(*b*) $\underset{\text{Acetic acid}}{CH_3COOH} + NaHCO_3 \longrightarrow \underset{\text{Sodium acetate}}{CH_3COONa} + H_2O + CO_2$

Ethanoic acid reacts with sodium bicarbonate to produce brisk effervescence of CO_2 gas and sodium acetate.

Q34. (*a*) *Write the names of the functional groups in:*

(*i*)  (*ii*) 

(*b*) *Describe a chemical test to distinguish between ethanol and ethanoic acid.*

(*c*) *Write a chemical equation to represent what happens when hydrogen gas is passed through an unsaturated hydrocarbons in the presence of nickel as a catalyst.* (CBSE 2009 F)

Ans. (*a*) (*i*) Ketone (*ii*) Aldehyde

(*b*) On adding Na_2CO_3/$NaHCO_3$, the test tube containing ethanoic acid produces brisk effervescence of CO_2 gas. Alcohol will not show any reaction.

$$CH_3COOH + NaHCO_3 \longrightarrow CH_3COONa + CO_2 + H_2O$$

$$C_2H_5OH + NaHCO_3 \longrightarrow \text{No reaction}$$

(*c*) $H_2C{=}CH_2 + H_2 \xrightarrow[\text{Catalyst}]{Ni} H_3C{-}CH_3$

Ethene (Unsaturated hydrocarbon) → Ethane (Saturated Hydrocarbon)

IV. LONG ANSWER TYPE QUESTIONS (*5 Marks*)

Q1. *An organic compound 'A' is widely used as a preservative in pickles and has a molecular formula $C_2H_4O_2$. This compound reacts with ethanol to form a sweet smelling compound 'B'.*

(*a*) *Identify the compound 'A'.*

(*b*) *Write the chemical equation for its reaction with ethanol to form compound 'B'.*

(*c*) *How can we get compound 'A' and 'B'?*

(*d*) *Which gas is obtained when compound 'A' reacts with washing soda? Give the equation.*

(*e*) *Write an equation to obtain 'A' back from 'B'.*

Ans. (*a*) 'A' is CH_3COOH acetic acid.

(*b*) $CH_3COOH + C_2H_5OH \longrightarrow CH_3COOC_2H_5 + H_2O$

(*c*) We can get compound A back by the process of saponification.

(*d*) A + washing soda $\longrightarrow$ CO_2 gas is produced

$$2CH_3COOH + Na_2CO_3 \longrightarrow 2CH_3COONa + H_2O + CO_2$$

(*e*) Saponification

$$CH_3COOC_2H_5 \xrightarrow{NaOH} C_2H_5OH + CH_3COONa$$

Q2. *Identify the compound A, B, C, D, and E in the following reaction:*

(*a*) $CH_3CH_2OH \xrightarrow{\text{(A)}} CH_3COOH$

(*b*) $CH_3CH_2OH + CH_3COOH \xrightarrow[H_2SO_4]{\text{conc.}} \text{(B)} + H_2O$

(*c*) $B + NaOH \rightarrow C_2H_5OH + \text{(C)}$

(*d*) $D + Na_2CO_3 \rightarrow CH_3COONa + \text{(E)} + H_2O$

(*e*) $E + Ca(OH)_2 \rightarrow \text{(F)} + H_2O$

white ppt.

Ans. (*a*) A = Alkaline $KMnO_4$ or acidified $K_2Cr_2O_7$

(*b*) B = $CH_3COOC_2H_5$

(*c*) C = CH_3COONa

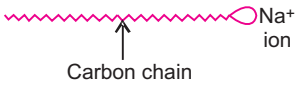
(*d*) D = CH_3COOH; E = CO_2

(*e*) E = CO_2; F = $CaCO_3$

Q3. *What are soaps? Explain the mechanism of the cleansing action of soaps? Soaps form scum with hard water. Explain why? How this problem is overcome by use of detergents?*

Ans. Soaps are sodium salts of fatty acids. It is biodegradable and shows cleansing action by removing dirt.

Mechanism of cleansing action: Soap has molecules with tadpole like structure.



Its head is made of Na^+ ion which is hydrophilic and long tail is made up of hydrocarbon chain which is hydrophobic, it attracts the dirt and removes it. When soap is added to water it forms micelles and helps in removing the dirt which sticks to the carbon chain. On rinsing the cloth with water it helps in removing the dirt, as Na^+ is hydrophilic. It attracts water and carries its tail entangled with dirt and flows away with

Scum formation: Soaps form scum with hard water because hard water has salts of calcium and magnesium which react with soap to form insoluble compound called scum.

In case of detergents, the salts present in hard water does not react with the molecules of detergent to form insoluble compound called scum, but the molecules of detergent remain as it is and helps in the cleansing action.

Q4. (*a*) *What do you mean by allotropy?*

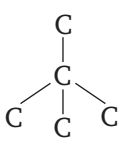
(*b*) *What is isomerism?*

(*c*) *Give one example of homologus series, give two properties of it.*

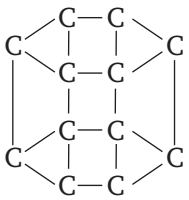
(*d*) *What is the full form of IUPAC?*

Ans. (*a*) **Allotropy:** It is the property of an element in which element show same chemical properties but different physical properties, due to difference in the bonding of atoms.

Example: Diamond and graphite are having same chemical properties but they look/appear to be physically different as the bonding in both differs.



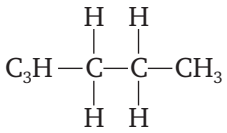
Diamond



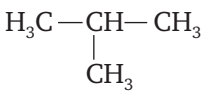
Graphite

(*b*) **Isomerism:** It is the property of hydrocarbons which show same molecular formula but exhibits different structural formulae.

Example: Butane



n-butane



iso-butane

Both of them show different properties.

(*c*) **Homologous series:** When the members of a hydrocarbon family obey same general formula they are said to be in homologous series. When the members are arranged in increasing order of their molecular masses:

Example: Alkane – C_nH_{2n+2}

CH_4 — Methane

C_2H_6 — Ethane

C H — Propane

C_4H_{10} — Butane

Properties:

(*i*) The difference between two consecutive members of homologous series is of —CH_2 and mass 14 a.m.u.

(*ii*) They all show same chemical properties and slight gradation in their physical properties.

(*d*) **IUPAC:** International Union of Pure and Applied Chemistry.

Q5. (*a*) *What are hydrocarbons?*

(*b*) *Give difference between saturated and unsaturated hydrocarbons.*

(*c*) *Why does carbon form large number of compounds?*

Ans. (*a*) Hydrocarbons – A compound of carbon and hydrogen.

(*b*)

Saturated	Unsaturated
1. C—C single bond	C═C, C≡C double or triple bond.
2. Alkanes C_nH_{2n+2}	Alkenes C_nH_{2n}, and Alkynes C_nH_{2n-2}
3. Undergo substitution reaction	Undergo addition reaction
4. Burns with blue flame	Burns with sooty flame

(*c*) Carbon forms large number of compounds due to

(*i*) Catenation – Self linking property which leads to long straight chains, branched chains and cyclic chains.

(*ii*) Isomerism – Compound of carbon can exist in more than one structural formula but has same molecular formula.

(*iii*) Tetravalency – To acquire noble gas configuration, carbon shares its outer electrons with other elements, thus form covalent bond with other elements.

Q6. *(a) Why does carbon form compounds mainly by covalent bonding?*

(b) List any two reasons for carbon forming a very large number of compounds.

(c) An organic acid 'X' is a liquid which often freezes during winter time in cold countries, has the molecular formula, $C_2H_4O_2$. On warming it with ethanol in the presence of a few drops of concentrated sulphuric acid, a compound 'Y' with a sweet smell is formed.

(i) Identify 'X' and 'Y'.

(ii) Write a chemical equation for the reaction involved. (CBSE 2008)

Ans. (*a*) Carbon forms compounds mainly by covalent bonding because carbon has small size, so neither it can loose four electrons easily, because very high amount of energy will be required, nor it can gain four electrons. Hence, it shares four electrons forming covalent bonds.

(*b*) (*i*) Due to catenation – Self linking property

(*ii*) Tetravalency of carbon – Forms compounds with other elements.

(*c*) (*i*) 'X' is CH_3COOH, it freezes during winter in cold countries.

'Y' is ester $CH_3COOC_2H_5$

(*ii*) $CH_3COOH + C_2H_5OH \xrightarrow{\text{Conc. } H_2SO_4} CH_3COOC_2H_5 + H_2O$

Ethanoic acid Ethanol Ester

Q7. *(a) What is homologous series of compounds? List any two characteristics of a homologous series.*

(b) (i) What would be observed on adding 5% solution of alkaline potassium permanganate solution drop by drop to some warm ethanol taken in a test tube?

(ii) Write the name of the compound formed during the chemical reaction.

(c) How would you distinguish experimentally between an alcohol and a carboxylic acid on the basis of a chemical property? (CBSE 2008)

Ans. (*a*) Organic compounds when arranged in series having same general formula and similar chemical properties is called homologous series.

Two characteristics of homologous series.

(*i*) Each successive member differ by —CH_2 group, 14 u.

(*ii*) The method of preparation and chemical properties of members of homologous series is same.

(*b*) (*i*) The colour of $KMnO_4$ will get discharged because ethanol gets oxidised to form ethanoic acid.

$$CH_3CH_2OH + 2(O) \xrightarrow{\text{alk. } KMnO_4} CH_3COOC_2H_5 + H_2O$$

(*ii*) Ethanoic acid

(*c*) On adding sodium bicarbonate solution to both the test tubes containing ethanol and ethanoic acid then the test tube containing carboxylic acid (ethanoic acid) will show brisk effervescence due to formation of CO_2 gas. Alcohol will not react with sodium bicarbonate.

Q8. (*a*) *What is a functional group in a carbon compound? Identify the functional group present in CH_3COOH and C_2H_5OH.*

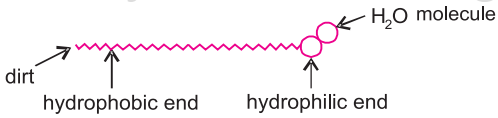
(*b*) *State the principle on which the cleansing action of soap is based.* (CBSE 2008 F)

Ans. (*a*) The atom or group of atoms which determines the properties of a compound is called functional group.

— OH is alcohol group

— COOH is carboxylic group

(*b*) Cleansing action of soap depends on its structure, it has two ends hydrophobic which attracts dirt, oil or grease and hydrophilic end which attracts water.



The dirt is carried by hydrophobic portion which is attached to hydrophilic end which gets attached to water and is washed away.

Q9. (*a*) *What is homologous series? Give one example.*

(*b*) *What will happens if ethanoic acid reacts with ethanol in the presence of an acid as a catalyst? Name the reaction. Write the chemical reaction for this reaction.*

(*c*) *Why are soaps ineffective in hard water?* (CBSE 2008 C)

Ans. (*a*) Homologous series is series of compounds having same functional group and same chemical properties. When members of the series are arranged in ascending order, two successive members differ by $-CH_2$ group and mass 14 u.

Example : **Alcohol**

CH_3OH
C_2H_5OH } CH_2 mass 14. a.m.u
C_3H_7OH

(*b*) Ethanol reacts with ethanoic acid to produce a fruity smelling compound called ester, the conc. sulphuric acid is used as dehydrating agent which removes water. Such reaction is called esterification.

Example:

$$\underset{\text{Alcohol}}{C_2H_5\boxed{OH}} + \underset{\text{Carboxylic acid}}{CH_3COO\boxed{H}} \xrightarrow{\text{conc. } H_2SO_4} \underset{\substack{\text{Ester}\\\text{(ethyl ethanoate)}}}{CH_3COOC_2H_5} + H_2O$$

(*c*) Hard water contains salts of Ca and Mg. Soap molecule reacts with these salts to produce white precipitate called scum, which is insoluble in water and the cleansing action of soap becomes ineffective.

Q10. (*a*) *Distinguish between esterification and saponification reactions of organic compounds.*

(*b*) *With a labelled diagram describe an activity to show the formation of an ester.*

(AI CBSE 2009)

Ans. (*a*) **Esterification:** Reaction in which carboxylic acid reacts with alcohol in presence of conc. H_2SO_4 to form a fruity smelling compound called ester.

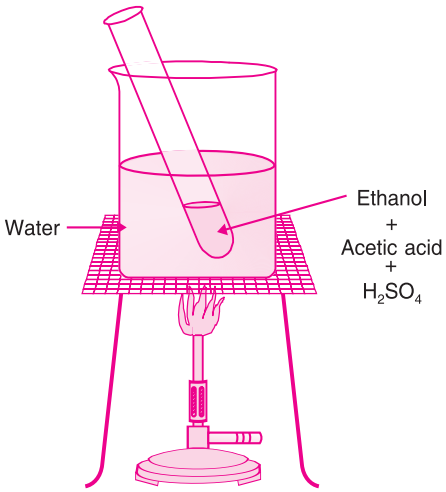
$$\underset{\text{Ethanoic acid}}{CH_3COOH} + \underset{\text{Ethanol}}{C_2H_5OH} \xrightarrow{\text{Conc. } H_2SO_4} \underset{\text{Ester}}{CH_3COOC_2H_5} + H_2O$$

Saponification: It is a reaction in which an ester reacts with alkali solution to form a compound called soap.

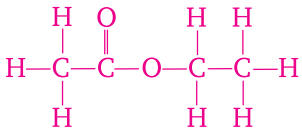
$$\underset{\text{Ester}}{CH_3COOC_2H_5} + \underset{\substack{\text{Sodium}\\\text{hydroxide}}}{NaOH} \longrightarrow \underset{\substack{\text{Sodium}\\\text{ethanoate}}}{CH_3COONa} + \underset{\text{Ethanol}}{C_2H_5OH}$$

(*b*) **Activity to show the formation of an ester:** Take a test tube and add ethanol, acetic acid and few drops of conc. H_2SO_4 in it. Warm it over a water bath, *i.e.*, keeping the test tube in a beaker containing water. Pleasant, fruity smelling compound called ester is formed.

$$CH_3COOH + C_2H_5OH \xrightarrow{\text{Conc. } H_2SO_4} CH_3COOC_2H_5 + H_2O$$



Q11. (*a*) *The structural formula of an ester is*



Write the structural formula of the corresponding alcohol and the acid.

(*b*) (*i*) *Mention the experimental conditions involved in obtaining ethene from ethanol.*

(*ii*) *Write the chemical equation for the above reaction.*

(*c*) *Explain the cleansing action of soap.* (CBSE 2009 F)

Ans. (*a*) CH_3COOH and CH_3CH_2OH

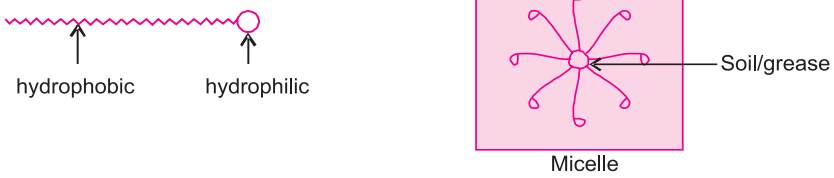
Ethanoic acid Ethanol

(*b*) (*i*) Ethanol when heated in presence of conc. H_2SO_4, it gets dehydrated to form ethene at 160°C – 170°C.

(*ii*) $C_2H_5OH \xrightarrow[160°C - 170°C]{\text{Conc. } H_2SO_4} H_2C = CH_2 + H_2O$

(*c*) **Cleansing action of soap:** Soap consists of two ends, long chain of hydrocarbon is called hydrophobic which repels water and attracts dirt and grease. The other end is hydrophilic which attracts water.

When soap is added to water it forms micelle structure as shown below.



The tail of the soap sticks to the dirt inwards and the head points outward. When water is agitated, the dirt sticks to more number of soap molecules. On lot of rinsing with water, the water washes away soap molecule with dirt attached to it.

V. QUESTIONS ON HIGH ORDER THINKING SKILLS (HOTS)

Q1. *A, B, C are members of homologous series their melting points are –183°C, –138°C, 130°C respectively. Among these*

(*i*) *Which member will have least number of carbon atoms?*

(*ii*) *Which member will have maximum number of carbon atoms?*

Ans. (*i*) A will have least number of carbon atoms.

(*ii*) C will have maximum number of carbon atoms.

Q2. *A hydrocarbon compound A is active ingredient of wine and cough syrup. A on oxidation with acidified $K_2Cr_2O_7$ forms compound B. Identify the compound A and B and write the chemical equations involved.*

Ans. A is ethanol, C_2H_5OH

B is ethanoic acid, CH_3COOH

Equation : $C_2H_5OH \xrightarrow{\text{acid } K_2Cr_2O_7} CH_3COOH$

Q3. *Write an activity to show the acidic nature of ethanol. Give the chemical equation of the reaction taking place.*

Ans. Take ethanol in a test tube and drop a small piece of sodium about the size of a grain of rice into it. The reaction evolves a colourless gas which is hydrogen.

Hydrogen gas can be tested by bringing a burning splinter/match stick near the mouth of the test tube, it burns with the popping sound.

This activity proves that ethanol like other acids release H_2 gas

$$2Na + 2CH_3CH_2OH \longrightarrow 2CH_3CH_2ONa + H_2$$

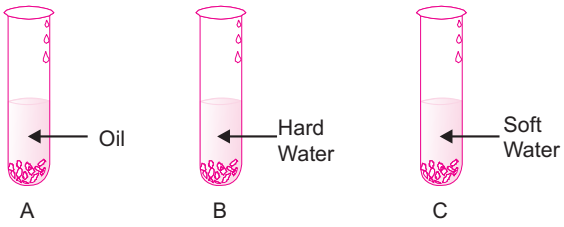
Q4. *A compound 'X' has molecular formula C_2H_6O is saturated hydrocarbons and is a very good solvent. How can you convert it into unsaturated hydrocarbon? Identify X and show its conversion with the help of equation.*

Ans. 'X' is $CH_3—CH_2OH$ ethanol. It can be made unsaturated by heating it with conc. H_2SO_4 which is a dehydrating agent removes water from it, thereby forming ethene.

$$CH_3—CH_2OH \xrightarrow[H_2SO_4]{\text{Hot conc.}} H_2C{=}CH_2 + H_2O$$

Ethanol Ethene

Q5. *Take about 20 ml of castor oil in a beaker. Add 30 ml of 20% sodium hydroxide solution. Heat the mixture with continuous stirring for a few minutes till the mixture thickens. Add 5–10 g of common salt to this. Stir the mixture well, allow it to cool, soaps is obtained.*



(*a*) *Why do we use common salt to make soap?*

(*b*) *What will happen if you will add the above made soap solutions to the following test tubes A, B, and C.*

(*c*) *Can we use potassium hydroxide instead of sodium hydroxide.*

Ans. (*a*) *Salt:* NaCl is added while making soap, because it will help the reaction to occur faster and adds sodium ion to increase the reaction rate.

(*b*) **In test tube A:** Soap + Oil ⟶ Lather/foam is formed. Carboxylic chain dissolves in oil.

In test tube B: Soap + Hard water ⟶ Insoluble compound called scum is formed.

In test tube C: Soap + soft water ⟶ Froth is formed.

(*c*) Yes, we can use potassium hydroxide to prepare soap.

VI. VALUE-BASED QUESTIONS

Q1. *A student reports the police about the illegal vending of alcohol near his school. He also knew about denatured alcohol.*

(a) What is denatured alcohol?

(b) What would happen if somebody consumes denatured alcohol?

(c) What value is reflected by a student who reported the matter to police?

Ans. (*a*) Denatured alcohol is ethanol when added with poisonous methanol or copper sulphate solution.

(*b*) On drinking denatured alcohol a person may die.

(*c*) Value reflected by student is society's law and order.

Q2. *Suman always carried her tiffin box in a jute bag while most of her friends got it packed in a poly bag.*

(a) What type of bonding is present in polythene?

(b) Give one advantage of carrying jute and disadvantage of poly bag.

(c) Which value is reflected in Suman by using jute bag?

Ans. (*a*) In polythene, long chain of ethene is present – C = C –.

(*b*) Jute bag is biodegradable and will not cause pollution. While poly bag is non-biodegradable and causes pollution.

(*c*) Suman shows the value of a responsible behaviour.

Q3. *Geeta helps her mother in washing clothes, toilets, balconies every Sunday. She uses the leftover detergent water of washing machine to clean toilets.*

(a) Why is detergent used in washing clothes?

(b) Give one advantage of detergent over soap.

(c) What value of Geeta is reflected in the above task?

Ans. (*a*) Detergents have strong cleansing ability and can remove oil and dirt from clothes or other surfaces.

(*b*) Soap cannot be used in hard water but detergents can be used in hard water.

(*c*) Geeta is trying to reduce water pollution and water shortage problem. She also shows helpful to her mother and responsible behaviour.

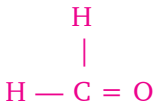
TEST YOUR SKILLS

Q1. *Classify the following carbon compounds on the basis of the nature of flame obtained on burning them.*

Camphor, Alcohol, Acetone and Naphthalene.

Q2. *Give the electron dot structure of* CO_2.

Q3. *Name the given compound:*



Q4. *How many covalent bonds are present in C_2H_6?*

Q5. *The physical properties of a carbon compound is – It has pungent smell, M.P. is 156 K and B.P. is 351 K. Name the compound.*

Q6. *What is hydrogenation? What is its industrial application?*

Q7. *Give a test that can be used to differentiate between ghee and oil.*

Q8. *What is functional group? Identify the functional group present in CH_3COOH and C_2H_5OH.*

Q9. *Explain the mechanism of cleaning action of soaps.*

Q10. *Complete the following equations:–*

(*i*) $CH_3CH_2OH \xrightarrow[\text{Heat}]{\text{Conc. } H_2SO_4}$

(*ii*) $CH_4 + Cl_2 \xrightarrow{\text{Sunlight}}$

(*iii*) $C_2H_5OH + CH_3COOH \xrightarrow[H_2SO_4]{\text{Conc.}}$

Q11. (*a*) *Give a chemical test to distinguish between saturated and unsaturated hydrocarbons.*

(*b*) *Name the product formed when ethanol burns in air.*

(*c*) *Why is the reaction between methane and chlorine considered as substitution reaction?*

❐❐❐

5 Periodic Classification of Elements

SYLLABUS

Need for classification, Modern Periodic Table, Gradation in properties, Valency, Atomic number, Metallic and Non-metallic properties.

Facts that Matter

Döbereiner's Classification

Döbereiner tried to classify and group elements in the order of increasing atomic masses, made group of three elements (triads) having similar chemical properties. The atomic mass of the middle element of the triad being equal to the arithmetic mean of the atomic masses of the other two elements.

Triads: Li, Na, K

6.9, 22.9, 39 $\qquad 6.9 + 39 = \frac{45.9}{2} = 22.95$

1. Group of three elements.
2. Arranged in increasing order of their masses.
3. Mass of the middle element was equal to the average mass of the other two elements.

Drawback of Döbereiner's Triads

1. He could make only three triads.
2. At that time only few elements (54) were known, the grouping was not done for all the elements so, it was not accepted.

Newland's Law of Octaves

He grouped seven elements and arranged them in increasing order of their atomic masses. He started with lowest element hydrogen and ended with thorium, the 56th element was known at that time.

Every eighth element showed the properties similar to that of first. It was called the Law of Octaves, (like music notes the first and the eighth note is same, similar to octaves.)

Drawbacks of Newland's Octaves

1. He could group the elements only till calcium, after Ca the remaining elements did not follow the law of Octaves.
2. Newland assumed that only 56 elements existed in nature and no new element will be discovered.
3. He tried to jumble few elements to make possible that the Law of Octaves is followed, *i.e.*, the properties of 1st and 8th element is same.
4. In order to fit the elements in his octave, he adjusted two elements, cobalt and nickel by placing in the same group of fluorine, chlorine and bromine.
   — Iron which resembled cobalt and nickel was placed in some other group.

   F
   Cl
   Co, Ni Fe
   Br

Mendeleev's Periodic Law

The properties of the elements are the periodic functions of their atomic masses.

- Mendeleev arranged the elements in the increasing order of their masses and the elements lying in the group have same properties.
- 63 elements were known at that time.
- He made a table of 8 groups (vertical columns) and 6 periods (horizontal rows).

Achievements

While arranging the elements Mendeleev left 3 gaps and he predicted 3 elements as Eka boron, Eka aluminium and Eka silicon. He also predicted the properties of these elements. All the 3 elements were discovered later; they were named as

(*a*) Scandium (*b*) Gallium (*c*) Germanium

Noble gases were not discovered then. After discovery they got a separate group without disturbing the elements in the table.

Noble gases are inert gases which are less reactive and are present in very less concentration in air.

Limitations/Anomalies of Mendeleev's Classification

While arranging the elements in this table, he placed cobalt (58.9) before nickel (at. mass 58.7). The position of hydrogen was not clear because it was placed along with the alkali metals.

It could have been placed along with fluorine, chlorine, bromine and iodine. (Halogen family) because it forms di-atomic molecule and like them it combines with metals forming covalent bonds.

Isotopes were not given any position in this table. Isotopes are the atom of same element with same atomic number but different atomic mass, *e.g.*, ${}^{35}_{17}Cl$ ${}^{37}_{17}Cl$

Modern Periodic Law

- Properties of the elements are periodic functions of their atomic number.
- Atomic number = Number of protons.
  Number of protons = Number of electrons
  Number of neutrons can vary but number of protons remain the same in an atom.
- It has 7 periods and 18 groups.
  Period number of an element = Number of shells.
  Distribution of electrons in a shell is determined by the formula $2n^2$, where 'n' is the shell number.

K shell (n = 1)	$2 \times (1)^2$ = 2 electrons
Period = 1	elements = H, He
L shell (n = 2)	$2 \times (2)^2$ = 8 electrons.
Period = 2	elements = Li, Be, B, C, N, O, F, Ne
M shell (n = 3)	$2 \times (3)^2$ = 18 electrons
Period = 3	elements = Na, Mg, Al, Si, P, S, Cl, Ar

1st period is the shortest
6th period is the longest
7th period is incomplete.

Characteristics in Groups

1. **Valence electrons:** The number of valence electrons in a group remains the same.

Group I	*Group 17*
Li 2, 1	Fluorine 2, 7
Na 2, 8, 1	Chlorine 2, 8, 7
K 2, 8, 8, 1	Bromine 2, 8, 18, 7
Rb 2, 8, 18, 8, 1	Iodine 2, 8, 18, 18, 7

2. **Valency:** All elements in a group have same valency.

Group I	*Valency*	*Group 17*	*Valency*
Li	1	F	1
Na	1	Cl	1
K	1	Br	1

3. **Atomic size:** Atomic size is the distance between the outermost orbit and the centre of the nucleus.
   On moving down the group, the atomic size of elements goes on increasing, as one shell get added as we move from top to bottom.

Li ○
Na ○
K ○
Rb ○

4. **Metallic character:** On moving down the group, the metallic character goes on increasing.

Li — least metallic
Na ↓
K
Rb — most metallic

Chemical Reactivity

The chemical reactivity of metals increases down the group as the metals readily lose electron as the atomic size increases down the group.

Metals Group 1	*Non-metals Group 17*
Li | reactivity	F | Most reactive
Na | increases	Cl | reactivity
K ↓ Most reactive	Br ↓ decreases

In case of non-metals, the reactivity decreases as we move down the group, the atom at the top of the group readily accepts electron.

Characteristics of Periods

1. **Valence electrons:** On moving from left to right in the period, the number of valence electrons increases from 1 to 8.

Example	Na	Mg	Al	Si	P	S	Cl	Ar
Electronic configuration	2,8,1	2,8,2	2,8,3	2,8,4	2,8,5	2,8,6	2,8,7	2,8,8
Valence electrons	1	2	3	4	5	6	7	8

2. **Valency:** On moving from left to right in a period the valency increases from 1 to 4 and then decreases from 4 to 1.

3rd Period	Na	Mg	Al	Si	P	S	Cl
Valency	1	2	3	4	3	2	1

3. **Atomic size:** On moving from left to right the atomic size decreases. This is due to increase in nuclear charge that pulls the electrons towards the nucleus.

3rd Period	Na	Mg	Al	Si	P	S	Cl
Size	◯	◯	◯	○	○	○	○

4. **Nature:** On moving from left to right, the metallic character decreases and the non-metallic character increases.

Facts to Recall

1. Döbereiner grouped the elements into 'triads'. When 3 elements are arranged in the increasing order of atomic masses, then the atomic mass of the middle element is roughly the average of the atomic masses of other two elements.

2. Newland arranged the element in increasing order of their atomic mass and found that every eighth element had properties similar to that of the first and called it as octaves.
3. Mendeleev arranged the elements in a table and he stated his law that the properties of elements are the periodic function of their atomic masses.
4. Moseley arranged the elements in increasing order of the atomic number.

   Modern periodic law: Properties of elements are periodic functions of their atomic numbers. Modern Periodic Table had 18 vertical columns called groups and 7 horizontal rows called **periods**.

   Elements on left side are metals and on right side are non-metals. Metalloids lie in a zig-zag between metal and non-metal.

   Groups: All elements in a group have same valence electrons, same valency. The size of atom increases from top to bottom. Reactivity of metals increases and reactivity of non-metals decreases in a group from top to bottom.

Periods

The number of shells indicate the period number. The valence electrons increases as we move from left to right, from 1 to 8, and valency first increases 1 to 4 and then decreases to 0.

Size of atom decreases from left to right,
Metallic character decreases and non-metallic character increases as we move from left to right.

On moving from left to right in a period the electropositive character of element decreases, but the electronegative character increases.

NCERT IN-TEXT ACTIVITIES SOLVED

ACTIVITY 5.1

- Hydrogen resembles alkali metals as it combines with halogens, oxygen and sulphur to form compounds having similar formula as metals.
- Hydrogen also resembles halogens as it exists in the form of diatomic molecules and combines with metals and non-metals forming covalent, compounds.
- No fixed position can be assigned to hydrogen in the Mendeleev's Periodic Table.

ACTIVITY 5.2

- Chlorine has two isotopes Cl-35 and Cl-37. Both the isotopes show same chemical properties and hence both the isotopes should be in the same slot.

ACTIVITY 5.3

- The position of Co and Ni were resolved by placing them in the increasing order of atomic number in Modern Periodic Table.
- The isotopes were not considered during the classification of elements in Modern Periodic Table because the elements were arranged in the increasing order of atomic number.

- The atomic number of an element can not be 1.5 because atomic number exists as whole number.
- Hydrogen should be placed in group-I in the Modern Periodic Table.

ACTIVITY 5.4

Group I Elements	*Atomic No.*	*Electronic Configuration*	*Valence electrons*	*Valency*	*Size of Atom*
H	1	1	1	1	○
Li	3	2, 1	1	1	○
Na	11	2, 8, 1	1	1	○
K	19	2, 8, 8, 1	1	1	○

ACTIVITY 5.5

II Period →	Li,	Be,	B,	C,	N,	O,	F,	Ne
Atomic number →	3	4	5	6	7	8	9	10
Electronic configuration →	2,1	2,2	2,3	2,4	2,5	2,6	2,7	2,8
Valence electrons →	1	2	3	4	5	6	7	8
Valency →	1	2	3	4	3	2	1	0
Size of atom →	◯	◯	◯	◯	○	○	○	○

ACTIVITY 5.6

To calculate valency of an element from its electronic configuration

	Magnesium	*Sulphur*
Atomic number →	12	16
E. configuration	2, 8, 2	2, 8, 6
Valency	2	2

Valency in period → 1 2 3 4 3 2 1 0

first increases from 1 to 4 and then decreases to 0.

Valency in group remains the same for all elements.

ACTIVITY 5.7

Atomic radii of the second period elements

Given:	B	Be	O	N	Li	C
	88	111	66	74	152	77

In decreasing order of their atomic radii

Li	Be	B	C	N	O
152	111	88	77	74	66

Lithium has the biggest size of atom, oxygen has the smallest size of atom. On moving from Left → Right in a period the atomic size goes on decreasing.

ACTIVITY 5.8

Group I elements.

Atomic size (pm)		○	Atomic size
Li	152	○	↓
Na	186	○	Increases
K	231	○	↓
Rb	244	○	↓
Cs	262	○	↓

- Atomic size increases down the group as new shell is added as we go down the group.

ACTIVITY 5.9

Elements of III period							
Na,	Mg,	Al,	Si,	P,	S,	Cl,	Ar
	Metals					Non-metals	

ACTIVITY 5.10

- Tendency to loose electrons in a **group**

Metals	Non-Metals
↓	↓
Tendency to loose e^- increases	Tendency to loose e^- decreases

- Tendency to loose electrons in **Period**

L ⟶ R

readily loose e^- readily gain e^-

ACTIVITY 5.11

Tendency to gain electrons increases across the period.

Tendency to gain electrons

Metals

↓

decreases down the group

NCERT IN-TEXT QUESTIONS SOLVED

Q1. *Did Döbereiner's triads also exist in the columns of Newland's Octaves? Compare and find out.*

Ans. Yes, it exists in the Newland's octave. It is Li, Na and K.

Q2. *What were the limitations of Döbereiner's classification?*

Ans. (*a*) All the existing elements were not classified.

(*b*) Döbereiner could identify only three triads from the elements.

Hence this system was not useful.

Q3. *What were the limitations of Newlands' Law of Octaves?*

Ans.

- Newlands' law was applicable only till calcium, after Ca, every eighth element did not possess properties similar to first.
- New elements discovered did not fit into the law.
- Wrong order of arrangement of elements was done, e.g. Co and Ni do not resemble halogen were found together in same slot, Fe being similar to Co and Ni was separated and kept in different slot.

Q4. *Use Mendeleev's Periodic Table to predict the formulae for the oxides of the following elements:*

K, C, Al, Si, Ba

Ans.

Element	*Group No.*	*Formula*
K	1	K_2O
C	4	CO_2
Al	3	Al_2O_3
Si	4	SiO_2
Ba	2	BaO

Q5. *Besides gallium, which other elements have since been discovered that were left by Mendeleev in his Periodic Table?* (any two)

Ans. Besides gallium, germanium and scandium have been discovered.

Q6. *What were the criteria used by Mendeleev in creating his Periodic Table?*

Ans. (*i*) Increasing order of atomic mass of the elements.

(*ii*) All elements in a group with similar properties.

(*iii*) The formula of oxides and hydrides formed by an element.

Q7. *Why do you think noble gases are placed in a separate group?*

Ans. Noble gases are inactive, do not resemble other elements and all of them show same properties, hence they are grouped separately.

Q8. *How could the Modern Periodic Table remove various anomalies of Mendeleev's Periodic Table?*

Ans. Modern Periodic Table is based on the atomic number of elements, therefore
(*i*) problem of isotopes was solved because isotopes have same atomic number
(*ii*) wrong order of Ar, K, Co, Ni was removed.

Q9. *Name two elements you would expect to show chemical reactions similar to magnesium. What is the basis for your choice?*

Ans. Calcium and barium.

Reason : (*i*) Both of them belong to same group as magnesium.

(*ii*) Ba and Ca has same valence electrons as Mg, and will show same properties as of magnesium.

Q10. *Name:*

(*a*) *Three elements that have a single electron in their outermost shells.*

(*b*) *Two elements that have two electrons in their outermost shells.*

(*c*) *Three elements with filled outermost shells.*

Ans.

(*a*)	Li, (2, 1)	Na, (2, 8, 1)	K (2, 8, 8, 1)
(*b*)	Be, (2, 2)	Mg (2, 8, 2)	
(*c*)	He, (2)	Ne, (2, 8)	Ar (2, 8, 8)

Q11. (*a*) *Lithium, sodium, potassium are all metals that react with water to liberate hydrogen gas. Is there any similarity in the atoms of these elements?*

(*b*) *Helium is an unreactive gas and neon is a gas of extremely low reactivity. What, if anything, do their atoms have in common?*

Ans. (*a*) All these metals are highly reactive, they have same valence electrons *i.e.* 1 and can readily loose electrons to become positive ions.

(*b*) Helium and neon have completely filled outermost shell.

Q12. *In the Modern Periodic Table, which are the metals among the first ten elements.*

Ans. Lithium and beryllium are metals.

Q13. *By considering their position in the Periodic Table, which one of the following elements would you expect to have maximum metallic characteristics?*

Ga, Ge, As, Se, Be

Ans. Among the given elements Be will show maximum metallic characteristics as it belongs to extreme left of the Periodic Table.

QUESTIONS FROM NCERT TEXTBOOK

Q1. *Which of the following statements is not a correct statement about the trends when going from, left to right across the periods of the Periodic Table?*

(a) The elements become less metallic in nature.

(b) The number of valence electrons increases.

(c) The atoms lose their electrons more easily.

(d) The oxides become more acidic.

Ans. (*c*) The atoms lose their electrons more easily.

Q2. *Element X forms a chloride with the formula XCl_2, which is a solid with a high melting point. X would most likely be in the same group of the Periodic Table as*

(a) Na *(b) Mg* *(c) Al* *(d) Si*

Ans. (*b*) Mg.

Q3. *Which element has*

(a) two shells, both of which are completely filled with electrons?

(b) the electronic configuration 2, 8, 2?

(c) a total of three shells, with four electrons in its valence shell?

(d) a total of two shells, with three electrons in its valence shell?

(e) twice as many electrons in its second shell as in its first shell?

Ans. (*a*) Ne (2, 8) (*b*) Mg (2, 8, 2)

(*c*) Si (2, 8, 4) (*d*) B (2, 3)

(*e*) C (2, 4)

Q4. (*a*) *What property do all elements in the same column of the Periodic Table as boron have in common?*

(*b*) *What property do all elements in the same column of the Periodic Table as fluorine have in common?*

Ans. (*a*) All other elements have same valence electrons and their valency is 3.

(*b*) All are non-metals, they have same valence electrons *i.e.*, 7 and their valency is 1, all of them gain electrons to form negative ions.

Q5. *An atom has electronic configuration 2, 8, 7.*

(a) What is the atomic number of this element?

(b) To which of the following elements would it be chemically similar?

(Atomic numbers are given in parentheses)

N (7) F(9) P(15) Ar (18)

Ans. (*a*) The atomic number of the element is 17.

(*b*) F(9) (2, 7) will be chemically similar to the given element.

Q6. *The position of three elements A, B and C in the Periodic Table are shown below:*

Group 16	*Group 17*
—	—
—	A
—	—
B	C

(*a*) *State whether A is a metal or non-metal.*

(*b*) *State whether C is more reactive or less reactive than A.*

(*c*) *Will C be larger or smaller in size than B?*

(*d*) *Which type of ion, cation or anion, will be formed by element A?*

Ans. (*a*) 'A' is non-metal.

(*b*) 'C' is less reactive than 'A'

(*c*) 'C' is smaller in size than 'B'

(*d*) 'A' will form negatively charged ion — Anion

Q7. *Nitrogen (atomic number 7) and phosphorous (atomic number 15) belong to group 15 of the Periodic Table. Write the electronic configuration of these two elements. Which of these will b*

Ans. Nitrogen atomic number 7 → 2, 5

Phosphorus atomic number 15 → 2, 8, 5

Nitrogen with two shells will be more electronegative because it can easily gain electron due to its smaller size of atom, the nuclear charge attracts the electron easily to become negative ion.

Q8. *How does the electronic configuration of an atom relate to its position in the Modern Periodic Table?*

Ans. The position of element depends upon its electronic configuration. The number of shells is equal to the period number. The valence electrons decides the group number in which it will be, elements with 1 valence electrons belong to group 1.

Elements with 2 valence electrons belong to group 2.

Q9. *In the Modern Periodic Table, calcium (atomic number 20) is surrounded by elements with atomic numbers 12, 19, 21 and 38. Which of these have physical and chemical properties resembling calcium.*

Ans. Ca atomic number — 20

Electronic configuration — 2, 8, 8, 2

Elements with atomic number 12 → 2, 8, 2

and atomic number 38 → 2, 8, 18, 8, 2

will resemble calcium as they all have same valence electrons and their chemical properties are also same.

Q10. *Compare and contrast the arrangement of elements in Mendeleev's Periodic Table and the Modern Periodic Table.*

Ans.

Mendleev's Periodic Table	*Modern Periodic Table*
1. It has 8 groups and 6 periods.	It has 18 groups and 7 periods.
2. Transition elements are not separated.	Transition elements are given separate place.
3. The inert gases were not present.	The inert gases are present in separate group.
4. Lanthanides and Actinides were not present.	Lanthanides and Actinides are at the bottom of the Periodic Table.
5. Position of element *i,e.*, group number and period number cannot be predicted.	Group number and period number can be predicted from its electronic configuration.
6. Elements are arranged according to the atomic mass.	Elements are arranged according to the atomic number.

MORE QUESTIONS SOLVED

I. MULTIPLE CHOICE QUESTIONS

1. 14 elements after actinium is called
(*a*) Lanthanides (*b*) Actinides
(*c*) *d*-block elements (*d*) *p*-block elements

2. An element has an atomic number of 15 with which of the following elements will it show similar chemical properties?
(*a*) Be(4) (*b*) Ne(10)
(*c*) N(7) (*d*) O(8)

3. The group number and period number respectively of an element with atomic number 8 is
(*a*) 6, 2 (*b*) 16, 2
(*c*) 6, 8 (*d*) 16, 4

4. An element belongs to period 2 and group 2 the number of valence electrons in the atoms of this element is
(*a*) 2 (*b*) 4
(*c*) 3 (*d*) 1

5. In the third period of the Periodic Table the element having smallest size is
(*a*) Na (*b*) Ar
(*c*) Cl (*d*) Si

6. Electronic configuration of Al^{+3} is
(*a*) 2, 8, 3 (*b*) 2, 8, 8
(*c*) 2, 8 (*d*) 2, 8, 8, 3

7. The increasing order of the atomic radii of elements Na, Rb, K, Mg is

(*a*) Na < K < Mg < Rb (*b*) K < Na < Mg < Rb

(c) Na < Mg < K < Rb (d) Mg < Na < K < Rb

8. Which of the following sets does not belong to a group?

(*a*) Li, Na, K (*b*) B, C, N

(*c*) B, Al, Ga (*d*) O, S, Se

9. An element with atomic number will form a basic oxide _____.

(*a*) 7 (*b*) 17

(*c*) 14 (*d*) 11

10. Element belonging to which of the following atomic numbers 11, 19, 14, 18, 23 belong to the same period?

(*a*) 11, 14, 23 (*b*) 11, 18, 20

(*c*) 11, 14, 18 (*d*) 14, 19, 23

11. The correct order of the increasing radii of the elements Na, Si, Al and P is

(*a*) Si, Al, P, Na (*b*) P, Si, Al, Na

(*c*) Al, Si, P, Na (*d*) Al, P, Si, Na

12. Identify the group which is not a Döbereiner triad

(*a*) Li, Na, K (*b*) Be, Mg, Cr

(*c*) Ca, Sr, Ba

13. Which is not true about noble gases?

(*a*) They are non-metallic in nature (*b*) They exist in atomic form

(*c*) They are radioactive in nature (*d*) Xenon is the most reactive among these

14. Which of the given elements A, B, C, D, and E with atomic number 3, 11, 15, 18, 19 respectively belong to the same group

(*a*) A, B, C (*b*) B, C, D

(*c*) A, D, E (*d*) A, B, E

15. Identify the wrong sequence of the elements in a group

(*a*) Ca, Sr, Ba (*b*) Cu, Au, Ag

(*c*) N, P, As (*d*) Cl, Br, I

16. Two elements X and Y have —

(*i*) X has 17 protons 18 neutrons

(*ii*) Y has 17 protons and 20 neutrons

Both X and Y are—

(*a*) Isobars (*b*) Isotopes

(*c*) Isotones (*d*) None of the above

17. Mendeleev predicted the existence of two elements and named them as *eka*-silicon and *eka*-aluminium. Identify the elements which took their position at later stage

(*a*) Si and Ge (*b*) Si and Ga

(*c*) Ge and Ga (*d*) Si and Al

18. An element 'X' is placed in group 13 and third period of the Periodic Table. It burns in oxygen to form an oxide which is amphoteric in nature. Identify the chemical formula of its chloride

(*a*) CCl_4 (*b*) BCl_2

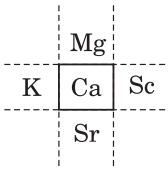
(*c*) $GaCl_3$ (*d*) $AlCl_3$

19. The element with atomic number 3 to 10 belong to the second period. Identify the most electropositive and most electronegative element.

(*a*) F, Li (*b*) Li, F

(*c*) Li, Ne (*d*) Ne, Li

20. In the Modern Periodic Table calcium (Z = 20) is surrounded by the elements with atomic numbers 12, 19, 21, and 38 which of the following will have physical and chemical properties resembling calcium.



(*a*) 12, 20, 38 (*b*) 12, 19, 20, 38

(*c*) 19, 20, 38 (*d*) 12, 19, 20

21. An element X (2, 8, 2) combines separately with $(SO_4)^{2-}$ and $(PO_4)^{3-}$ radicals. The chemical formulae of the compounds are

(*a*) X_2SO_4 : $X_3(PO_4)_2$ (*b*) XSO_4 : $X_3(PO_4)_2$

(*c*) $X(SO_4)_2$: $X_2(PO_4)_3$

22. Two elements X and Y belong to group 1 and 2 respectively in the same period. The formulae of this oxides are

(*a*) XO, YO (*b*) X_2O, YO

(*c*) X_2O, Y_2O (*d*) XO, YO_2

23. In the Modern Periodic Table, the metals among the first ten elements are—

(*a*) Be, Na (*b*) Li, Be

(*c*) Be, Li, Na (*d*) Li, Na

24. Which of the following has maximum non-metallic character?

(*a*) F (*b*) Br

(*c*) Cl (*d*) I

25. Arrange the following elements into the increasing order of their metallic character along a period.

(*a*) S < Si < P < Al (*b*) S < P < Si < Al

(*c*) Si < P < S < Al (*d*) Si < S < P < Al

26. Which of the following is not the characteristics of isotopes of an element?

Isotopes of an element

(*a*) show same atomic mass

(*b*) show same atomic number

(*c*) occupy same position in the Periodic Table

(*d*) show same chemical properties

Answers

1. (*b*)	**2.** (*c*)	**3.** (*a*)	**4.** (*a*)	**5.** (*b*)	**6.** (*c*)	**7.** (*c*)
8. (*b*)	**9.** (*d*)	**10.** (*c*)	**11.** (*b*)	**12.** (*b*)	**13.** (*c*)	**14.** (*b*)
15. (*b*)	**16.** (*b*)	**17.** (*c*)	**18.** (*d*)	**19.** (*b*)	**20.** (*a*)	**21.** (*b*)
22. (*b*)	**23.** (*d*)	**24.** (*a*)	**25.** (*b*)	**26.** (*a*)		

II. VERY SHORT ANSWER TYPE QUESTIONS (*1 Mark*)

Q1. *Give one example of Döbereiner's Triad.*

Ans.

Li,	Na,	K
7	23	39

Q2. *How many triads could Döbereiner identify from the existing elements then?*

Ans. Döbernier could identify only three triads.

Q3. *What is the limitation of Döbereiner triads?*

Ans. He failed to arrange all the elements in triads having same chemical properties.

Q4. *What was the basis of classification of elements made by Newlands?*

Ans. Newlands arranged the elements in the order of increasing atomic masses.

Q5. *Give two li*

Ans. Two limitations of Newlands' law of octaves are:

(*i*) The law was applicable only upto calcium.

(*ii*) In order to fit elements into his table, Newlands adjusted two elements in wrong slot, and grouped unlike elements in same groups.

Q6. *On what basis did Mendeleev classified the element?*

Ans. Mendeleev arranged the elements on the basis of their increasing atomic mass and similarity of chemical properties.

Q7. *Which two chemical properties were considered by Mendeleev for grouping of elements?*

Ans. The two chemical properties are:

(*a*) The nature of compounds formed by elements with oxygen.

(*b*) The nature of compounds formed by elements with hydrogen.

Q8. *State Mendeleev's Periodic Law.*

Ans. The properties of elements are the Periodic Function of their atomic masses.

Q9. *Define 'groups and periods'.*

Ans. The vertical columns in a Periodic Table are called groups and the horizontal rows are called periods.

Q10. *What is the formula of oxide and hydride of Group I elements?*

Ans. Oxide formula $\rightarrow R_2O$

Hydride formula $\rightarrow$ RH.

'R' represents element.

Q11. *Name three elements discovered later, which filled gaps left by Mendeleev for them.*

Ans. Scandium, gallium and germanium.

Q12. *What are isotopes?*

Ans. Isotopes are the atoms of same element having same atomic number but different mass number.

e.g., $^{12}_{6}C$ $^{14}_{6}C$

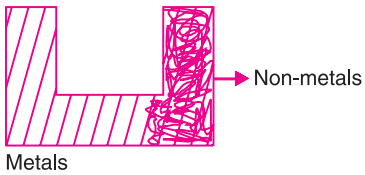
$^{1}_{1}H$ $^{2}_{1}H$ $^{3}_{1}H$

Q13. *How many groups and periods are present in the Modern Periodic Table?*

Ans. Modern Periodic Table has 18 groups and 7 periods.

Q14. *What is the location of metals and non-metals in the Modern Periodic Table?*

Ans. Metals are placed on the left side and non-metals are placed on the right side of the Periodic Table.



Q15. *State Modern Periodic Law.*

Ans. 'Properties of elements are a periodic function of their atomic number'.

Q16. *In Modern Periodic Table what is common among all the elements in a group.*

Ans. All elements in same group shows same valence electrons and same chemical properties.

Q17. *Fluorine (F) atomic number 9 and chlorine (Cl) atomic number = 17 are placed in group number17, what are the number of valence electrons present in them.*

Ans. Fluorine atomic number 9 = 2, 7

Chlorine atomic number 17 = 2, 8, 7

Both of them show 7 valence electron.

Q18. *What is common among all the elements present in one period?*

Ans. All the elements in same period show same number of shells e.g., all elements in period 3, show 3 electron shells each.

Q19. *How many elements are present in first, second, third and fourth period?*

Ans.

Period number	*Shell*	*Formula*	*Max. Electron in valence shell*	*Elements in a period*
1.	K	$2n^2$	2	2
2.	L	$2n^2$	8	8
3.	M	$2n^2$	8	8
4.	N	$2n^2$	8	18

Q20. *What is atomic size?*

Ans. The radius of an atom, *i.e.*, the distance between the centre of the nucleus and the outermost shell of an atom is called atomic size.

The atomic radius is measured in picometre. (1 pm = 10^{-12} m)

Q21. *What happens to the size of atom as we move from left to right in a period.*

Ans. The atomic size in a period decreases as we move from left to right.

Q22. How does the tendency to lose electrons will change in a period.

Ans. The tendency to lose electrons will decrease across a period as the effective nuclear charge acting on the valence shell electrons increases.

Q23. How do you think the tendency to lose electrons will change in a group?

Ans. Down the group, the effective nuclear charge experienced by valence electrons decreases, hence they can easily lose electrons.

Q24. *How was the anomaly in arrangement of elements in the Mendeleev's Periodic Table removed?*

Ans. When elements were arranged in the increasing order of atomic number. The anomalies of Mendeleev's Periodic Table were removed.

Q25. *What are noble gases/inert gases?*

Ans. The element which is inactive, does not react with any other element and it has its outermost shell completely filled are called inert gases or noble gases.

e.g., He, Ne, Ar, Xe.

Q26. *Name two alkali metals present in Group I.*

Ans. Alkali metals are Li, Na, K.

Q27. *An element 'X' belongs to II group and 2nd period. Write the atomic number and name of element.*

Ans. K L ∴ Atomic Number = 4

2, 2 Element = Beryllium

Q28. *An element 'A' has atomic number 11, name the period and group number to which it belongs.*

Ans. 'A' — atomic number = 11

Electronic configuration = K L M

2, 8, 1

∴ Period number = Shell No. = 3

Group number = Valence electron = 1

Q29. *An element 'P' belongs to group = 2 and period = 3, state whether it is a metal or non-metal and nature of its oxides.*

Ans. Group 2 = Metals

Nature of oxide = Basic oxide

Q30. *The electronic configuration of an atom is 2, 8, 7. Give its atomic number, nature of oxide.*

Ans. Electronic configuration = 2, 8, 7

∴ Atomic number = 17

Nature of oxide = Acidic oxide

Q31. *An element belongs to group 13 and period 3, name the element and give its valency.*

Ans. The element is Aluminium.

The valency = 3

Q32. *What are metalloids? Give 2 examples.*

Ans. The elements which show some properties of metal and some properties of non-metal are called semi-metals or metalloids. Example — Boron, Silicon, Germanium, Arsenic.

Q33. An element X belongs to group 17 and element Y belongs to group 1. What type of bond will they form?

Ans.

	X	Y
Group Number	17	1
Valency	1 (Non-metal)	1 (Metal)

Both of them will form ionic bond with the formula XY.

Q34. *The following elements belong to same period arrange them in order.*

	X	Y	Z
Atomic Radius →	231	262	242

Ans.

Y Z X

262 242 231

The atomic size decreases in a period.

Q35. *What is the valency of magnesium with atomic number 12 and nitrogen with atomic number 7?*

Ans. Magnesium, atomic number = 12

Electronic configuration = 2, 8, 2

∴ Valency = 2

Nitrogen, atomic number = 7

Electronic configuration = 2, 5

∴ Valency = 3

Q36. *How many shells are present in all the elements that belong to period 3?*

Ans. All elements in period 3 contain 3 shells in which the electrons are distributed (K, L, M).

Q37. *What happens to the electropositive character of elements as we move from left to right of the period in the Periodic Table?*

Ans. On moving from left to right in a period, the electropositive character decreases as the tendency to lose electrons decreases.

Q38. *Fluorine, chlorine, bromine belong to same group. What is common between them?*

Ans. All three elements *i.e.* fluorine, chlorine, bromine, have same number of valence electrons and same valency.

Q39. *What are halogens? Where are they located in the Periodic Table?*

Ans. Halogens are those elements which react with metals to form salts. They are present in 17th group of the Periodic Table.

Q40. Atomic number of 4 elements is given below which element will belong to the group of Helium.

W	*X*	*Y*	*Z*
8	15	36	20

Ans. Element Y, with atomic number 36 will belong to the same group as He.
Both are inert gas.

atomic number of Y 36 = 2, 8, 18, 8
atomic number of helium 4 = 2, 2

III. SHORT ANSWER TYPE QUESTIONS (*2 or 3 Marks*)

Q1. *Why Mendeleev could not assign fixed position to hydrogen in the table?*

Ans. (*a*) Hydrogen resembles alkali metal, *i.e.* like alkali metals it combines with halogen, oxygen and sulphur to form compounds with similar formula as alkalis.

(*b*) Like halogen, hydrogen also exists as diatomic molecule and combine with metal and non-metals to form covalent compounds.

Q2. *Name the group number of the following elements, halogens, alkali metals, inert gases, hydrogen, in the Modern Periodic Table.*

Ans. Halogens — group No. 17
Alkali metals — group No. 1
Inert gases — group No. 18
Hydrogen — group No. 1

Q3. *State two characteristics of groups.*

Ans. All the elements in a group have the following characteristics:

(*a*) All element in a group show same number of valence electrons, hence show similar properties.

(*b*) As we move top to bottom in a group the atomic radius goes on increasing and there is a slight gradation in properties.

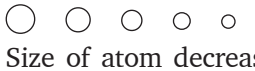
Q4. *What happens to the valency of elements as we move from left to right in a Periodic Table?*

Ans. As we move from left to right in a Periodic Table the valency first increases till 4 and then again decreases.

L → R	Valency → in a period	1	2	3	4	3	2	1	0

Q5. *The number of electrons goes on increasing in the outer shell as we move from left to right in a period, why does the atomic size goes on decreasing?*

Ans. In a period all elements have same number of shells. As we move from left to right in a period the number of electrons goes on increasing at the same time the number of protons also goes on increasing therefore attraction force of nucleus increases and pulls the valence electrons i.e. the outermost shell towards the nucleus and hence the size of atom goes on decreasing.



Size of atom decrease from L → R in a period.

Q6. *What happens to the metallic character as we move from top to bottom in a group?*

Ans. The metallic character increases as we move from top to bottom as the tendency to lose electrons increases.

Q7. *What happens to the non-metallic character as we move from top to bottom in a group?*

Ans. The non-metallic character decreases as we move from top to bottom in a group as the tendency to gain electrons decreases down the group.

Q8. *The atomic number of 'X' is 17. Predict its (a) valency, (b) formula of halide, (c) type of ion formed, (d) reactivity with respect to the other members of same group.*

Ans. 'X' has atomic number 17

$\therefore$ Electronic configuration $\rightarrow$ 2, 8, 7

(*a*) Valency = 1

(*b*) Formula of halide = HX

(*c*) Type of ion formed = Negative ion (Anion).

(*d*) Reactivity = Most reactive among those elements which lie below X in a group.

Q9. *Why are noble gases placed in a separate group?*

Ans. All noble gases show same valency *i.e.* '0', all of them are inert gases, the chemical properties are same and hence they are placed in same group.

Q10. *Given below are 3 elements W, X, Y and Z the atomic numbers are 9, 10, 16, 17. Predict the following:*

(*a*) *Two elements lying in same group.*

(*b*) *Element in second period.*

Ans.

Element	*Atomic Number*	*Electronic Configuration*	*Group No.*	*Period No.*
W	9	2, 7	17	2
X	10	2, 8	18	2
Y	16	2, 8, 6	16	3
Z	17	2, 8, 7	17	3

(*a*) Two elements in same group — W and Z

(*b*) Element in second period — W and X

Q11. *State the difference between Modern Periodic Table and Mendeleev's Periodic Table.*

Ans.

Mendeleev's Periodic Table	*Modern Periodic Table*
1. It is based on atomic mass.	1. It is based on atomic number.
2. It has 8 groups and 7 periods.	2. It has 18 groups and 7 periods.
3. No place for isotopes.	3. Isotopes were not considered.

Q12. *Write all the elements present in third period of the Periodic Table and give their electronic configuration.*

Ans. Elements of third period are

	Na	Mg	Al	Si	P	S	Cl	Ar
3rd Period	KLM	KLM	KLM	KLM	KLM	KLM	KLM	KLM
	2, 8, 1	2, 8, 2	2, 8, 3	2, 8, 4	2, 8, 5	2, 8, 6	2, 8, 7	2, 8, 8

Q13. *How does electronic configuration helps us to locate the position of element in the Periodic Table?*

Ans. The electronic configuration of an atom conveys the valence electrons and number of shells. Valence electrons helps in detecting the group number.

Number of shells in an atom tells the period to which it belongs.

Q14. *What are the merits of Mendeleev's Periodic Table?*

Ans. Merits of Mendeleev's Periodic Table are:

(*i*) Mendeleev left some gaps in his table. Predicted the chemical properties of these 3 elements which were discovered later and had same properties as predicted by Mendeleev, they were gallium, germanium and scandium.

(*ii*) He arranged the elements very systematically in periods and groups.

Q15. *Why does the reactivity of metals increases and that of non-metals decreases as we move down the group?*

Ans. Reactivity of metals depends on the tendency to lose electrons. If the atomic size increases, the valence electrons are easily removed thereby forming positive ion. In case of metals the atomic size increases as we move down the table. Reactivity of non-metals depends on the tendency to gain electrons. As we move down the group, the tendency to gain electrons decreases because the atomic size increases, the nuclear force decreases.

Q16. *List the elements present in 2nd period. Write their atomic number and electronic configuration.*

Ans.

Elements →	Li	Be	B	C	N	O	F	Ne
Atomic No. →	3	4	5	6	7	8	9	10
Electronic configuration →	2, 1	2, 2	2, 3	2, 4	2, 5	2, 6	2, 7	2, 8

Q17. *For the following given elements predict the;*

(*a*) *Valency*

(*b*) *Period number*

(*c*) *Group number*

Na (11), Al(13), Cl(17), K(19)

Ans.

Element	***Atomic Number***	***Valency***	***Period Number***	***Group Number***	***Electronic configuration***
Na	11	1	3	1	2, 8, 1
Al	13	3	3	13	2, 8, 3
Cl	17	1	3	17	2, 8, 7
K	19	1	4	1	2, 8, 8, 1

Q18. *Elements of group 1 are given below with their atomic number:*

Li (3) *Na (11)* *K (19)*

(*a*) *Give their atomic size.*

(*b*) *Reactivity.*

Ans.

Group 1	*Atomic Number*	*Electronic Configuration*
Li	3	2, 1
Na	11	2, 8, 1
K	19	2, 8, 8, 1

(*a*) The atomic size goes on increasing as new shell is added in each element as we move from top to bottom. So it is Li < Na < K.

(*b*) The reactivity increases as it is easy to lose electrons if the size of atom is big, the nuclear force decreases K is more reactive than Na and Li.

Q19. *Lithium, sodium potassium belong to same group called alkali metals. Why?*

Ans. Lithium, sodium and potassium have same valence electron *i.e.* 1, hence they belong to same group. The group is called alkali metals group because all these elements form oxides which dissolve in water to form alkali.

Q20. *Carbon with atomic number 6 and silicon with atomic number 14 belong to same group although carbon is non-metal and silicon is semi-metal.*

Ans. Carbon with atomic number 6, shows electronic configuration 2, 4. Silicon with atomic number 14 shows electronic configuration 2, 8, 4.

Both the elements have same valence electrons, hence they are placed in same group.

Q21. *What physical and chemical properties of elements were used by Mendeleev in creating his Periodic Table? Explain the two observations that posed challenge in Mendeleev Periodic Law.* (CBSE 2008)

Ans. The physical property used was the atomic mass of an element.

The chemical property used was the nature of oxide and hydride formed *i.e.* similarity in chemical properties were used by Mendeleev. The two observations that posed challenge in Mendeleev Periodic Law were:

(*i*) Arranging elements according to the increasing order of atomic mass could not be maintained. Chemical properties do not depend on atomic mass.

(*ii*) Isotopes were not given any place in the table as they have different atomic mass but same chemical properties.

Q22. *Table given below shows a part of the Periodic Table.*

H							He
Li	Be	B	C	N	O	F	Ne
Na	Mg	Al	Si	P	S	Cl	Ar

Using this table explain why?

(*a*) *Li and Na are considered as active metals.*

(*b*) *Atomic size of Mg is less than that of Na.*

(*c*) *Fluorine is more reactive than chlorine.* (CBSE 2008 F)

Ans. (*a*) Li and Na can readily lose electrons due to bigger size of atom.

(*b*) Mg has more number of protons than Na which attracts the electrons thereby reducing the size of Mg.

(*c*) Fluorine readily accepts/gains electrons to become F^- ion due to its small atom size as compared to chlorine.

Q23. *The position of three elements A, B and C in the Periodic Table are shown below:*

Group VI	*Group VII*
—	—
—	A
—	—
B	C

Giving reasons, explain the following:

(*a*) *Element A is a non-metal.*

(*b*) *Element B has a larger atomic size than element C*

(*c*) *Element C has a valency of 1.* (CBSE 2008 F)

Ans. (*a*) A is a non-metal because it can gain electrons easily, it has 7 valence electrons and form negative ions to become stable.

(*b*) The atomic number of B is less than C, it has less nuclear charge, less force of attraction between protons in the nucleus and valence electrons, hence its size is bigger than C.

(*c*) Element 'C' has 7 valence electrons, it can gain 1 electron to become stable so its valency is 1.

Q24. *The position of three elements A, B and C in the Periodic Table are shown below:*

Period	*Group I*	*II*	*III*
1	—	—	—
2	—	—	B
3	A	C	—

Giving reason, explain the following:

(*a*) *Element A is a metal.*

(*b*) *Element C has a larger size than B.*

(*c*) *Element B has a valency of 3.* (CBSE 2008 F)

Ans. (*a*) 'A' is a metal because its valence electron is 1, it can readily loose electron to became stable.

(*b*) Element 'C' belongs to 3rd period it has 3 shells whereas 'B' has only 2 shells, it belongs to 2nd period, distance between nucleus and valence electrons is more in C, hence its size is bigger than B.

(*c*) 'B' belongs to III group, has 3 valence electrons, it can loose 3 electrons to become stable hence its valency is 3.

Q25. *The position of 3 elements A, B and C in the Periodic Table is shown below:*

Group →	I	VI	VII
Period ↓			
1	B		
2			A
3		C	

Giving reasons, explain the following:

(a) Element A is a non-metal.

(b) Atom of element C has larger size than A.

(c) Element B has a valency of 1.

Ans. (*a*) A belongs to 7th group, has 7 valence electron, it can gain 1 electron to become stable. So it is a non-metal as it forms negative ion.

(*b*) 'C' has 3 shells 'A' has 2 shells so C is bigger than A.

(*c*) 'B' has one valence electron, it can loose this electron to become stable. So its valency is 1.

Q26. *The elements of the second period of the Periodic Table are given below:*

Li Be B C N

(a) Give reason to explain why atomic radii decreases from Li to F.

(b) Identify the most

(i) Metallic and (ii) Non-metallic element. [AI CBSE 2008 F]

Ans. (*a*) In a period on moving from left to right, the atomic number increases, the number of shells remains the same, nuclear charge increases the force of attraction of electrons towards the centre increases. The valence electrons are pulled at the centre, hence atomic radii decreases from Li to F.

(*b*) (*i*) Most metallic element → Li

(*ii*) Most non-metallic element → F.

Q27. *The elements of the third period of the Periodic Table are given below:*

Group	I	II	III	IV	V	VI	VII
	Na	Mg	Al	Si	P	S	Cl

(a) Which atom is bigger — Na or Mg? Why?

(b) Identify the most

(i) Metallic and (ii) Non-metallic element in period 3.

Ans. (*a*) Na atom is bigger in size this is because as we move from Na to Cl, the atomic number goes on increasing and the nuclear charge also increases. It pulls/attract the valence electrons at the centre and thus the atomic size decreases.

(*b*) (*i*) Most metallic — Na

(*ii*) Most non-metallic — Cl

Q28. (*a*) *What is meant by periodicity in properties of elements with reference to the Periodic Table?*

(*b*) *Why do all the elements of the same group have similar properties?*

(*c*) *How will the tendency to gain electrons change as we go from left to right across a period? Why?* (AI CBSE 2009)

Ans. (*a*) The repetition of same properties after definite interval is called periodicity in properties.

(*b*) All elements in group have same valence electrons.

(*c*) Tendency to gain electrons increases from L → R in the period because the atomic size goes on decreasing and nuclear charge increases, which can attract the nearby electron.

IV. LONG ANSWER TYPE QUESTIONS (*5 Marks*)

Q1. *The atomic number of element X is 17 predict its*

(*a*) *Physical state.*

(*b*) *Name of element.*

(*c*) *Formulae of its compound with hydrogen.*

(*d*) *Metal or Non-metal.*

(*e*) *Formulae of its molecule.*

Ans. Atomic number of X = 17.

Electronic configuration = 2, 8, 7

(*a*) Physical state → Gas

(*b*) Chlorine

(*c*) HCl

(*d*) Non-metal

(*e*) Cl_2

Q2. *Two elements A and B belong to group 1 and 2 respectively in the same period. Compare them with respect to:*

(*a*) *Valency* (*b*) *Size of atom* (*c*) *Formula of oxide*

(*d*) *Nature of oxide* (*e*) *Metallic character*

Ans.

Group	1	2
Elements	A	B

(*a*) Valency A → 1, B → 2

(*b*) Size of atom → A is bigger atom than B.

(*c*) Formula of oxide → A_2O, BO

(*d*) Nature → Basic

(*e*) Metallic character → A is more metallic than B.

Q3. *Give all characteristics of group.*

Ans. Characteristics of a group:

(*a*) Valence electrons → All elements show same valence electrons in a group.

(*b*) Valency → Valency of all the elements remains the same in a group.

(*c*) Atomic size → The atomic size goes on increasing down the group.

(*d*) Metallic character → In case of metals the metallic character increases down the group.

(*e*) Non-metallic character → In case of non-metals the non-metallic character decreases down the group.

Q4. *Give the characteristics of a period.*

Ans. In a period as we go from left to right:

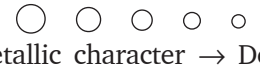
(*a*) Valence electrons → Goes on increasing

1, 2, 3, 4, 5, 6, 7, 8.

(*b*) Valency → Valency first increases and then decreases

1, 2, 3, 4, 3, 2, 1, 0.

(*c*) Size of atom → Size of atom goes on decreasing



(*d*) Metallic character → Decreases

(*e*) Non-metallic character → Increases

Q5. *You are given five elements with some description of each element, place them in the Modern Periodic Table.*

(a) Essential for breathing and burning.

(b) Inactive, two electrons in the outermost shell.

(c) Atom has same number of protons, electrons and neutrons, used in fertilizer industry.

(d) Number of neutrons, protons are same used in building our bones.

(e) This element form the hardest naturally occurring substance as allotrope.

Ans.

Element	Period	Group
(*a*) Oxygen	2	16
(*b*) Helium	1	18
(*c*) Nitrogen	2	15
(*d*) Calcium	4	2
(*e*) Carbon	2	14

Q6. *Name the following elements*

(a) Two shells, both of which are completely filled.

(b) Three shells with 2 valence electrons.

(c) Group 1, two shells.

(d) Group 17, period 3.

(e) Metal, with valency 3 group number 13 period 3.

Ans. (*a*) Two shells → K L

Filled → 2, 8

Atomic number → 10

∴ Element — Neon.

(*b*) Three shells → K, L, M
2 Valence electron → 2, 8, 2
Atomic number →12 ∴ Element = Magnesium

(*c*) Group 1
2 shells → K L
Electronic configuration → 2, 1
Atomic number → 3 ∴ Element = Lithium

(*d*) Group 17
Period → 3, K L M
Electronic configuration → 2, 8, 7
Atomic number → 17, ∴ Element = Chlorine

(*e*) Group → 13
Valency → 3
Period → 3 K L M
Electronic configuration → 2, 8, 3
∴ Atomic number → 13, ∴ Element = Aluminium.

Q7. *(a) What are 'groups' and 'periods' in the Periodic Table?*

(b) Two elements M and N belong to groups I and II respectively and are in the same period of the Periodic Table. How do the following properties of M and N vary?

(i) Sizes of their atoms.

(ii) Their metallic characters.

(iii) Their valencies in forming oxides.

(iv) Molecular formulae of their chlorides. (CBSE 2009 F)

Ans. (*a*) The vertical column in the Periodic Table are called 'groups', the horizontal rows in the table are called periods.

(*b*) (*i*) 'M' and 'N' belong to the same period but group I and II respectively. N is smaller than M as the atomic size decreases on moving from left to right across the Periodic Table.

(*ii*) M is more metallic than 'N' because metallic character decreases from left to right as tendency to lose electrons decreases due to decrease in atomic size.

(*iii*) The valencies of M and N are 1 and 2 respectively, valency across the period first increases then decreases.

(*iv*) MCl and NCl_2.

Q8. *On the baiss of the table of Mendeleev's Periodic Table* (AI CBSE 2008)

(a) Name the element which is in

(i) I group and 3rd period. *(ii) VII group and 2nd period.*

(b) Suggest the formula for the following:

(i) Oxide of nitrogen *(ii) Hydride of oxygen*

(c) In group VIII of Periodic Table, why does cobalt with atomic mass 58.93 appear before nickel having atomic mass 58.71?

(d) Besides gallium, which two other elements have since been discovered for which Mendeleev had left gaps in his Periodic Table?

(*e*) *Using atomic masses of Li, Na and K, find the average atomic mass of Li, and K and compare it with the atomic mass of Na. State the conclusion drawn from this activity.*

Ans. (*a*) (*i*) Sodium (*ii*) Fluorine

(*b*) (*i*) N_2O_5 (*ii*) H_2O

(*c*) Co resembles with Rh and Ir whereas 'Ni' resembles with Pd and Pt.

(*d*) Germanium and scandium

(*e*)

Li	Na	K	Average atomic mass of Na
6.939	22.99	39.102	$= \frac{6.939 + 39.102}{2} = 23.0205$

The atomic mass of Na is the average atomic mass of Li and K and these elements resemble with each other.

Q9. (*a*) *Why do we classify elements?* (AI CBSE 2008)

(*b*) *What were the two criteria used by Mendeleev in creating his Periodic Table?*

(*c*) *Why did Mendeleev leave some gaps in his Periodic Table?*

(*d*) *In Mendeleev's Periodic Table, why was there no mention of Noble gases like Helium, Neon and Argon?*

(*e*) *Would you place two isotopes of chlorine Cl-35 and Cl-37 in different slots because of their different atomic masses or in the same slot because their chemical properties are the same? Justify your answers.*

Ans. (*a*) Classification is done to study the properties of elements conveniently.

(*b*) Increasing order of atomic mass and similarity in chemical properties i.e. the nature of oxide and hydride formed.

(*c*) The gaps were left for undiscovered elements then.

(*d*) Noble gases were not invented at that time.

(*e*) Cl-35 and Cl-37 will be kept in the same slot as their chemical properties are same.

Q10. (*a*) *Which 2 criteria did Mendeleev use to classify the elements in his table.*

(*b*) *State Mendeleev's Periodic law.*

(*c*) *Why could no fixed position be given to hydrogen in Mendeleev's Periodic Table.*

(*d*) *How and why does the atomic size vary as you go:*

(*i*) *From left to right along a period*

(*ii*) *Down a group?* (CBSE 2009)

Ans. (*a*) (*i*) Increasing order of atomic mass and similarities in chemical properties of elements.

(*ii*) The formula of oxides and hydrides formed by elements.

(*b*) Mendeleev's Periodic Law → Properties of elements are periodic functions of their atomic masses.

(*c*) Hydrogen had no fixed position in Mendeleev's Periodic table because it resembles alkali metal by forming positive ions and resembles halogens by forming diatomic molecule.

(*d*) (*i*) Atomic size decreases from left to right, as the valence electrons are attracted by the nucleus due to increase in the nuclear force.

(*ii*) The atomic size increases from top to bottom in a group because the number of shells keep on increasing therefore distance between nucleus and valence electrons increases.

Q11. (*a*) *Why did Mendeleev left gaps in his Periodic Table?* (CBSE 2009)

(*b*) *State any 3 limitations of Mendeleev's classification.*

(*c*) *How does electronic configuration of atoms change in period with increase in atomic number?*

Ans. (*a*) Mendeleev left some gaps for undiscovered elements, because he predicted that there would be such elements which will fit in the gaps in future. He also predicted the properties of these elements.

(*b*) 3 limitations are:

(*i*) Position of hydrogen was not justified.

(*ii*) Increasing order of atomic mass could not be maintained.

(*iii*) Isotopes were not given separate place as they have different atomic mass.

(*c*) In a period the valence electrons goes on increasing from left to right as the number of shells is same.

TEST YOUR SKILLS

Q1. *An element 'X' belongs to Group I and 3rd period.*

(i) Give its electronic configurations.

(ii) Formula when it combines with oxygen.

(iii) Formula when it combines with hydrogen.

(iv) State its nature.

(v) Give its valency.

Q2. *An element belongs to 3rd period and 17th group of the Periodic Table, find out*

(i) The electronic configuration of element on its left side and right side.

(ii) Its valence electrons.

(iii) Its size with in comparison with its neighbouring elements.

Q3. *An element X from group I combines with an element Y from group 17 to form a compound. Both X and Y belong to II period.*

(a) Give the formula of the compound formed.

(b) Will the compound be ionic or covalent?

(c) Give its electron dot structure.

Q4. *The position of A, B, C is given in the Periodic Table*

Group II	***Group 17***
A	*B*
	C

(i) Which element is more electropositive?

(ii) Name the element that is electronegative in nature.

(iii) *What will be the formula of A and B after reaction?*

(iv) *Which element will be more reactive in group 17 and why?*

Q5. *An element has electronic configuration.*

2, 8, 8, 7

(i) *What type of ion will it form?*

(ii) *Name the unit to measure its atomic radius.*

(iii) *Give the electronic configuration of an element that lies above this element.*

(iv) *Give the electronic configuration of an element that belongs to same period but in 17th group.*

Q6. *Identify the following elements:*

(a) *Element with 4 valence electrons in L shell.*

(b) *Element with 2 valence electrons in K shell.*

(c) *Element with 7 valence electrons in M shell.*

(d) *Element with 1 valence electrons in K shell.*

Q7. *Name two alkali metals present in Group I.*

Q8. *An element 'X' belongs to II group and 2nd period. Write the atomic number and name of element.*

Q9. *An element 'Y' belongs to group = 2 and period = 3, State the nature of oxide and type of element.*

Q10. *What is ato*

Q11. *Name two isotopes of carbon.*

Q12. *What happens to the valence electrons and valency as we move left to right in a period and top to bottom in a group?*

Q13. *The atomic number of 'X' is 17, predict its*

(a) *valency.*

(b) *formula of its halide.*

(c) *type of ion formed.*

(d) *reactivity with respect to the other numbers of same group.*

Q14. *State three points of difference between Mendeleev's Periodic Table and Modern Periodic Table.*

Q15. *For the following given elements predict the*

(a) *valency.*

(b) *period number.*

(c) *group number.*

Na (11), Al (13), Cl (17).

Q16. *Give the characteristics of a period in Periodic Table.*

Q17. *Name the following elements:*

(a) *Two shells, both of which are completely filled.*

(b) *Three shells with 2 valence electrons.*

(c) *Metal with valency 3, group number 13 and period 3.*

❐❐❐

8 How do Organisms Reproduce?

SYLLABUS

Reproduction in animals and plants (asexual and sexual), Reproductive health-need and methods of family planning, Safe sex vs HIV/AIDS, Child bearing and women's health.

Facts that Matter

Reproduction

Definition: It is a biological process by which all living organisms give rise to new individuals of their own species.

(*a*) The DNA in the cell nucleus is the information centre for making proteins.

(*b*) The first step in reproduction is replication of DNA followed by cell division.

(*c*) Variations happen during copying of DNA.

(*d*) These variations are the basis of evolution.

(*e*) Variations are useful for the survival of species over time.

TYPES OF REPRODUCTION

1. Asexual Reproduction
2. Sexual Reproduction

Asexual Reproduction

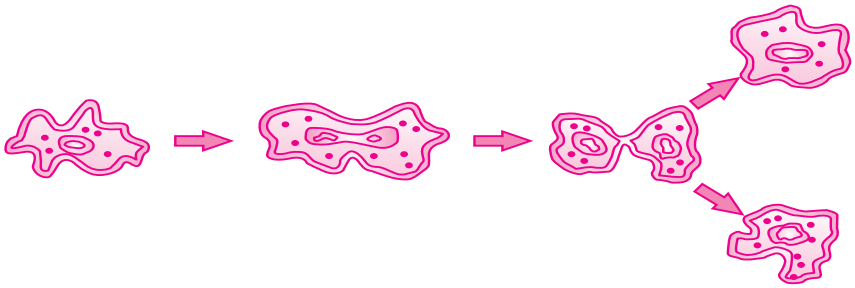
Definition: When a single parent is involved in the formation of a new individual, without the fusion of gametes, it is called asexual reproduction. It involves repeated mitotic divisions.

Type of asexual reproduction:

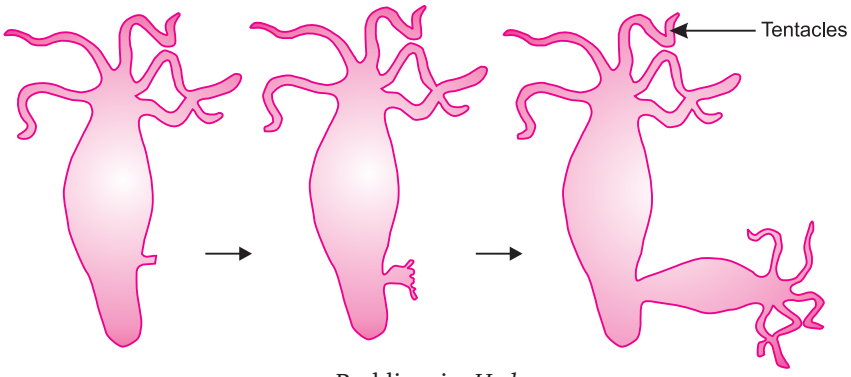
(*i*) Fission

(*a*) **Binary Fission:** When a single unicellular organism, splits to form two new individuals, first by nuclear division and then by cytoplasmic division, it is called binary fission.

The splitting of the cells can take place in any plane. It occurs during favourable conditions in unicellular organisms such as *Amoeba*, *Paramecium*, *Euglena, etc.,* In *Leishmania*, binary fission occurs in definite orientation in relation to body structure.



Binary fission in *Amoeba*



Budding in *Hydra*

(*b*) **Multiple Fission:** Multiple fission involves division of a single unicellular parent daughter nucleus moves to the periphery, get covered with cytoplasm to form many daughter individuals. It is a common mode of reproduction in *Plasmodium* when it invades the RBC of man. It occurs during unfavorable conditions.

(*ii*) Budding

(*a*) **In *Hydra*:** A bulge or projection appears as a result of repeated mitotic division on the lateral side of the parent's body. It grows on the parent body to resemble a small *Hydra*. When the new *Hydra* matures, a constriction at its base separates it from its parent.

(*b*) **In Yeast:** A bud starts as a small outgrowth from the surface of the adult cell. As it enlarges, the nucleus of the adult cell divides and then the bud get pinched off but still remains attached to the parent cell. This in turn produces another bud at its tip and the process continues 3–4 times in chain of yeast cells.

(*iii*) Spore Formation

It mostly occurs in fungi and bacteria. The spores develop on a structure called sporangium found on slender, erect fungal hyphae. Within the sporangium, a nucleus divides several times and each daughter nucleus gets surrounded by a bit of cytoplasm to form a spore. A spore is a small microscopic structure with a thick wall. It is light and air borne. The sporangium on maturing bursts to release the spores, which in favourable conditions germinates into an entirely new organisms *e.g., Rhizopus*, *Mucor*, *Penicillium etc.*

(iv) Regeneration

It is the ability of a fully differentiated organism to regenerate the whole body from their body parts.

In *Planaria* and *Hydra*, if the individual is cut or broken into many parts, a small piece is capable of regeneration of the entire individual.

Regeneration is carried out by specialized cells. These cells proliferate, and undergo tissue organization in an organized manner.

(v) Fragmentation

In simple, multicellular organisms like *Spirogyra* the body/fragment breaks up into smaller pieces upon maturation. These pieces or fragments grow into new individuals.

(vi) Vegetative Propagation

It is a process by which a new plant can be obtained from vegetative plant parts such as root, stem or leaf.

NATURAL VEGETATIVE PROPAGATION

(i) **By Stem:** Underground stems of potato, onion, garlic *etc.,* Subaerial stems of water hyacinth, mint, strawberry *etc.*

(ii) **By Roots:** Roots of certain plants like guava, carrot, sweet potato and Dahlia have adventitious buds on the roots which give out shoots that develop into new plants.

(iii) **By Leaves:** In *Bryophyllum*, adventitious buds are present along the notches of the leaves. Du plantlets fall off, develop roots and become independent plants.

ARTIFICIAL VEGETATIVE PROPAGATION

(*i*) **Cutting:** When cuttings of short pieces of plants such as a stem placed in moist soil with suitable conditions, they develop roots and shoots and grow into a new plant. e.g. grapes, phalsa, bougainvillea, cactus and pineapple *etc.,*

(*ii*) **Layering:** In this, a branch of the plant is buried in soil and is induced to produce roots while it is still attached to the parent plant.

(*a*) **Mound layering:** In this a flexible branch of stem is trimmed off its side branches. The branch is bent to the ground level and buried about 5–8 inches under the soil, leaving the tip exposed. After some time, roots grow from the branch into the soil. Now this plant can be cut from the main plant and made to grow as an independent plant.

(*iii*) **Grafting:** It is a technique of joining a part of one plant on a different plant, so that they unite and grow as one plant. The supporting and rooted part of the plant is called *Stock* and the part of the plant to be grafted is called *Scion*. The Stock has got a root system and is generally disease resistant. The Scion is a cutting from a plant of desirable variety like superior quality flowers and fruits. Grafting is done in a way that **cambium** of scion is in direct contact with the cambium of stock. The new plant has the root system of stock and shoot system of scion.

IMPORTANCE OF VEGETATIVE PROPAGATION

(*i*) It is easier, less expensive and a rapid way of producing new plants under favourable conditions.

(*ii*) The plants that cannot produce viable seeds such as banana, pineapple, and jasmine and orange *etc.,* can be easily grown in this way.

(*iii*) Plants produce in such a way bear flowers and fruits much earlier.

(*iv*) It is highly suitable for plants that have small number of seeds, poor seed viability or long periods of seed dormancy.

(*v*) It can be used to preserve a stock of preserved varieties.

Sexual Reproduction

Sexual reproduction is a process of combining DNA from two different individuals during reproduction. This is brought about by the fusion of the male and female gametes.

Unisexual: Organisms where male and female reproductive organs are in different individual e.g. human being, dogs, papaya, water melon.

Testis: Male gonads that produce **sperms**.

Ovary: Female gonads that produce **eggs** or **ova**.

Fertilization: The process of union of male and female gametes to form **Zygote** is called fertilization. Zygote develops into new individual.

External Fertilization: When fertilization occurs outside the body *e.g.,* in fishes and frogs. (Gametes are released in water.)

Internal Fertilization: Process of fertilization takes place inside the body of the female. E.g. in birds, reptiles and humans.

Copulation (Mating): The process by which male gametes are transported from the testis into the body of the female with the help of copulatory organs or accessory organs.

Advantages of Sexual Reproduction

1. Promotes diversity of the characters in the offspring because it results from the fusion of gametes.

2. Sexual reproduction leads to variations which are useful for ensuring the survival of species.

PLANT REPRODUCTIVE SYSTEM

Stamen: Male reproductive part of a flower. It consists of a stalk called **filament** and a flattened top called **anther**. Anthers produce pollen grains, that produces two male gametes.

Carpel: Female reproductive part of a flower. They have a swollen **ovary** at the base, an elongated **style** and a terminal **stigma**. The ovary contains **ovules**. Each ovule has female gamete.

Pollination: The transfer of pollen grains from anther to the stigma by agents like wind, water, insects *etc.* It is of two types:

(*a*) Self Pollination: The transfer of pollen grains from the anther of a flower to the stigma of the same flower is known as self pollination.

(*b*) Cross Pollination: The transfer of pollen from the anther of one flower to the stigma of the another flower either of the same plant or of a different plant of the same species is known as cross pollination.

Fertilization in Plants: Once pollen grains are deposited on stigma, they form tubes called **pollen tubes**. Once pollen tube grows inside the style and reaches the ovary. Then it

enters the ovule through a small pore called **micropyle**. Inside the ovule two male gametes are released into the embryo sac. One male gamete fuses with the egg and this fusion is called **Syngamy** which produces the zygote. The other male gamete fuses with two polar nuclei and this is called **Triple Fusion** (Three nuclei involved). Thus two fusion processes occur in the embryo sac and hence it is called **Double Fertilization**.

After fertilization the zygote divides several times to form an embryo within the ovule. The ovule develops a seed coat and develops into a seed. The ovary develops into fruit.

HUMAN REPRODUCTIVE SYSTEM

In humans reproductive system is highly evolved. The reproductive system becomes functional at a definite age called **Puberty**. Males reach this at the age of 13 – 14 years. While females reach puberty at the age of 10–12 years.

At the age of puberty males produce sperms and the male hormone **testosterone** from the testis.

The female produce ova and female hormone **estrogen** from the ovary,

These hormones are important because they:

(*i*) regulate the process of gametogenesis (formation of gametes).

(*ii*) maintain structure and function of accessory sex organs.

(*iii*) develop secondary sex characters like facial, axial and pubic hair, pitch of voice and development of mammary glands.

MALE REPRODUCTIVE SYSTEM

Primary male reproductive organ is a pair of **testis**. They lie in small pouch like muscular structure outside the abdominal cavity called **scrotum** or **scrotal sac**.

Scrotum provides optimal temperature for formation of sperms. This temperature is 1 – 3°C lower than body temperature.

From each testis arise a long tube called **Vas deferens**. Along the path of the vas deferens lie the prostate gland and seminal vesicles. They add their secretion which make sperms mobile and provides nutrition to sperms.

It unites with the duct coming from urinary bladder to form a common tube called **urethra**. Urethra is enclosed in within a thick muscular organ called **penis** that opens outside through the genital pore.

This opening is common for urine and sperms. The *sperms* are tiny bodies that contain mainly the genetic material and a long tail for motility.

FEMALE REPRODUCTIVE SYSTEM

Paired ovaries are located in the abdominal cavity near the kidneys.

Ovaries produce the female gamete ova and also secrete female hormones **estrogen** and **progesterone**

Each ovary is composed of follicles that mature to produce ova at the puberty.

Near posterior end of ovary, a funnel like structure leads into a long convoluted tube called **fallopian tube** or **Oviduct**

Fallopian tube from both the sides open into an elastic bag like structure called uterus. The uterus opens into the vagina through the cervix.

Vagina is a tubular structure also called "birth canal" as the young one after maturation in the uterus is born through this canal.

In females urethra and vaginal openings are separate.

Sexual Cycles in Females

After puberty is attained in females ovaries exhibit cycle of events at definite intervals.

The ovarian follicles grow into mature follicle. Generally one mature follicle develops to surround one ovum. The maturing ovum is from one of the two ovaries.

The ovum is released from the respective ovary by the process of **ovulation**.

At the same time changes occur in the uterus and vagina.

As the ovarian follicle matures, the inner wall of uterus thickens and gets prepared to receive the developing zygote.

If fertilization doesn't occur the thickened inner wall of uterus breaks down along with its blood vessels and moves out of the vagina in the form of a bleeding called **Menstrual Flow (Menstruation)**.

This lasts for 2–8 days. These cyclic events take place every 28 days and is marked by the menstrual flow and is called **Menstrual Cycle**.

Ovulation takes place in the mid of the menstrual cycle around 14th day.

During pregna

Fertilization

In humans internal fertilization occurs. The sperms reach the female genital tract by copulation.

Sperms are highly active and mobile. Millions of sperms are released in the vagina and they move up through the cervix and uterus.

In **fallopian tube** only one sperm fertilizes the ovum.

Zygote is formed if copulation takes place in the middle of menstrual cycle.

Fertilization is marked by absence of menstrual flow.

Zygote begins to develop immediately in the fallopian tube and pregnancy begins.

Embryo moves to the uterus and gets attached to its thickened inner wall. The close attachment of the embryo with the uterus is called **Implantation**.

After implantation special tissues develop between uterine wall and the foetus called *Placenta* through which nutritional, excretory, respiratory needs of the foetus are met.

The development of foetus inside the uterus till birth takes about 9 months.

The birth of fully developed foetus occurs as a result of rhythmic contraction of the muscles in the uterus.

Population Control

Techniques to prevent and manage pregnancy:

1. **Barrier Method:** Physical device such as condoms, diaphragm and cervical caps are used. They prevent entry of sperms in the genital tract during the copulation and also prevent sexually-transmitted diseases like AIDS, gonorrhoea and syphiles.

2. **Chemical Method:** Use of specific drug by females. Oral pills are hormonal preparation. They inhibit production of gametes by changing hormonal balances. They can cause side effects.
3. **Intrauterine Contraceptive Devices (IUCDs):** A copper-T is placed safely in the uterus by a doctor or a skilled nurse that prevents implantation in the uterus. They may cause irritation of uterus.
4. **Surgical Methods:** A small portion of the vas deferens in male, and fallopian tube in female is surgically removed or ligated (tied). It is called **Vasectomy** in males and **Tubectomy** in females.

Reproductive Health: Includes aspects like:

1. Responsible, safe and satisfying reproductive life.
2. Awareness regarding fertility regulation methods, the right, freedom and choice to control birth.
3. Ability to prevent and control sexually transmitted diseases.

Sexually Transmitted Diseases (STDs): Infectious disease caused by bacteria, virus, protozoans and fungi that spread through sexual contact *e.g.,* gonorrhoea, syphilis, trichomoniasis, AIDS *etc.*

In most cases symptoms are: burning sensation at urination and urethral discharge.

Acquired Immuno Deficiency Syndrom (AIDS) is also a sexually transmitted disease caused by Human Immuno deficiency Virus (HIV). Its cure has not been found till now and it may cause death if not treated properly.

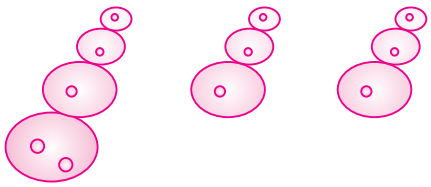
NCERT IN-TEXT ACTIVITIES SOLVED

ACTIVITY 8.1

Dissolve about 10 gm of sugar in 100 ml of water. Take 20 ml of this solution in a test tube and add a pinch of yeast granules to it. Put a cotton plug on the mouth of the test tube and keep it in a warm place.

After 1 or 2 hours. Put a small drop of yeast from the test tube on a slide and cover it with a coverslip

Observation: You will observe that the yeast shows asexual reproduction by budding.

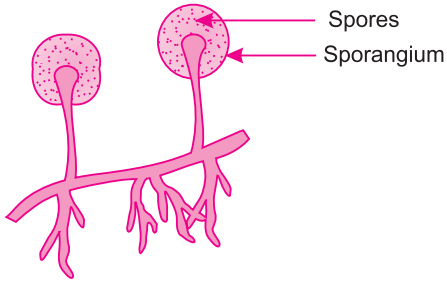


Budding in Yeast

ACTIVITY 8.2

Wet a slice of bread, and keep it in a cool, moist and dark place. Observe the surface of the slice with a magnifying glass. Record your observations for a week.

Observation: On bread grows fungi called bread mould, initially it is white in colour then it becomes brown to black on maturity.

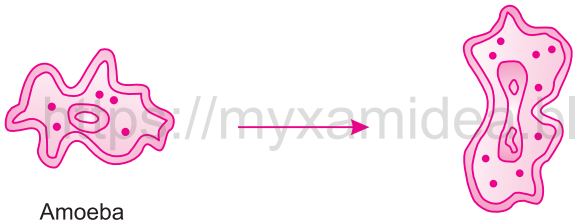


Bread Mould

ACTIVITY 8.3

Observe a permanent slide of *Amoeba* under a microscope. Similarly, observe another permanent slide of *Amoeba* showing binary fission. Compare the observations of both the slides.

Observation: The slide of *Amoeba* shows single *Amoeba* and the one with binary fission appears to be a big sized *Amoeba* with a constriction in the centre.



Amoeba

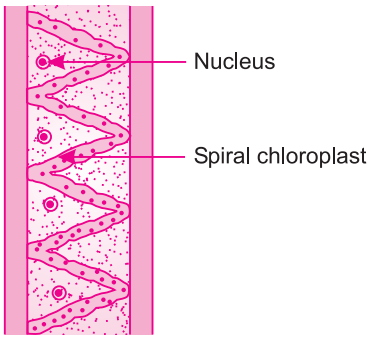
Binary fission in Amoeba

ACTIVITY 8.4

Collect water from a lake or pond that appears dark green and contains filamentors structures. Put one or two filaments on a slide. Put a drop of glycerine on these filaments and cover it with a coverslip

Observe the slide under a microscope.

Observation: It appears as shown *Spirogyra* filament



Spirogyra filament

ACTIVITY 8.5

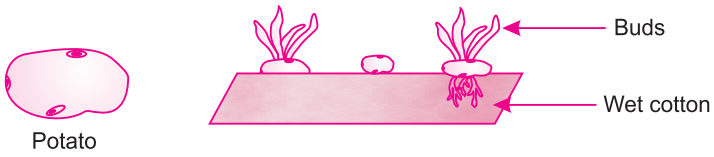
Take a potato and observe its surface. See the notches (Eyes of potato).

Cut the potato into small pieces such that some pieces contain a notch or bud and some do not.

Spread same cotton on a tray and wet it. Place the potato pieces on this cotton. Note where the pieces with buds are placed.

Observe the change taking place in these potato pieces over the next few days. Make sure that the cotton is kept moistened.

Observation: Potato with notches or buds show the growth of a new plantation whereas the other pieces of potato do not show such growth.



ACTIVITY 8.6

Select a money plant. Cut some pieces such that they contain at least one leaf. Cut out some other portions between two leaves. Dip one end of all the pieces in water and observe over the next few days. Observe which ones grow and give rise to fresh leaves.

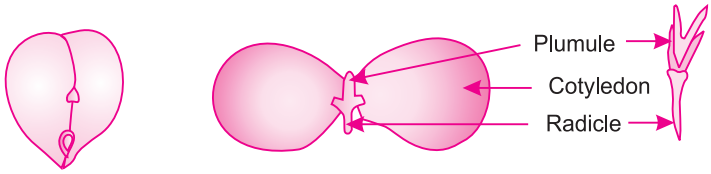
Observation: The stems of money plant with leaves showed the growth while the other parts between two leaves did not show any growth.

ACTIVITY 8.7

Soak a few seeds of Bengal gram (chana) and keep them overnight.

Drain the excess water and cover the seeds with a wet cloth and leave them for a day. Make sure that the seeds do not become dry. Cut open the seeds carefully and observe the different parts. Identify different parts.

Observation: The seed consists of two cotyledons (dicotyledon) when it starts growing it shows the growth of future shoot called plumule and root called radicle.



NCERT IN-TEXT QUESTIONS SOLVED

Q1. *What is the importance of DNA copying in reproduction?*

Ans. DNA copying is an important phenomenon of reproduction through which the organisms pass on their characteristics to their offspring. It maintains the characteristics in different generations of the species. It also produces variations which are useful for the survival of species for long time.

Q2. *Why is variation beneficial to the species but not necessary for the individual?*

Ans. Accumulation of variations after several generations results in new set of traits required for survival. As they show results after many generations so they are not important for individual.

Q3. *How does binary fission differ from multiple fission?*

Ans. **Binary Fission:** An organism is divided into two individuals. Mitotic division takes place resulting in two identical individuals or daughter cells. e.g., *Amoeba*.

Multiple Fission: Mitotic division takes place. The nucleus divides repeatedly to form a number of equal sized and similar individuals, e.g., Plasmodium.

Q4. *How will an organism be benefited if it reproduces through spores?*

Ans. During adverse circumstances spore remain coated with protective layer. This helps an organism survive adverse conditions. Spores are means to tide over bad phases.

Q5. *Can you think of reasons why more complex organisms cannot give rise to new individuals through regeneration?*

Ans. More complex organisms cannot give rise to new individuals because:

1. Their body design is highly complicated.
2. There are specific organs to do specific functions.
3. There is a labour division in the body of complex organisms.
4. Exception is lizard, which can regenerate its tail.

Q6. *Why is vegetative propagation practised for growing some types of plants?*

Ans. The process by which some plants can reproduce asexually by their vegetative parts like roots, stems and leaves is called vegetative propagation. It has many advantages. Plants raised by this method can bear flowers and fruits earlier than those produced from seeds. Plants that have lost capability to produce seeds like banana, orange, rose and jasmine can be propagated. All plants produced are genetically similar to the parent plant.

Q7. *Why is DNA copying an essential part of the process of reproduction?*

Ans. DNA copying is needed because information stored in DNA is used to make protein. Synthesis of different proteins will lead to altered body design. Thus, reproduction at its most basic level involves making copies of the blueprints of body design.

Q8. *How is the process of pollination different from fertilization?*

Ans. **Pollination** is the transfer of pollen grains from the anther of a stamen to the stigma of a carpel. These are transferred by agents such as insects, birds, wind or water.

Fertilization is defined as the fusion of a male gamete (sperm) with a female gamete (ovary) to form a zygote by sexual reproduction.

Q9. *What is the role of seminal vesicles and prostate gland?*

Ans. **Seminal vesicles** are a pair of thin-walled muscular and elongated sacs which secrete a fluid for nourishment of sperms.

Prostate glands also produce a fluid which is released in the urethra along with secretion of seminal vesicle. It affects the vaginal pH so that sperms move smoothly inside the vagina.

Q10. *What are the changes seen in girls at the time of puberty?*

Ans. At the time of puberty, breast size begins to increase, with darkening of the skin of the nipples. Also, girls begin to menstruate at around this time.

Q11. *How does the embryo get nourished inside the mother's body?*

Ans. The embryo grows inside the mother's womb and gets nourishment from its mother's blood through placenta. Placenta contains villi which connects the embryo with the mother's blood. These villi provides a large surface area for glucose and oxygen to pass from mother to the embryo.

Q12. *If a woman is using copper-T, will it help in protecting her from sexually transmitted diseases?*

Ans. No, it will not protect the woman from sexually transmitted diseases as fluid to fluid contact occurs in the vagina.

QUESTIONS FROM NCERT TEXTBOOK

Q1. *Asexual reproduction takes place through budding in*

(*a*) *amoeba.* (*b*) *yeast.* (*c*) *plasmodium.* (*d*) *leishmania.*

Ans. (*b*) yeast

Q2. *Which of the following is not a part of the female reproductive system in human beings?*

(*a*) *Ovary* (*b*) *Uterus* (*c*) *Vas deferens* (*d*) *Fallopian tube*

Ans. (*c*) Vas deferens

Q3. *The anther contains*

(*a*) *sepals* (*b*) *ovules* (*c*) *carpel* (*d*) *pollen grains*

Ans. (*d*) pollen grains

Q4. *What are the advantages of sexual reproduction over asexual reproduction?*

Ans. In **asexual reproduction,** the offspring is almost identical to the parent because they have the same gene as their parent. Thus, variation is not present.

Sexual reproduction involves fusion of male and female gametes. The offspring exhibits diversity of characters because they receive some genes from the mother and some from the father. The mixing of genes in different combinations; results in genetic variations. This variation leads to the continuous evolution of various species to produce various organisms.

Q5. *What are the functions performed by testis in human beings?*

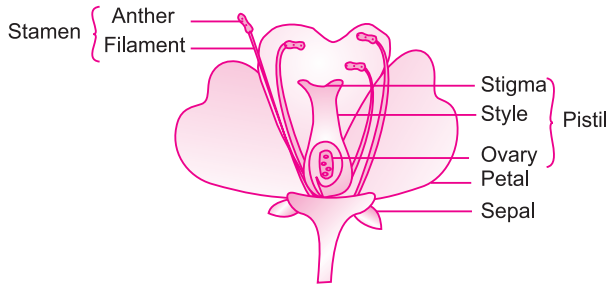
Ans. The function of testis is to produce sperms and male sex hormone called testosterone.

Q6. *Why does menstruation occur?*

Ans. Menstruation occurs in females when the egg produced inside the cervix is not fertilized. Since the egg does not fuse with the male gamete, so the thick and soft lining of uterus having a lot of blood capillaries in it are not required. This unfertilized egg dies within a day and the lining breaks down shedding blood along with other tissues. This comes out of the vagina in the form of bleeding.

Q7. *Draw a labelled diagram of the longitudinal section of a flower.*

Ans.



Q8. *What are the different methods of contraception?*

Ans. Contraception is the method to avoid pregnancy. Various methods of contraception are as follows:

Physical Barrier Methods: Use of condoms, diaphragms, cervical caps can be used. These prevent the entry of sperms into the female genital tract by acting as a barrier between them.

Chemical Methods: Oral pills can be used which change the hormonal balance and stop release of egg. Vaginal pills kill the sperms.

Surgical Methods: This includes **vasectomy** (sperm duct is removed) in males and **tubectomy** (removal of small portion of fallopian tube) in females.

Q9. *How are modes of reproduction different in unicellular and multicellular organisms?*

Ans. Unicellular organisms have only one cell. There is no separate tissue for reproduction. So, they can reproduce by the process of fission or budding. Multicellular organisms contain various cells and have separate system for reproduction. So, they can reproduce by both sexual and asexual methods.

Q10. *How does reproduction help in providing stability to the population of species?*

Ans. Stability is provided by equalizing the birth and death ratio. Thus, the rate of birth should approximately be equal to the rate of death.

Q11. *What could be the reasons for adopting contraceptive methods?*

Ans. The reasons for adopting contraceptive methods could be:

1. Protection from sexually transmitted diseases such as HIV-AIDS, gonorrhoea, syphilis, warts *etc.*
2. Restricting the number of children.
3. Sufficient gap between successive births.
4. Enjoying a good reproductive health.
5. Controlling population.

MORE QUESTIONS SOLVED

I. MULTIPLE CHOICE QUESTIONS

1. The simple animals like *Planaria* can be cut into a number of pieces and each piece grows into a complex organism. What is the process known as?

(*a*) Budding (*b*) Fragmentation

(*c*) Spore formation (*d*) Regeneration

2. _____ is the portion on which grafting is done and it provides the roots?

(*a*) Stock (*b*) Scion

(*c*) Both (a) and (b) (*d*) None of these

3. Where does fertilisation occur in human females?

(*a*) Uterus (*b*) Cervix

(*c*) Oviduct (*d*) None of these

4. Which one of the options is incorrect?

Vegetative propagation is practised because

(*a*) Plants which produce non viable seeds can be grown.

(*b*) It is a easier method than sowing seeds.

(*c*) Such plants produce seeds and fruits much earlier than other methods

(*d*) For obtaining better species of plants.

5. Growing foetus derive nutrition from mother's blood through

(*a*) uterus (*b*) fallopian tube

(*c*) placenta (*d*) cervix

6. What is the surgical method of contraception in female and male respectively?

(*a*) Tubectomy and Vasectomy (*b*) Vasectomy and Copper-T

(*c*) Tubectomy and Copper-T (*d*) None of these

7. Which of the following is not a sexually transmitted disease?

(*a*) Warts

(*c*) Syphilis (*d*) Gonorrhoea

8. What is the puberty age in human males?

(*a*) 8-10 (*b*) 10-12

(*c*) 12-14 (*d*) 14-16

9. Fruit is formed from

(*a*) Stamen (*b*) Stigma

(*c*) Ovary (*d*) Ovule

10. Which of these is not the function of the seminal vesicles present in human males?

(*a*) To covert the sperms in a fluid medium.

(*b*) To provide nutrition.

(*c*) To make their transport easier.

(*d*) To make them sticky.

11. The female reproductive part of the flower consists of

(*a*) Stigma, Anther, Filament (*b*) Style, Ovary, Thalamus

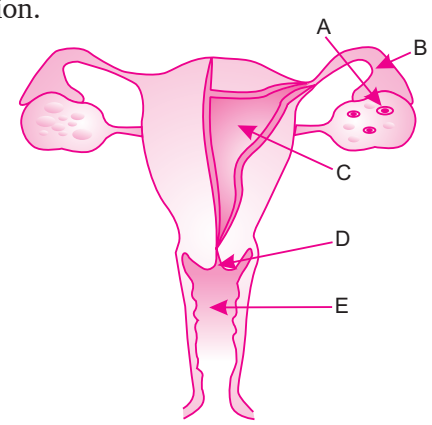
(*c*) Stigma, Ovary, Style (*d*) Anther, Corolla, Filament

12. In which of the following plant bud in notches of leaves help in its propagation?

(*a*) Radish (*b*) *Bryophyllum*

(*c*) Bougainvillea (*d*) Jasmine

13. Choose the right option.



A	B	C	D	E
(*a*) Fallopian tube	Oviduct	Uterus	Cervix	Vagina
(*b*) Oviduct	Vas deferens	Ovary	Vagina	Cervix
(*c*) Ovary	Oviduct	Uterus	Cervix	Vagina
(*d*) Ovary	Fallopian tube	Uterus	Vagina	Cervix

14. The process of the transfer of pollen grains from the flower of one plant to the stigma of the flower of another plant of the same species is known as

(*a*) Cross pollination (*b*) Fertilisation

(*c*) Self pollination (*d*) None of the above

15. What are the functions performed by the testis in human males?

(*a*) Production of gametes–eggs and secretion of sex hormones–estrogen

(*b*) Production of gametes–sperms and secretion of sex hormones–testosterone

(*c*) Production of gametes–sperms and secretion of sex hormones–estrogen

(*d*) None of the above

16. Why are the testes located outside the abdominal cavity in scrotum?

(*a*) Because sperm formation requires more spaces.

(*b*) Because sperm formation requires a lower temperature.

(*c*) Because sperm formation requires a higher temperature.

(*d*) None of the above.

17. IUCD is for

(*a*) Vegetative propagation (*b*) Contraception

(*c*) Increasing fertility (*d*) Avoiding miscarriage

18. The two oviducts in a human female unite into an elastic bag like structure known as

(*a*) Vagina (*b*) Uterus

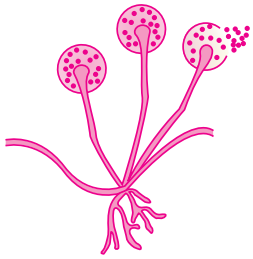
(*c*) Fallopian tube (*d*) Cervix

19. Which of the following disease is transmitted sexually?

(*a*) Kala azar (*b*) Jaundice

(*c*) Elephantiasis (*d*) Syphilis

20. Identify the organism



(*a*) *Rhizobium* (*b*) *Rhizopus*

(*c*) Rhizoid (*d*) Mushroom

21. Which of the following is a contraceptive?

(*a*) Copper-T (*b*) Condom

(*c*) Diaphragm (*d*) All of these

22. The process where the unfertilised egg is released out of the body with the blood used to nourish the embryo is known as

(*a*) Menstruation (*b*) Fertilisation

(*c*) Germination (*d*) Pollination

23. After fertilisation name the part which develops into the seeds

(*a*) Ovary (*b*) Ovule

(*c*) Pollen grain (*d*) None of the above

24. Unisexual flowers contain

(*a*) Both stamen and carpel (*b*) Only stamen

(*c*) Only carpel (*d*) Either stamen or *carpel*

25. *Spirogyra* reproduces by

(*a*) Fission (*b*) Regeneration

(*c*) Fragmentation (*d*) Budding

26. The process in which the cytoplasm of a single eukaryotic cell is divided to form two daughter cells is known as?

(*a*) Karyokinesis (*b*) Cytokinesis

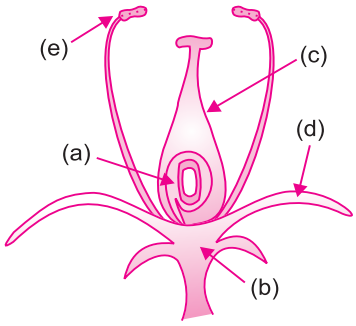
(*c*) Meiosis (*d*) Mitosis

27. Unicellular organisms reproduce by

(*a*) Mitotic cell division (*b*) Meiotic cell division

(*c*) Both (a) and (b) (*d*) None of the above

28. Chose the correct option



A	B	C	D	E
(*a*) Ovary	Thalamus	Filament	Sepal	Anther
(*b*) Ovary	Thalamus	Style	Sepal	Anther
(*c*) Ovule	Sepal	Style	Thalamus	Filament
(*d*) Ovule	Sepal	Style	Thalamus	Stamen

29. What is the surgical method of contraception used in human males?

(*a*) Vasectomy (*b*) Condoms

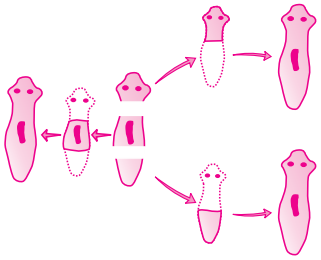
(*c*) Contraceptive pills

30. Vegetative propagation in potato takes place through

(*a*) Stem (*b*) Root

(*c*) Leaves (*d*) Seeds

31. The type of reproduction taking place is



(*a*) Budding (*b*) Fragmentation

(*c*) Regeneration (*d*) Fission

32. The anther contains

(*a*) Sepals (*b*) Ovules

(*c*) Carpel (*d*) Pollen grains

33. The full form of AIDS is

(*a*) Acquired Immune Deficiency System

(*b*) Acquired Immune Disease Syndrome

(*c*) Acquired Immediate Deficiency Syndrome

(*d*) Acquired Immuno Deficiency Syndrome

34. Union of male and female gametes forms

(*a*) Egg (*b*) Embryo

(*c*) Zygote (*d*) Spore

35. Identify the type of cell division taking place

(*a*) Longitudinal cell division taking place

(*b*) Transversal cell division in *Paramecium*

(*c*) Longitudinal cell division in *Paramecium*

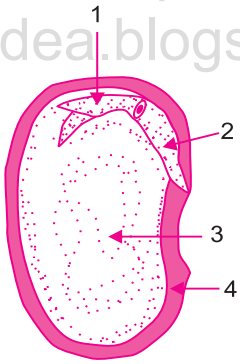
(*d*) Transversal cell division in *Amoeba*

36. The number of chromosomes in human ovum is

(*a*) 21 (*b*) 22

(*c*) 23 (*d*) 24

37.



Choose the correct option

1	2	3	4
(*a*) Plumule	Radicle	Cotyledon	Seed coat
(*b*) Radicle	Plumule	Seed coat	Cotyledon
(*c*) Cotyledon	Seed coat	Radicle	Plumule
(*d*) Radicle	Plumule	Cotyledon	Seed coat

38. The common passage meant for transporting urine and sperms in males is

(*a*) Ureter (*b*) Vas deferens

(*c*) Urethra (*d*) Anus

Answers

1. (*d*)	**2.** (*a*)	**3.** (*d*)	**4.** (*c*)	**5.** (*c*)	**6.** (*a*)	**7.** (*b*)
8. (*c*)	**9.** (*c*)	**10.** (*d*)	**11.** (*c*)	**12.** (*b*)	**13.** (*c*)	**14.** (*a*)
15. (*b*)	**16.** (*b*)	**17.** (*b*)	**18.** (*b*)	**19.** (*d*)	**20.** (*b*)	**21.** (*d*)
22. (*a*)	**23.** (*b*)	**24.** (*d*)	**25.** (*c*)	**26.** (*d*)	**27.** (*a*)	**28.** (*b*)
29. (*a*)	**30.** (*a*)	**31.** (*c*)	**32.** (*d*)	**33.** (*d*)	**34.** (*c*)	**35.** (*b*)
36. (*c*)	**37.** (*a*)	**38.** (*c*)				

II. VERY SHORT ANSWER TYPE QUESTIONS (*1 Mark*)

Q1. *Why do organisms reproduce?*

Ans. Organisms reproduce to perpetuate their race and maintain their species.

Q2. *How do we know that two different individuals belong to the same species?*

Ans. Members of same species are capable of interbreeding the same species by the similarity in their body design and other physical features.

Q3. *Name the nucleic acids.*

Ans. DNA and RNA are the two nucleic acids present in the living cells.

Q4. *Give the full form of DNA.*

Ans. Deoxyribo Nucleic Acid.

Q5. *What happens during copying of DNA?*

Ans. Copies of DNA are formed and hereditary information is passed on from one generation to the next.

Q6. *When does copying of DNA occur?*

Ans. Copying of DNA occurs during cell division.

Q7. *The mode of reproduction depends on which feature of the organism.*

Ans. The mode of reproduction depends on the body design of the organism.

Q8. *Name two plants whose flowers are unisexual.*

Ans. Papaya, watermelon.

Q9. *Name two plants whose flowers are bisexual.*

Ans. Mustard, chinarose.

Q10. *What is fertilization?*

Ans. Fertilization is the process of fusion of the male and the female gametes.

Q11. *What is pollination?*

Ans. The process of transfer of pollen grains from the stamen to the stigma of a flower is called pollination.

Q12. *What is the importance of DNA copying in reproduction?*

Ans. DNA copying during reproduction is important for the transfer of parental characters to the offsprings.

Q13. *How does the developing embryo get nourishment inside the mother's body?*

Ans. The embryo gets nourishment from the mother's blood with the help of a special tissue called placenta.

III. SHORT ANSWER TYPE QUESTIONS (*2 or 3 Marks*)

Q1. *Differentiate between asexual and sexual reproduction.*

Ans.

Asexual	*Sexual*
1. Asexual reproduction involves a single parent.	1. Sexual reproduction involves two parents (male and female).
2. No gametes are formed during asexual reproduction.	2. Gamete formation takes place in sexual reproduction.
3. No or little variations occur during asexual reproduction.	3. Many variations occur during sexual reproduction.

Q2. *Enumerate the various methods of asexual reproduction in living organisms.*

Ans. The various methods of asexual reproduction are fission (binary and multiple), fragmentation, regeneration, budding, vegetative propagation, spore formation and tissue culture.

Q3. *What is binary and multiple fission? Name the organisms in which they occur.*

Ans. Binary fission is the division of one parent cell into two identical daughter cells. It takes place in *Amoeba*, *Paramecium*, *Euglena* and other protozoa.

In multiple fission one single celled organism divides into many daughter cells within a cyst. These are released when the cyst breaks. This takes place in *Plasmodium* (malarial parasite).

Q4. *What is fragmentation?*

Ans. Fragmentation is the method of breaking up of an organism into smaller pieces or fragments which grow into new organisms as in algae *Spirogyra*.

Q5. *What is regeneration? Name two organisms that can reproduce by regeneration.*

Ans. Many fully differentiated organisms have the ability to give rise to new organisms from their body parts by being cut or broken into many pieces. This is known as regeneration. All organisms do not have the capacity to reproduce by regeneration. *Hydra* and *Planaria* can reproduce by the process of regeneration.

Q6. *What is budding? Name two organisms that reproduce asexually by budding.*

Ans. In budding a small part of the parents body grows out as a bud which then detaches and becomes a new organism. *Hydra* and yeast reproduce by budding.

Q7. *What is vegetative propagation? What are its advantages?*

Ans. The process by which some plants can reproduce asexually by their vegetative parts like roots, stem and leaves is called vegetative propagation. It has many advantages. Plants raised by vegetative propagation can bear flowers and fruits earlier than those produced from seeds. Plants that have lost the capacity to produce seeds like banana, rose and jasmine can be propagated by this method. All plants produced by this method are genetically similar to the parent plant.

Q8. *How do potato and Bryophyllum plants reproduce vegetatively?*

Ans. Potato tuber has depressions called "eyes" on its surface. These eyes have vegetative buds in them which germinate to produce a new potato plant. Similarly the fleshy leaves of *Bryophyllum* bear vegetative buds in the notches along the leaf margin. These buds germinate to form small plantlets which form new plants on being detached.

Q9. *Name two plants that can reproduce asexually by formation of spores.*

Ans. Bread mould (*Rhizopus*) and ferns reproduce asexually by formation of spores.

Q10. *What are the limitations of asexual mode of reproduction?*

Ans. In asexual mode of reproduction there are no genetic variation so there is less adaptability in the offspring.

Q11. *What is the significance of sexual reproduction?*

Ans. (*a*) A sexual reproduction results in new combination of characters and increases genetic variations.

(*b*) It promotes diversity of characters in the offspring.

(*c*) It speeds up the process of making variations in the population.

Q12. *How is the amount of DNA maintained in each generation?*

Ans. The amount of DNA is maintained in each generation by a specialized mode of cell division called meiosis which produces specialized male and female germ cells called gametes which are haploid. One male and female gamete fertilize to give rise to a diploid zygote which has the same chromosome number as the parent. This process maintains the chromosome number and the amount of DNA in each generation.

Q13. *State the advantages of seed formation in plants.*

Ans. The seed contains the future plant or embryo which can develop into a seedling under appropriate conditions. The seed is in a state of dormancy and can be kept in secure state for long period of time.

Q14. *What is germination of seed?*

Ans. When the seed gets the right conditions the embryo within it starts growing to form the shoot and the root. When the embryo emerges out of the seed to form a new seedling it is called the germination of seed.

Q15. *What is puberty?*

Ans. Puberty is the age at which the gametes start forming in the male and female human beings. At this age boys and girls become sexually mature.

Q16. *What changes occur in the flower after fertilisation?*

Ans. After fertilisation the flower withers. The sepals and the petals dry up, the ovary converts into fruit, the ovule forms the seed and the zygote forms the embryo which is enclosed in the seed.

Q17. *Name the agents of pollination.*

Ans. The agents that bring about pollination are wind, water, birds and insects.

Q18. *State the functions of the human male and female sex hormones.*

Ans. The human male sex hormone testosterone regulates the formation of the male gamete, the sperms and brings about changes in appearance seen in boys at the time of puberty.

The human female sex hormone estrogen brings about the changes occurring in girls at puberty and progesterone controls the uterus changes occurring during the menstrual cycle and also helps in maintaining the pregnancy.

Q19. *What happens when the egg is fertilised?*

Ans. When the egg is fertilised zygote is formed, it starts dividing and gets implanted in the lining of the uterus.

Q20. *What is menstruation? Why does it occur?*

Ans. Menstruation is the process of breakdown and removal of the inner lining of the uterus along with the blood vessels in the form of vaginal bleeding. This happens after every 28 days if the egg is not fertilised. This takes place in human females and in some primates.

Q21. *What is STD? Name two STDs.*

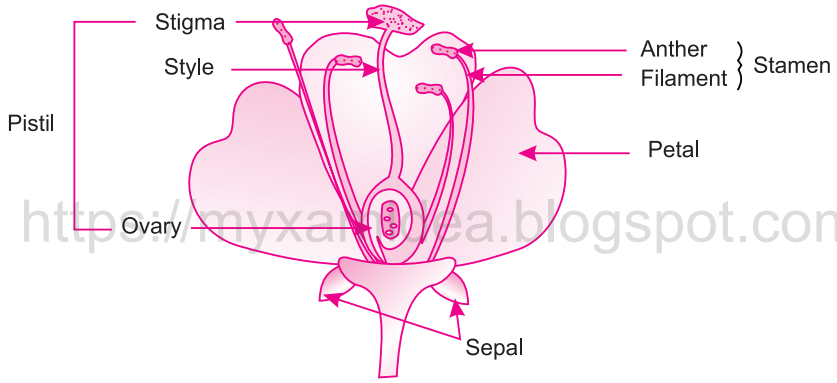
Ans. STD is Sexually Transmitted Disease. Two STDs are syphilis and gonorrhoea.

Q22. *What is the role of seminal vesicles and prostate gland?*

Ans. These are the accessory glands associated with the male reproductive system. Seminal vesicles and prostrate gland secrete a fluid which makes the transport of sperms easier and also provides nourishment to the sperms. This fluid together with the sperms is called the semen.

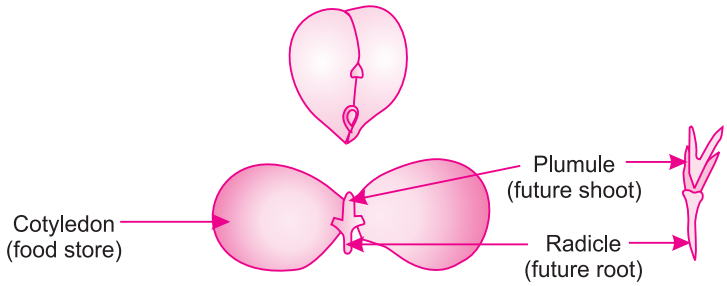
Q23. *Draw a well labelled diagram of a bisexual flower.*

Ans.



Q24. *Draw a well labelled diagram of a dicot seed (gram seed).*

Ans.



Germination of gram seed

Q25. *Device an experiment to show germination of gram seed.*

Ans. (*a*) Soak a few seeds of Bengal gram (chana) and keep them overnight.

(*b*) Drain the excess water and cover the seeds with a wet cloth and leave them for a day. Make sure that the seeds do not become dry.

(*c*) Cut open the seeds carefully and observe the different parts.

(*d*) Compare your observations with the figure above that shows the germination of gram seed and see if you can identify all the parts.

Q26. *What does the male and female reproductive system consists of?*

Ans. The male reproductive system in human beings consists of testes which produce sperms, vas deferens, seminal vesicles, prostrate gland, urethra and penis.

The female reproductive system consists of a pair of ovaries, fallopian tube, uterus and vagina.

Q27. *Explain the process of sexual reproduction in plants.*

Ans. After the pollen lands on a suitable stigma it germinates to form the pollen tube. The pollen tube grows through the style and carries the male germ cells in it. The pollen tube enters the ovule and the male germ cells fuse with the egg cell to form the zygote. This process is called fertilisation.

Q28. *State the changes that occur in human males and females at puberty.*

Ans. Puberty is the state of sexual maturiy in humans. The changes that take place in males during puberty are growth of hair on the body, appearance of beard and moustache and the voice becomes hoarse. Females show development of breasts, and beginning of menstruation.

Q29. *What is self and cross pollination?*

Ans. **Self Pollination:** It is the transfer of pollen grains from the anther of a flower to the stigma of the same or another flower on the same plant.

Cross Pollination: It is the transfer of the pollen grains from the anther of a flower to the stigma of another flower on a different plant of the same species.

Q30. *What is 'reproduction'? Mention the importance of DNA copying in reproduction.* (CBSE 2008)

Ans. Reproduction is the process by which the existing organisms produce their own kind.

DNA copying during reproduction is important for the transfer of parental characters to the offspring.

Q31. *List any two differences between pollination and fertilisation* (CBSE 2008)

Ans.

Pollination	***Fertilisation***
1. Transfer of pollen grain from anther to stigma of a flower.	Fusion of pollen nucleus and ovule in the ovary.
2. It is a physical process, no new substance is formed.	It is a chemical process in which a new structure called zygote is formed.
3. Its types are self pollination and cross pollination.	Its types are internal and external fertilisation.

Q32. *Mention the information source of making proteins in the cell. What is the basic event in reproduction?* (CBSE 2008)

Ans. Cellular DNA is the information source of making proteins in the cell.

The basic event in reproduction is copying of DNA so that the cells can further divide.

Q33. *Name one sexually transmitted disease each caused due to bacterial infection and viral infection. How can these be prevented?* (AI CBSE 2008)

Ans. **Bacterial infection:** gonorrhoea

Viral infection: warts and HIV-AIDS

Prevention: Use of condoms by male.

Q34. (*a*) *In human body what is the role of*

(*i*) *Seminal vesicles* (*iii*) *Prostrate glands.*

(*b*) *List two functions performed by testes in human beings.* (AI CBSE 2008)

Ans. (*a*) **Seminal vesicles:** Produce a fluid which makes the transport of sperms easy.

Prostate glands: Produces a fluid which keeps sperms floating in it and provides nourishment.

(*b*) Two functions of testes:

(*i*) They secrete hormone: testosterone responsible for the male characteristics.

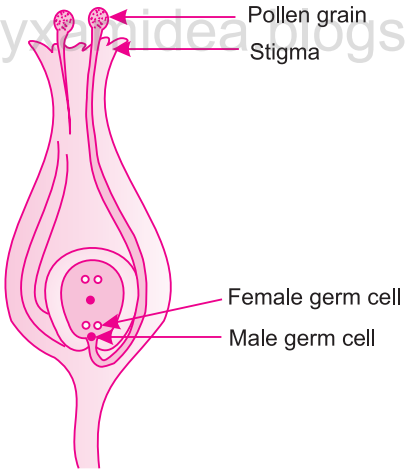
(*ii*) It helps in the formation of sperms.

Q35. (*a*) *Draw a diagram illustrating, fertilisation in a flowering plant and label it.*

Pollen grain, male germ cell, female germ cell, stigma.

(*b*) *Describe the process of fertilisation in plants.* (CBSE 2008 F)

Ans. (*a*)



Fertilisation in a flowering plant

(*b*) **Fertilisation in plants:** It takes place after the pollination is done.

(*i*) The pollen grain develops a tube called pollen tube which carries male germ cells to the ovary.

(*ii*) The male germ cell fuses with the female germ cell in the ovary and forms zygote.

(*iii*) The zygote further forms embryo.

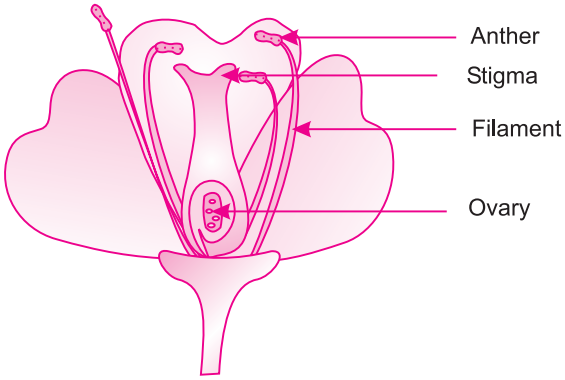
(*iv*) The embryo develops a protective coating and forms seed.

(*v*) The ovary forms a fruit with seed in it.

Q36. *(a) Draw a diagram showing longitudinal section of a flower and label on it: stigma, ovary, anther, filament.*

(b) How is the process of pollination different from fertilisation? (CBSE 2008 F)

Ans. (a)



Parts of a flower

(b)

Pollination	***Fertilisation***
1. Transfer of pollen grain from anther to stigma of a flower.	Fusion of pollen nucleus and ovule in the ovary.
2. It is a physical process, no new substance is formed.	It is a chemical process in which a new structure called zygote is formed.
3. Its types are self pollination and or cross pollination.	Its types are internal and external fertilisation.

Q37. *(a) Name the parts labelled A, B, C, D, and E*

(b) Where do the following functions occurs?

(i) Production of an egg

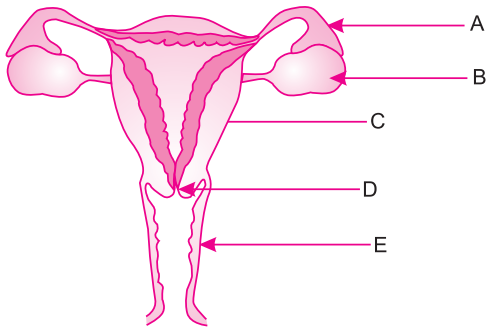
(ii) Fertilisation

(iii) Implantation of zygote

(c) What happens to the lining of uterus

(i) before release of fertilised egg.

(ii) if no fertilisation occurs.



Ans. (a) A ⟶ Fallopion tube
B ⟶ Ovary
C ⟶ Uterus
D ⟶ Cervix
E ⟶ Vagina

(b) (i) Production of an egg — ovary
(ii) Fertilisation — fallopian tubes
(iii) Implantation of zygote — lining of the uterus

(c) (i) Before release of fertilized egg – the uterus wall becomes thick.
(ii) If no fertilisation occurs – the lining of uterus slowly breaks down and comes out in the form of bleeding.

Q38. *(a) Explain the terms:*

(i) Implantation (ii) Placenta

(b) What is the average duration of human pregnancy? (CBSE 2009)

Ans. (a) (*i*) **Implantation:** The zygote when fixes itself on the inner thick wall of uterus for further development is called implantation.

(*ii*) **Placenta:** It is the special tissue in the form of a disc which is embedded in the uterus wall. It provides large surface area for glucose and oxygen to pass from mother to the embryo. The waste generated by the embryo also passes into the mother's blood through this placenta

(*b*) It takes nine months for the human pregnancy.

Q39. *What are sexually transmitted diseases? Name four such diseases. Which one of them damages the immune system of human body to complete?* (CBSE 2009)

Ans. The diseases that spread due to sexual contact from infected person to a healthy person are called sexually transmitted diseases.

Four STDs:

(*i*) Gonorrhoea (*ii*) Syphilis (*iii*) Warts (*iv*) AIDS

AIDS: Acquired Immuno Deficiency Syndrome damages the immune system.

Q40. *Name the following:*

(i) Name two plants that cannot produce seeds.

(ii) An organism that reproduces by budding and regeneration.

(iii) An organism that grows by multiple fission

(iv) One unisexual flower.

Ans. (*i*) *Bryophyllum*, Banana (*ii*) *Hydra* (*iii*) *Paramecium* (*iv*) Maize flower

Q41. *What is the role of following in reproduction?*

(i) DNA (ii) Ovulation (iii) Fertilisation

(iv) Puberty (v) Contraception

Ans. (*i*) Variation (*ii*) Egg production (*iii*) Zygote formation

(*iv*) Attainment of sexual maturity (*v*) Birth control

Q42. *Give one term for the following:*

(a) Beginning of menstrual cycle

(b) Release of ovum from the ovary

(c) Fusion of male and female eggs

(d) Prevention of unwanted pregnancy

(e) Time for development of offspring in female human.

Ans. (*a*) Menstruation (*b*) Ovulation (*c*) Fertilisation

(*d*) Contraception (*e*) Nine months

Q43. *Name the hormone the secretion of which is responsible for dramatic changes in appearance in girls when they approach 10–12 years of age.* (CBSE 2008)

Ans. Oestrogen and Progesterone.

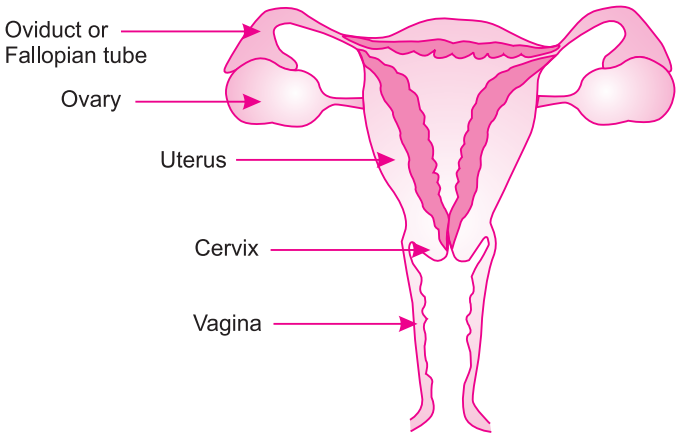
Q44. *Why is DNA copying an essential part of the process of reproduction?* (AI CBSE 2009)

Ans. Refer to Q7. on page 88.

IV. LONG ANSWER TYPE QUESTIONS (*5 Marks*)

Q1. *Draw a well labelled diagram of the female reproductive system in humans.*

Ans.

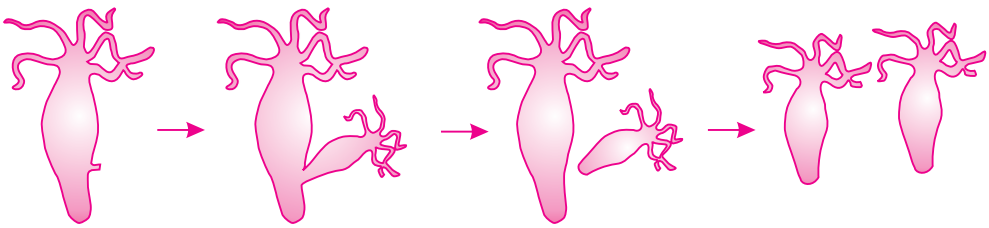


Q2. *With the help of diagrams explain the process of budding in Hydra and fission in Amoeba.*

Ans. (*i*)

Fission in *Amoeba*

(*ii*)



Budding in *Hydra*

Q3. *State the functions of the following:*

(*a*) *testis* (*b*) *ovaries* (*c*) *vas deferens* (*d*) *stamen* (*e*) *pistil*

Ans. (*a*) **Testis:** Form the male gametes the sperms and secrete the male sex hormone testosterone

(*b*) **Ovaries:** Form the female gamete ovum or the egg cell and secrete the female sex hormones estrogen and progesterone.

(*c*) **Vas deferens:** Transport the sperms from the testis to the exterior.

(*d*) **Stamen:** Form the pollen grains in flowers. The pollen grains bear the male gametes.

(*e*) **Pistil:** The ovary forms the egg and the stigma helps in attracting the pollen grains for fertilisation.

Q4. *What are the various artificial methods of vegetative propagation in plants?*

Ans. The various artificial methods of vegetative propagation in plants are:

(*a*) **Cutting:** In this any part of the plant like the stem root or leaf is cut and buried in the soil which gives rise to a new plant as in rose, guava, grapes *etc.,*

(*b*) **Layering:** In plants like jasmine and strawberry a branch from the plant is brought down too the ground and covered with damp soil. After few days new roots are formed and the branch is cut from the main plant.

(*c*) **Grafting:** In this the stem of a plant is given a cut and the other plant is fixed (with its stem) in it e.g., sugarcane, roses, grapes are grown for agricultural purposes.

(*d*) **By Roots:** Plants like sweet potato show the growth of more plants from a root.

(*e*) **Stem:** Plants like potato, ginger, onion, they show growth from their stems.

(*f*) **By Buds:** Plant like *Bryophyllum* and potato grow small buds on them and a growth of new plant takes place.

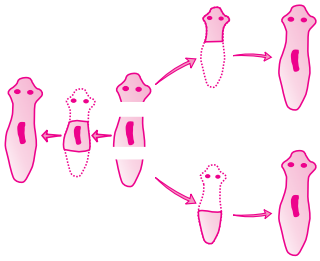
Q5. *Illustrate the following with the help of a suitable diagrams:*

(*i*) *Regeneration in Planaria*

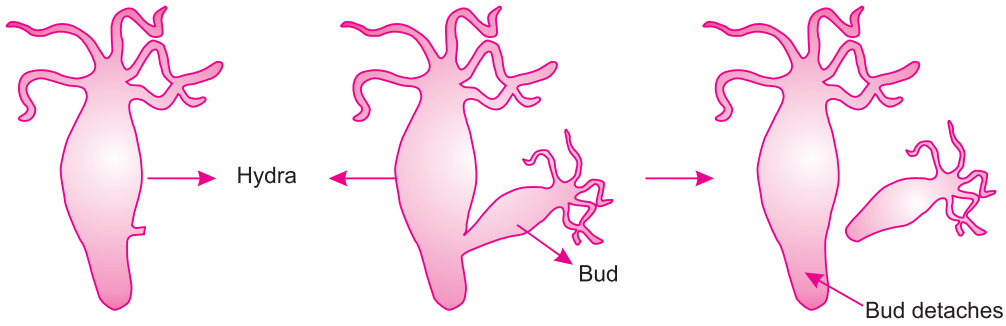
(*ii*) *Budding in Hydra* (AI CBSE 2008)

Ans. (*i*) Regeneration in Planaria

Planaria: If it is divided into 3 parts a, b and c, each part grows as a new individual



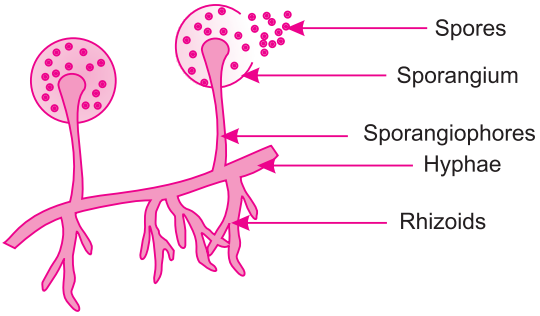
(*ii*) Budding in *Hydra*



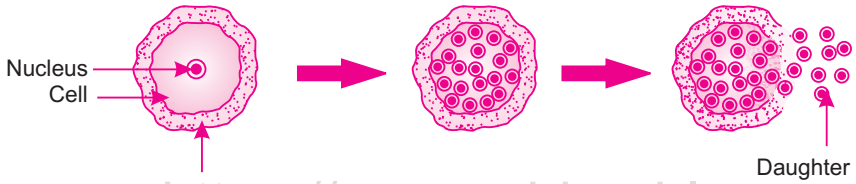
Q6. *Illustrate the following with the help of suitable diagram* (AI CBSE 2008)

(i) Spore formation in Rhizopus (ii) Multiple fission in Plasmodium

Ans. (*i*) Spore formation in *Rhizopus*



(*ii*) Multiple fission in *Plasmodium*

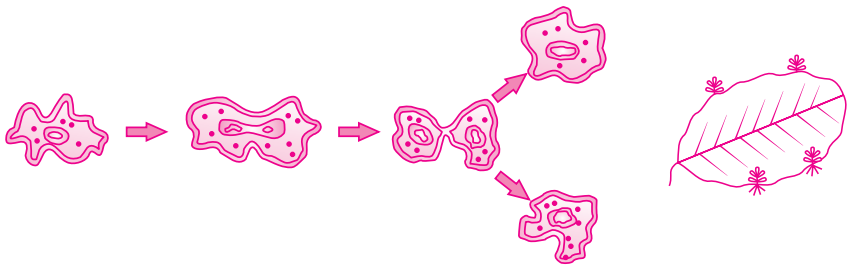


Q7. *Illustrate the following with the help of suitable diagram*

(i) Binary fission in Amoeba

(ii) Leaf of Bryophyllum with buds (AI CBSE 2008)

Ans. (*i*) Binary fission in *Amoeba* (*ii*) *Bryophyllum* leaf

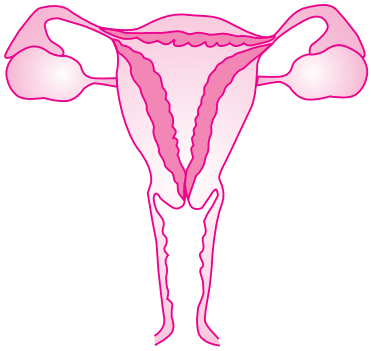


TEST YOUR SKILLS

Q1. *Observe the given figure of female reproductive system. Draw the figure in answer copy, label and name the following:*

(a) Label the part where fertilisation takes place.

(b) Label the part where zygote implants.

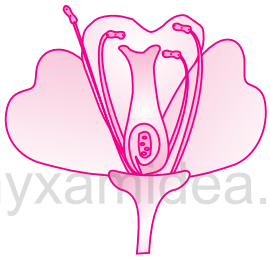


(c) Label the part where eggs are formed.

(d) Label the part where embryological development takes place.

(e) Label the part that produces hormones.

Q2. Observe the figure given below



Draw the figure in your answer copy and label the following and name it:

(a) Female whorl of the flower

(b) Part which attracts insects

(c) Part which becomes seed

(d) Part which becomes fruit

(e) Male gametes of the flower

Q3. Draw male reproductive system and label the parts that you get as answer from (a)—(e).

(a) Where testes are located.

(b) Where the fluid is formed which helps sperms to swim.

(c) Where sperms are formed.

(d) Which is blocked to prevent pregnancy (surgically).

(e) Which makes a fluid that keeps the sperms alive for longer time.

Q4. Draw a diagram and label the following parts of seed (germinating stage):

(a) Part that will become shoot

(b) Part that will become root.

(c) Part that contains food for the growth.

Q5. How will an organism be benefited if it reproduces through spores?

Q6. *Name two plants whose flowers are unisexual.*

Q7. *Give the full form of DNA.*

Q8. *Name two organisms that reproduce by budding.*

Q9. *What are the limitations of asexual mode of reproduction?*

Q10. *What is the role of seminal vesicles and prostate gland?*

Q11. *Draw a well labelled diagram of a dicot seed.*

Q12. *Explain the terms:*

(*a*) *implantation* (*b*) *placenta*

Q13. *What are STD? Name four such diseases.*

Q14. (*i*) *Draw a diagram illustrating fertilisation in a flawering plant and label pollen grain, male germ cell, stigma.*

(*ii*) *Describe the process of fertilisation in plants.*

Q15. *What are the different methods of contraception, in male and female human being?*

❐❐❐

9 Heredity and Evolution

SYLLABUS

Heredity, Mendel's contribution—Laws of inheritance of traits, Sex determination: brief introduction, Basic concepts of evolution.

Facts that Matter

Heredity is the transmission of characters or traits from the parents to their offspring.

Variation is the difference in the characters or traits among the individuals of a species.

Accumulation of Variations

Sexual reproduction of organisms produces variations. The variations produced in organisms during successive generations get accumulated in the organisms. The significance of a variation shows up only if it continues to be inherited by the offspring for several generations.

In sexually reproducing organisms there is a vast similarity. Variations if any are not genetic but due to environment and are non-inheritable.

Variation increases the chances of survival of a species in a changing environment. Selection of variants by environmental factors forms the basis for evolution process.

Heredity: The rules of heredity determines the process by which traits are inherited.

Inherited traits are those characters which are transferred from one generation to another e.g., height, skin colour, blood group etc.

Rules for Inheritance of traits (Mendel's contributions):

Inheritance is the transmission of genetically controlled characteristics from one generation to the next.

Gregor Mendel choose pea plants for studying inheritance. Pea plants have a number of clear cut differences e.g., some plants were tall, some short, they are easy to tell apart and also they have a short life cycle.

Mendel's Monohybrid Cross

1. Mendel first crossed pure bred tall pea plants with pure bred dwarf pea plant and found that only tall pea plants were produced in the first generation (F_1).
2. Mendel then crossed the tall pea plants of the Ist generation (F_1) and found that both tall plants and dwarf plants were obtained in the second generation (F_2) in the ratio 3:1 i.e., 3/4 tall and 1/4 dwarf plant (monohybrid ratio).

Mendel's Dihybrid Cross

A breeding experiment dealing with two characters at the same time is called a dihybrid cross. Mendel considered shape as well as colour of seeds simultaneously.

Mendel's Conclusion: Based on the findings of monohybrid and dihybrid crosses Mendel concluded—

(*i*) In a monohybrid cross, only one of two contrasting characters (traits) appeared in F_1 generation. However, in F_2 generation, both the parental traits appeared in certain proportion.

(*ii*) In a dihybrid cross, when two contrasting pairs of traits were considered simultaneously, only a parental combination appeared in F_1 generation. However, in F_2 generation, raised by self-pollination, other combinations of traits appeared. These included two parental type traits and two new combinations in approximately same proportion.

Mendel's Interpretation: On the basis of monohybrid and dihybrid crosses, Mendel postulated:

(*i*) There are a pair of unit **factors** controlling each character in pea plant, one inherited from each parent. Mendel considered these factors as the carriers of hereditary information from one generation to another, *i.e.*, from parents to the offsprings. At the time of reproduction, when gametes are formed, these factors segregate so that each gamete receives only one factor of each character. This is called **law of segregation. Fertilisation** brings these two factors again together in the offspring.

(*ii*) In F_1 generation, only one character was expressed. Mendel called it as **dominant** character. The character which was not expressed was termed **recessive** character. **The phenomenon of appearance of only of two contrasting traits in F_1 generation, is termed as dominance.**

(*iii*) The characters are not lost even when they are not expressed.

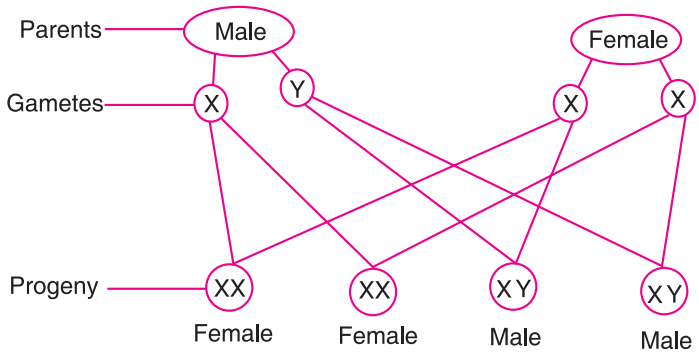
(*iv*) When F_1 offsprings were allowed to be self pollinated, both the parental traits were expressed in definite proportion in F_2 generation.

(*v*) From the F_1 generation of a dihybrid cross, Mendel postulated that inheritance of factors controlling a particular trait in an organism are independent of the other. **This is called law of independent assortment.** Hence, at the time of reproduction, two pairs of factors of each of the two traits in a dihybrid cross segregated independently during gamete formation and randomly formed combinations.

How do these Traits get expressed?

Traits of parents are transmitted to their offsprings (progeny) through genes present on their chromosomes during the process of sexual reproduction.

In sexually reproducing organisms sex cells are produced by meiosis. Each gamete (sex cell) has a single set of chromosomes. Chromosomes are thread like structure present in the nucleus of a cell which contain hereditary information of the cell. Chromosomes are made up of DNA and proteins. The most important component of chromosome is DNA. Each species has a fixed number of chromosomes in each of its cells. Chromosomes occur in pairs.



1. Colour variations during reproduction. One beetle develops a green body colour. Crows cannot locate green beetles in the green bush hence the number of green

beetles increases as compared to red beetles. In this case **Natural selection** is exerted by crows and **individuals more suited to the environment survive.**

2. One beetle develops a blue colour. Blue and red both are detected by crows and are eaten. If calamity strikes e.g., an elephant stamps on the bush and **by chance** only blue beetles survive then their number increase. **This random change in the gene frequency occurring by chance irrespective of its being beneficial or harmful is called genetic drift.**
3. In this situation when bushes develops disease, food for beetles reduces. Due to scarcity of food beetles are poorly nourished. The average weight of beetles decreases. Then when scarcity is over the average weight of beetles are again increased.

Acquired and Inherited Traits

There are 2 kinds of traits in every organism.

(*i*) Inherited traits. These traits are controlled by specific genes and are passed on from one generation to another. Any alteration in the DNA will be passed on, through germ cells, to progeny resulting in variations in them.

(*ii*) Acquired traits. Certain traits are acquired by organisms in their life time. For instance, decrease in the body weight of beetles due to starvation is an acquired trait by the beetles during their life time. It involves changes in the non-reproductive tissues caused by environmental factors. It will not bring any change in the DNA. Therefore, even if some of the generations of beetle are low in weight because of starvation, this trait can not be inherited by the progeny over generations.

Speciation

Origin of a new species from the existing one is called speciation.

The important factors which could lead to the rise (or formation) of a new species are the following:

(*i*) Geographical isolation of a population caused by various types of barriers (such as mountain ranges, rivers and sea). The geographical isolation leads to reproductive isolation due to which there is no flow of genes between separated groups of population.

(*ii*) Genetic drift caused by drastic changes in the frequencies of particular genes is by chance alone.

(*iii*) Variations caused in individuals due to natural selection.

In most of the cases, new species are formed when the population of some species splits into two separate groups which then get isolated from each other geographically by the barriers such as mountain ranges, rivers or the sea. The geographical isolation of the two groups of population leads to their reproductive isolation due to which no genes are exchanged between them. However, breeding continues within the isolated populations producing more and more generations. Over the generations, the processes of genetic drift (random change in gene frequency), and natural selection operate in different ways in the two isolated groups of population and make them more and more different from each other. After thousand of years, the individuals of these isolated groups of population become so different that they will be incapable of reproducing with each other even if they happen to meet again. We say that new species have been formed.

Evolution and Classification

Characteristics are details of behaviour or appearance. The more characteristics two species will have in common, the more closely they are related. They will also have a common ancestor. Classification of species is a reflection of evolutionary relationship.

Evidences of Evolution

Homologous organs: Organs of different organism that have structural similarity, develop in the same way but perform different functions e.g., forelimb of a frog, a bird, and a human. Similarities indicate that all these vertebrates had a common ancestor.

Analogous organs: Organs of different organisms that are structurally and developmentally different but perform same function. e.g., wings of birds and insects.

Fossils: Remains or impressions of the hard parts of past organisms found in the strata of the earth.

AGE OF FOSSILS

1. **Relative:** Fossils found closer to the surface are more recent than fossils found in the deeper layers.
2. **Radioactive dating:** The age of a fossil can be calculated based on the property of radioactive uranium which changes to lead. The amount of lead in a rock can help to calculate, the age of the fossil.

Evolution by Stages

Evolution by an organism or its organs from simple to complex has taken place in stages:

(*a*) Feathers were first developed in dinosaurs but they could not fly. They protected them from the cold. Later birds used feathers for flight. This indicates that birds are related to dinosaurs also that a character developed for one function is later on used for an entirely different function.

(*b*) Eyes developed first in planaria as photosensitive eye spots. Simple and compound eyes developed in insects and crustaceans. The structure of eye in each is different enough for them to have separate evolutionary origins.

(*c*) Artificial selection is the process by which man selects traits useful to him for improving the qualities of domesticated plants and animals e.g., different vegetables developed from the wild cabbage-cauliflower, broccoli, red cabbage, kale.

Molecular phylogeny is the branch of science which is used to trace the change in DNA (introduced during cell division and accumulated over generations) backwards in time to find out where each change diverged from the other. Thus, closely related organisms accumulated lesser number of differences in their DNA as compared to distantly related organisms which accumulate greater number of differences in their DNA. Such studies help in teaching evolutionary relationships among organisms.

Evolution should not be Equated with Progress

Evolution is the generation of diversity and the shaping of the diversity by environmental selection. The only progressive trend in evolution is that more complex designs have emerged over time. But simple designs are also efficient e.g., bacteria, protozoan have survived. New species evolved from previous one. Natural selection and genetic drift lead to the formation

of a population which cannot reproduce with the original one. New species may have better adaptive advantage to environmental conditions.

Human Evolution

Human evolution has been studied by using various tools for tracing evolutionary relationships like excavating, carbon dating, studying fossils and determining DNA sequences. All human beings are single species called **Homo sapiens.** Earliest members of this species came from Africa.

Human beings and chimpanzees are closely related species. Both these had a common ancestor a long time ago. This ancestor diverged into several forms and each form evolved in its own separate way to give rise to present forms of human beings, chimpanzees and other great apes.

NCERT IN-TEXT ACTIVITIES SOLVED

ACTIVITY 9.1

To study the earlobes of students in the class.

Observation: It is observed that the lowest part of the ear, called the earlobe, is closely attached to the side of the head in some of us, and not in others. Hence, free and attached earlobes are two variants found in human populations.

ACTIVITY 9.2

For Mendel's experiment.

(I) TT tt

Tall short

F_1 Progeny— Tt Tt Tt Tt

All tall plants

(II) Tt Tt

F_2 Progeny— on crossing of traits we get 1 : 2 : 1 ratio as follows:

	T	t
T	TT	Tt
t	Tt	tt

T—is dominant hence

∴ TT — Tall

Tt — Tall

tt — Short

NCERT IN-TEXT QUESTIONS SOLVED

Q1. *If a trait A exists in 10% of a population of an asexually reproducing species and a trait B exists in 60% of the same population, which trait is likely to have arisen earlier?*

Ans. Trait B is likely to have arisen earlier as it occurs in more number.

Q2. *How does the creation of variations in a species promote survival?*

Ans. Variations increases the adaptability of an organism to its changing environmental conditions.

Q3. *How do Mendel's experiments show that traits may be dominant or recessive?*

Ans. Mendel took pea plants of two different characters *i.e.*, tall plants and short plants. The first generation of F_1 progeny formed were all tall. This shows that traits may be either dominant or recessive, there is no way in between traits obtained.

Q4. *How do Mendel's experiments show that traits are inherited independently?*

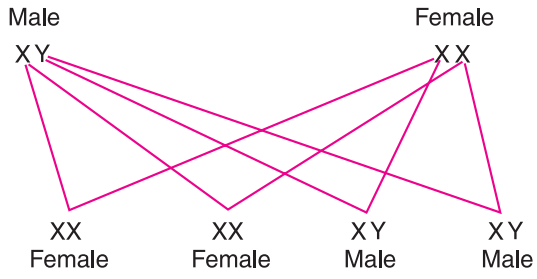
Ans. When Mendel crossed pure bred tall pea plants with pure bred short pea plants, he found that only tall plants were produced in F_1 generation. Mendel, further crossed the tall pea plants obtained in F_1 generation with dwarf plants and obtained the ratio of Tall: Short plant as 3 : 1 in F_2 generation. This experiment proved that traits are inherited independently so other intermediate traits or new traits were formed.

Q5. *A man with blood group A marries a woman with blood group O and their daughter has blood group O. Is this information enough to tell you which of the traits–blood group A or O is dominant? Why or why not?*

Ans. The given information is *not enough* to tell us which of the traits-blood group A or O – is dominant. In blood heredity, bood type A is always dominant and blood type O is always recessive. Here, father's Blood group can be I^AI^A (homozygous) or I^Ai (heterozygous) genotypically, whereas that of mother is *ii*. For daughter to be born with bloodd mother. For this father must have heterozygous I^Ai blood group and mother must have homozygous blood group *ii*.

Q6. *How is the sex of the child determined in human beings?*

Ans. In case of human beings female sex have a pair of XX chromosomes (sex) and male sex have a pair of XY sex chromosome. When the crossing of male and female gametes takes place then the sex of the child is determined as follows:



This shows that the ratio of male: female sex of the child is same *i.e.*, (1 : 1), 50% possibility of each is seen here.

Q7. *What are the different ways in which individuals with a particular trait may increase in a population?*

Ans. The ways in which individual with a particular trait may be increased in a population are:

(*a*) If it can survive in the adverse condition *i.e.*, naturally selected.

(*b*) It can also be increased by the inheritance.

Q8. *Why are traits acquired during the life-time of an individual not inherited?*

Ans. The traits can be inherited from one generation to the other only if there is a variation/change in DNA. The traits acquired during the life-time of an individual may not bring change in the genes of DNA.

Q9. *Why are the small numbers of surviving tigers a cause of worry from the point of view of genetics?*

Ans. The small number of tigers are causing a worry for the genetics because if they become extinct then the genes of this species will be lost forever. There will be no scope of again getting this species back to life without their genes.

Q10. *What factors could lead to the rise of a new species?*

Ans. The factors which can lead to the rise of a new species are gene flow, genetic drift, reproductive isolation and natural selection.

Q11. *Will geographical isolation be a major factor in the speciation of a self-pollinating plant species. Why or why not?*

Ans. No, geographical isolation cannot be a major factor in the speciation of self-pollinating plant species.

It is because such plants do not depend on other plants for its further reproduction to be carried out.

Q12. *Will geographical isolation be a major factor in the speciation of an organism that reproduces asexually? Why or why not?*

Ans. No, because the asexually reproducing organisms does not depend on other organisms for their reproduction.

Q13. *Give an example of characteristics being used to determine how close two species are in evolutionary*

Ans. Two organisms with similar characteristics have genes with similar DNA codes. Whereas the organisms with different characteristics will have different genes, different DNA structures.

Q14. *Can the wing of a butterfly and the wing of a bat be considered homologous organ? Why or why not?*

Ans. The wing of butterfly and the wing of a bat cannot be considered homologous organs because both have different structures but same function. They have different basic structural design and developmental origin. They are analogous organs.

Q15. *What are fossils? What do they tell us about the process of evolution?*

Ans. Preserved traces of living or dead organisms on solid hard surface is called fossil. Fossils help us to know the evolution. If a fossil is found closer to the surface of earth, then it is more recent in origin than the fossils we find in deeper layers.

Fossils, like Archaeopteryx, help us to find evolutionary relation between organisms.

Q16. *Why are human beings who look so different from each other in terms of size, colour and looks said to belong to the same species?*

Ans. Because irrespective differences in characters they have capacity of interbreeding. Interbreeding is an important criteria to categorize them as one species.

Q17. *In evolutionary terms, we can say which among bacteria, spiders, fish and chimpanzees have a better body design? Why or why not?*

Ans. Evolution shows that body design changed from simple to complex. Hence, bacteria has the simplest body design and chimpanzee has the most complex and better body design.

QUESTIONS FROM NCERT TEXTBOOK

Q1. *A Mendelian experiment consisted of breeding tall pea plants bearing violet flowers with short pea plants bearing white flowers. The progeny all bore violet flowers, but almost half of them were short. This suggests that the genetic make-up of the tall parent can be depicted as*

(*a*) *TTWW* (*b*) *TTww*

(*c*) *TtWW* (*d*) *TtWw*

Ans. (*c*) TtWW

Q2. *An example of homologous organs is*

(*a*) *our arm and a dog's fore-leg.*

(*b*) *our teeth and an elephant's tusks.*

(*c*) *potato and runners of grass.*

(*d*) *all of the above.*

Ans. (*d*) all of the above.

Q3. *In evolutionary terms, we have more in common with*

(*a*) *a Chinese school-boy.*

(*c*) *a spider.* (*d*) *a bacterium.*

Ans. (*a*) a Chinese school-boy

Q4. *A study found that children with light-coloured eyes are likely to have parents with light-coloured eyes. On this basis, can we say anything about whether the light eye colour trait is dominant or recessive? Why or why not?*

Ans. No, we cannot say that the traits is recessive or dominant unless we know the nature of the two variants of a trait.

Q5. *How are the areas of study—evolution and classification—interlinked?*

Ans. For classification of organisms we generally group the organisms of same characteristics together and those with different characteristics are grouped or classified separately. A set of characteristics tells about the level of evolution of an organism.

Q6. *Explain the terms analogous and homologous organs with examples.*

Ans. Analogous organs—Organs with different structure and same function e.g., wings of bird, insects.

Homologous organs—Organs which have same structure but different functions are called homologous organ e.g., forearm of lizard, bird and human.

Q7. *Outline a project which aims to find the dominant coat colour in dogs.*

Ans. **Dominant → WW (white colour)**

		w	w
White	W	Ww	Ww
colour	W	Ww	Ww

F_1 generation–all white dogs

Ww (Male) Ww (female)

	w	w
W	WW	Ww
w	Ww	ww

F_2 generation

WW, Ww, Ww } White ww black

3 : 1

Q8. *Explain the importance of fossils in deciding evolutionary relationships.*

Ans. Fossils help us to know the following:

(*a*) Fossils help to trace the racial history of organisms.

(*b*) They help to measure the geological time.

(*c*) Older fossils lie at the depth and young fossils are at the upper surface of the earth. Complex organisms are present at top and simple organisms are present at the bottom.

(*d*) Fossil like—Archaeopteryx-show the link between two different types of species.

Q9. *What evidence do we have for the origin of life from inanimate matter?*

Ans. Miller and Urey in 1953 assembled an atmosphere similar to that thought to exist at early period (Gases like ammonia, methane, hydrogen sulphide) over earth. This was maintained at a temperature just below 100°C and sparks were passed through the mixture of gases to simulate lighting. At the end of a week 15% of the carbon (from methane) had been converted to simple compounds of carbon including amino acids which make up protein molecules. Presence of protein cell membrane correlates with above experiment. This shows that life originated from inanimate matter.

Q10. *Explain how sexual reproduction gives rise to more viable variations than asexual reproduction. How does this affect the evolution of those organisms that reproduce sexually?*

Ans. Variations are seen more in sexual reproduction than asexual reproduction because variations occur due to change in DNA coding and due to sexual reproduction in which two genes from two different sexes *i.e.*, male and female genes crossing over takes place and hence cause the variation.

Q11. *How is the equal genetic contribution of male and female parents ensured in the progeny?*

Ans. By studying the crossing over of genes of male sex and female sex is as follows:

	M ale		**Female**
	XY		**XX**
		X	X
X		XX	XX
Y		XY	XY
	XX		XY
	↓		↓
	Female		Male
F_1	50%		50%
Progeny			

Q12. *Only variations that confer an advantage to an individual organism will survive in a population. Do you agree with this statement? Why or why not?*

Ans. No, depending on the nature of variations different individuals have different kinds of advantages. However, when a drastic change occurs in environment only those organism in the population will survive which have an advantageous variation in that population to survive in changed environment.

MORE QUESTIONS SOLVED

I. MULTIPLE CHOICE QUESTIONS

1. Which of the following is a totally impossible outcome of Mendel's Experiment (cross breeding pure bred tall and short pea plants)

(*a*) 3 tall 1 short plant (*b*) 24 tall and 8 short plants

(*c*) 8 tall and 0 short plants (*d*) 4 tall plants and 1 medium-height plant.

2. Which one of the following is not one of the direct conclusions that can be drawm from Mendel's experiment?

(*a*) Only one parental trait is expressed

(*b*) Two copies of each trait is inherited in sexually reproducing orgainsm

(*c*) For recessive trait to be expressed, both copies should be identical.

(*d*) Natural selection can alter frequency of an inherited trait.

3. Which one is a possible progeny in F_2 generation of pure bred tall plant with round seed and short plant with wrinkled seeds?

(*a*) Tall plant with round seeds (*b*) Tall plant with wrinkled seeds

(*c*) Short plant with round seed (*d*) All of the above

4. A section of DNA providing information for one protein is called—

(*a*) Nucleus (*b*) Chromosomes

(*c*) Trait (*d*) Gene

5. Which of the following is controlled by genes?
(*i*) Weight of a person
(*ii*) Height of a person
(*a*) only 1 (*i*) (*b*) only (*ii*)
(*c*) both (*i*) and (*ii*) (*d*) Sometimes (*i*) and sometimes (*ii*)

6. Which one of the following is present in the nucleus?
(*a*) Gene (*b*) DNA
(*c*) Chromosomes (*d*) All of these

7. Amongst which of the following animals, sex of the offsprings not genetically determined?
(*a*) Humans (*b*) Snails
(*c*) Birds (*d*) Dogs

8. What is the probability that a human progeny will be a boy?
(*a*) 50% (*b*) 56%
(*c*) 47.34% (*d*) It varies

9. Who have a perfect pair of sex chromosomes?
(*a*) Girls only (*b*) Boys only
(*c*) Both girls and boys (*d*) It depends on many other factors

10. There is an inbuilt tendency of variation during reproduction because of–

(*i*) Errors in DNA copying
(*ii*) Sexual reproduction
(*a*) only (*i*) (*b*) only (*ii*)
(*c*) both (*i*) and (*ii*) (*d*) none of them

11. Which one of the following gives a survival advantage and thus alters frequency of inherited trait.
(*i*) natural selection
(*ii*) genetic drift
(*a*) only (*i*) (*b*) only (*ii*)
(*c*) both (*i*) and (*ii*) (*d*) none of these

12. If we breed a group of squirrels and surgically remove their tails, then amongst the progeny of these tailless squirrels–
(*a*) All have no tail (*b*) All have a tail
(*c*) Some of them have tails (*d*) Cannot be determined.

13. With whom we associate theory of evolution?
(*a*) Charles Darwin (*b*) Mendel
(*c*) Stanley Miller (*d*) Harold Urey

14. Formation of 2 independent species due to genetic drift, geographical isolation, natural selection is specifically referred as–
(*a*) Evolution (*b*) Classification
(*c*) Speciation (*d*) Reproduction

15. Which of the following can be called a characteristic?

(*a*) Plants can photosynthesise (*b*) We have 2 eyes

(*c*) Mango tree is multicellular (*d*) All of these

16. If A and B have n characteristics common while A and C have n/2 characteristics common, then which of the two organisms are more closely related?

(*a*) A and C (*b*) A and B

(*c*) Characteristics need to be known (*d*) None of these

17. Homologous organs have

(*a*) Same structure, same function (*b*) Different structure, different function

(*c*) Same structure, different function (*d*) Same function, different structure

18. Analogous organs have

(*a*) Same structure, same function (*b*) Different structure, different function

(*c*) Same structure, different function (*d*) Same function, different structure

19. Fossils helps

(*a*) To study evolution

(*b*) To understand climatic conditions in past

(*c*) For a hierarchy of organisms (classification)

(*d*) They help in all the above

20. How can we know how old fossils are:

(*a*) Fossils found closer to surface are recent than those found much below

(*b*) Detecting ratios of isotopes

(*c*) Studying its characteristics

(*d*) All of these

21. Which one of the following strongly indicates that bird and dinosaurs are closely related?

(*a*) They both have feathers (*b*) They both respire

(*c*) They both reproduce (*d*) They both have eyes

22. Wild cabbage is being cultivated for thousands of years and humans have generated broccoli, cauliflower, kala etc. from it. This is an example of

(*a*) Natural selection (*b*) Genetic drift

(*c*) Geographic isolation (*d*) Artificial selection

23. Organism A recently came into existence while B was formed millions of years ago. What does this indicate?

(*i*) A is more efficient than B

(*ii*) A is more complex than B

(*a*) Only (*i*) (*b*) Only (*ii*)

(*c*) Both (*i*) and (*ii*) (*d*) Either (*i*) or (*ii*)

Answers

1. (*d*)	**2.** (*d*)	**3.** (*d*)	**4.** (*d*)	**5.** (*b*)	**6.** (*d*)	**7.** (*b*)	**8.** (*a*)
9. (*a*)	**10.** (*b*)	**11.** (*a*)	**12.** (*b*)	**13.** (*a*)	**14.** (*c*)	**15.** (*d*)	**16.** (*c*)
17. (*c*)	**18.** (*d*)	**19.** (*d*)	**20.** (*d*)	**21.** (*a*)	**22.** (*d*)	**23.** (*c*)	

II. VERY SHORT ANSWER TYPE QUESTIONS (*1 Mark*)

Q1. *Define heredity.*

Ans. Heredity deals with the inheritance of characters from one generation to the next.

Q2. *Define variations.*

Ans. Variations are differences that occur between the organisms of the same species in spite of the same basic feature.

Q3. *How does the creation of variations in a species promote survival?*

Ans. Variations increases the adaptability of an organism to its changing environmental conditions.

Q4. *What is a trait?*

Ans. A characteristics feature is called a trait.

Q5. *Name two human traits that show variations.*

Ans. Colours of eyes and shape of external ears.

Q6. *What is ad*

Ans. An adaptation is characteristics feature which helps an organism to survive in its habitat in a better way.

Q7. *Which of the two sperm or egg–decides the sex of the child?*

Ans. The sperm decides the sex of the child.

Q8. *The forelimbs of frog, reptiles, birds and arms of man show the same basic design. What kind of organs are these?*

Ans. Homologous organs.

Q9. *What is microevolutions?*

Ans. Microevolutions is the evolution that takes place on a relatively small scale at the population level and can change the common characteristics of particular species.

Q10. *What is speciation?*

Ans. Speciation is the process of formation of a new species from the already existing species by accumulation of variations, natural selection, gene flow, genetic drift, etc.

Q11. *What is a gene?*

Ans. Gene is the unit of inheritance. It is a part of the chromosome which controls the appearance of a set of hereditary characteristics.

Q12. *Who is known as the "father of Genetics"?*

Ans. G.J. Mendel is called the "father of Genetics".

Q13. *What is evolution?*

Ans. Evolution is the sequence of gradual changes which take place in living organisms over millions of years to give rise to new species.

Q14. *What type of reproduction gives rise to more number of successful variations?*

Ans. Sexual reproduction.

Q15. *What are fossils?*

Ans. Fossils are preserved traces or remains of living organisms of geological past.

Q16. *What are the uses of fossils?*

Ans. 1. Fossils helps to trace the racial history of organisms.

2. They help to analyse the past climatic conditions.

3. They help to measure the geological time.

Q17. *Name the scientist who put forth the theory of natural selection.*

Ans. Charles Darwin.

Q18. *What is artificial selection?*

Ans. It is the process of modification of a species by selective breeding. Animals and plants with desirable characters are selected and propagated. Artificial selection by farmers has resulted in the formation of cauliflowers, cabbage, broccoli and kohlrabi from the wild cabbage.

III. SHORT ANSWER TYPE QUESTIONS (*2 or 3 Marks*)

Q1. *How can we trace evolutionary relationships?*

Ans. Evolutionary relationships can be traced by studying fossils, by studying homologous and analogous organs, by comparing the embryos of different animals and by comparing the DNA's of different species.

Q2. *What is phylogeny and molecular phylogeny?*

Ans. Phylogeny is the evolutionary history of an organism.

Molecular phylogeny traces the evolutionary relationships by comparing the differences in the DNA of different organisms.

Q3. *Why evolution should not be equated with progress?*

Ans. Evolution cannot be equated with progress because it seems to have just given rise to more complex body designs. For example bacteria still flourish in spite of a very simple body design while dinosaurs did not survive in spite of complex design. Thus evolution is simply the generation of diversity and shaping of diversity by environmental selection.

Q4. *What is environmental selection?*

Ans. It is the selection within a population resulting from the influence exerted by the environment. It leads to a change in the composition of genes within a population.

Q5. *What term did Mendel use for genes? Where are the genes located?*

Ans. Mendel used the term 'factors' for genes. Genes are portions of DNA which code for a single protein.

Q6. *How many pairs of chromosomes do human beings have, specify the types of chromosomes also?*

Ans. Human beings have 23 pairs of chromosomes the first 22 pairs are called **autosomes** are similar in males and females. The 23rd pair is called the **sex chromosome.** In males it is XY and in females it is XX.

Q7. *What are homologous organs? Explain with an example.*

Ans. Homologous organs are those organs in different plants or animals which have the same basic structural design and origin but may have different functions.

Example., hand of human and fore-limb of frog.

Q8. *What are analogous organs? Explain with an example.*

Ans. Analogous organs have the same function but have different structural design and origin. For example, wings of birds and insects have the same function but have different structural design and origin.

Q9. *State the importance of variations.*

Ans. Variations are the differences in the characters among the individuals of a species. Variations enable the organisms to adapt themselves in the changing environmental conditions.

Variations form the raw materials for evolution and formation of new species.

Q10. *What is the significance of studying homologous and analogous organs?*

Ans. Organisms that have homologous organs show relatedness and a common ancestory.

Q11. *Which of the following combinations of sex chromosomes produces a male or a female child—XX or XY?*

Ans. XX combination produces a female child while the XY combination produces a male child.

Q12. *Which of the following are homologous and analogous organs?*

(*a*) *Wings of birds and insects.* (*b*) *Flippers of whale and fins of fish.*

(*c*) *Flippers of whale and wings of bat.* (*d*) *Our teeth and elephants tusks.*

(*e*) *Potato and runners of grass.*

Ans. (*a*) — Analogous organs

(*b*) — Analogous organs

(*c*) — Homologous organs

(*d*) — Homologous organs

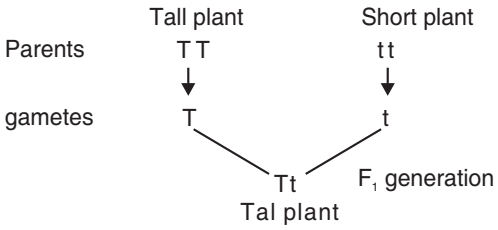
(*e*) — Homologous organs.

Q13. *How do traits or characters get expressed?*

Ans. Genes control the expression of a trait or a character in an organism. Genes produces proteins. The proteins act as enzymes which can directly control a character or help in the formation of a hormone which can control the expression of a particular character.

Q14. *A true breeding tall plant is crossed with a true breeding short plant. All the offsprings of the F_1 generation are tall. Of these two characters which one is dominant and which is recessive.*

Ans.



Q15. *In Q14. on previous page the tall plant of the F_1 generation is selfed. What is the outcome or ratio of the F_2 progeny?*

Ans. Parent: Tall Tt / \ Gametes: T t × Tall Tt / \ T t (heterozygous)

	T	t
T	TT	Tt
t	Tt	tt

Progeny: (F_2 generation) TT Tall, Tt Tall, Tt Tall, tt Short

Ratio Tall : Short = 3 : 1

Q16. *How is the sex of the child determined in human beings?*

Ans. Human beings have 23 pairs of chromosomes. 22 pairs are autosomes and the 23rd pair is the sex chromosome. The males have XY and the females have XX. All the gametes formed in the females are of one type i.e., X. In males there are two types of sperms that are formed –X and Y. If the sperms having X fertilizes with the egg the zygote formed is XX. This will form female child. If the sperm having Y fertilizes with the egg then the zygote formed is XY and the offspring will be male child. So basically it's the male gametes that decide the sex of the unborn child.

Q17. *What is genetic drift?*

Ans. Accidents in small populations can change the frequency of some genes in a population even if they give no survival advantage. This is genetic drift, which provides diversity without any adaptations. So, it is the random change in the frequency of alleles in a population over successive generation.

Q18. *Which is gene flow?*

Ans. It is the exchange of genetic material by interbreeding between populations of the same species. Gene flow increases the variations in a population.

Q19. *What is classification?*

Ans. It is the arrangement of organism into series of groups based on the similarity of characters on physiology, anatomy, morphology and other relationships.

Q20. *How do we know how old fossils are?*

Ans. We can find the relative of the fossil by the depth at which the fossil is found. The ones that are found near the surface are more recent than the fossils found in the deeper layer.

The second way of dating fossils in detecting the ratios of different isotopes of the same element in the fossils material.

Q21. *What is speciation? How does it occur?*

Ans. Formation of new species from the existing ones over the period of time is called speciation.

Speciation takes place due to gene flow, genetic drift, reproductive isolation and finally natural selection.

Q22. *What is natural selection?*

Ans. According to Darwin, natural selection is the process which brings about evolution of new species of plants and animals.

It consists of the following processes:

(*i*) He noted that the size of population tends to remain constant despite the fact that more offsprings are produced than needed.

(*ii*) Variations provide adaptations.

(*iii*) The best adopted survive in the changing environment (survival of the fittest).

(*iv*) Nature selects the best organisms with better adaptations and after many generations new species are formed (natural selection).

Q23. *Define Genetics. What did Mendel's contribution to genetics?*

Ans. The science of heredity and variation is called Genetics.

Mendel conducted breeding experiments in a plant called garden pea (pisum sativum) with contrasting pair of characters, found that only one character of the pairs appeared in the first generation but both the characters appeared in the subsequent generation. On the basis of these results of his experiments he put forth the various principals of inheritance. He also suggested that each character is controlled by a pair of factors which are now called as genes.

Q24. *A man with blood group A marries a woman with blood group O and their daughter has blood group O. Is this information enough to tell you which of the traits–blood group A or O is dominant? Why?* (CBSE 2008)

Ans. Refer to Q5. on page 115.

Q25. *Define variation in relation to a species: Why is variation beneficial is the species.*

Ans. Variations are differences that occur between the organisms of the same species in spite of the same basic features.

Variation in species promotes survival of an organism in changing environment by increasing the adaptability.

Q26. *What is the effect of DNA copying which is not perfectly accurate on the reproduction process?* (AI CBSE)

Ans. If DNA copying is not perfectly accurate then the variations occurs among the species of same organisms.

Q27. *Describe briefly four ways in which individual with a particular trait may increase in population.* (Foreign 2008)

Ans. Four ways in which individual with a particular trait may increase in population are:

(*a*) Variations that occur in species helps in the survival of individuals.

(*b*) Organisms when show genetic drift which cope them to survive in the given environment.

(*c*) Adaptation and natural selection.

(*d*) Sexual reproduction results in variation.

Q28. *"Variations that confer an advantage to an individual organism only will survive in population". Justify.* (Foreign 2008)

Ans. Variation is the difference in the characters or traits among the individuals of a species. Sexual reproduction of organisms produces variation. The variations produced in organisms during successive generations gets accumulated in the organism. The significance of variations shows up only if it continues to be inherited by the offspring for several generation.

Q29. *What are fossils? What do they tell about the process of evolution?* (AI CBSE. 2008)

Ans. Fossils are preserved traces or remains of living organism of geological past. Fossils help to trace the racial history of organisms. Fossils found closer to the surface are more recent than fossils found in the deepest layers.

IV. LONG ANSWER TYPE QUESTIONS (*5 Marks*)

Q1. (*i*) *What is genetics?*

(*ii*) *Give the common name of the plant on which Mendel performed its experiments.*

(*iii*) *What for did Mendel use the term factors and what are these factors called now?*

(*iv*) *What are genes? Where are the genes located?*

Ans. (*i*) Science which deals with the study of heredity and variations is called genetic.

(*ii*) Pea plant.

(*iii*) Mendel used the term factors for 'genes'.

(*iv*) Genes is the unit of inheritance. It is a part of the chromosome which controls the appearance of a set of hereditary character.

Genes are located on the chromosome.

Q2. *Define 'evolution'. State Darwin's theory of evolution.*

Ans. **Evolution** is a change in the genetic composition of a population.

Darwin's theory

1. The size of population remains the same, constant despite the fact that more offsprings are produced than needed.
2. Variations provide adaptations.
3. The best adapted organism survive in the changing environment (survival of the fittest).
4. Nature selects the best organisms with better adaptations and after many generations new species are formed (natural selection).

Q3. *What are various evidences in factors of evolution?*

Ans. Evidences are:

(*a*) *Homologous organs:* Organs which have same structure but different function. E.g., wings of a bat, hands of man and limbs of monkey.

(*b*) *Analogous organ.* Organs which perform similar function but are structurally different are called analogous organ. E.g., wings of bat, insects, birds.

(*c*) *Vestigial organs:* These organs are those which appear in an organism but are functionless e.g., vermiform appendix, nictitating membrane in eye is present in human beings but has no function.

(*d*) *Embryological evidence*: The study of embryos of vertebrates shows that all of them have same origin as their structure at initial stage is same. Embryo of frog, fish, man looks alike.

(*e*) *Fossils as evidence*: Archaeopteryx fossils shows a link between bird and reptiles as this fossil has some feature of bird and some of reptile.

Q4. *(i) What are traits?*

(ii) Explain the inherited trait and acquired traits.

(iii) Define speciation. What are the factors which could lead to the rise of a new species?

Ans. (*i*) Traits: A characteristic feature is called trait.

(*ii*) Inherited and acquired trait (given in notes on page 112).

(*iii*) Speciation and factors (given in notes on page 112).

Q5. *Explain the analogous organs and homologous organs. Identify the analogous and homologous organ amongst the following:*

Wings of an insect, wings of a bat, forelimbs of frog, forelimbs of human. (CBSE 2007)

Ans. Analogous organs are those organs that have same function but have different structural design and origin. E.g., wings of birds and insects.

Homologous organs are those organs in different plants or animals which have the same basic structural design and organ but have different appearance and functions.

Analogous—Wings of an insect, wings of a bat

Homologous–Forelimbs of frog, forelimbs of human and wings of bat.

V. QUESTIONS ON HIGH ORDER THINKING SKILLS (HOTS)

Q1. *Green and red coloured seeds are recessive and dominant trait respectively. Out of F_1 and F_2, in which generation will the green seed appear, if both parents are not hybrid.*

Ans. F_2 generation.

Q2. *Dead remains of two species A and B were buried. Later only A's body was found to be a fossil but not B's given reason.*

Ans. B's body did not have hard tissues, like bones.

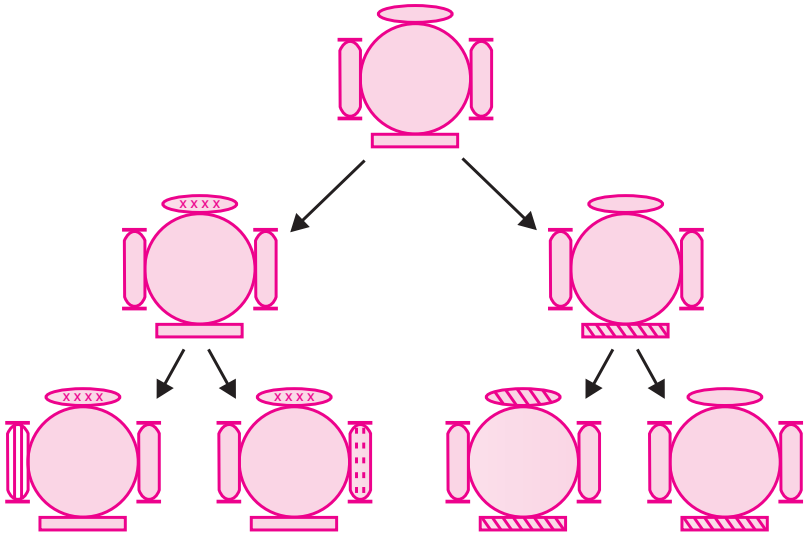
Q3. *Species A shares ten characteristics with species B, species C share fifteen characteristics with D which of the two pairs share closer relation.*

Ans. C and D.

Q4. *After the death of two insects, one of the insect was burried in hot mud and the other in usually found mud. Which of the two is more likely to be preserved better and why?*

Ans. The insect burried in hot mud. The body will not get decomposed in hot mud and the impression of the body will remain.

Q5. *Study the given diagram and answer the questions.*



Creation of diversity over succeeding generations. The original organism at the top will give rise tohttps://myxamidea.blogspot.comces. Each of them, in turn, will give rise to two individuals in the next generation. Each of the four individuals in the bottom row will be different from each other. While some of these differences will be unique, others will be inherited from their respective parents, who were different from each other.

(*i*) *Why do we find all bottom row individuals different from each other?*

(*ii*) *What is similar in all the individuals?*

Ans. (*i*) The differences can be due to inheritance of acquired traits. When respective parents are different from each other the variation occurs due to inheritance.

(*ii*) Body design.

Q6. *With the help of an example explain how "Genes control characteristics or traits"?*

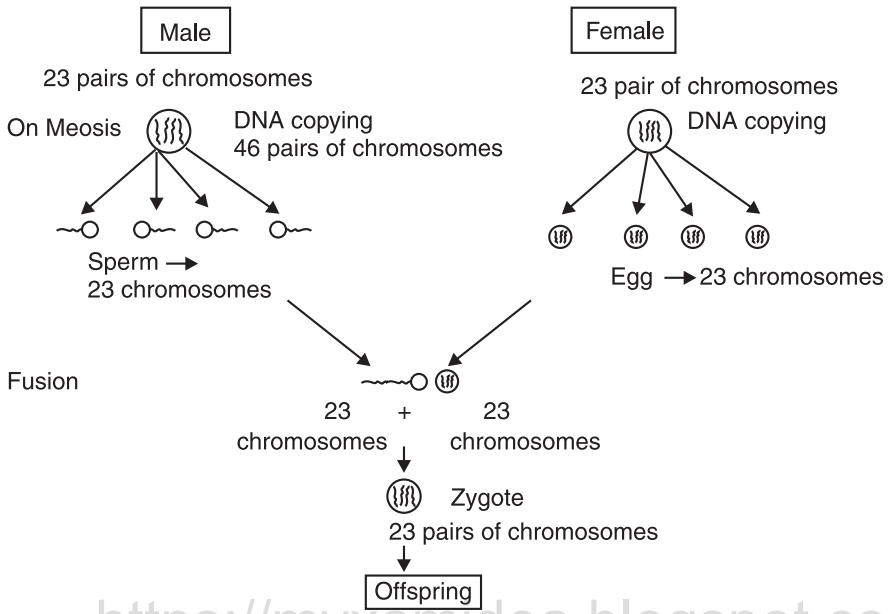
Ans. Tallness of a plant is a characteristic. Height of a plant depend on the amount of hormone secreted by the plant responsible for its tallness. The gene has the coding for the amount of hormone released. If the gene for that hormone has an alteration and makes its efficiency low, then the plant will be short.

Thus, this shows that traits are controlled by gene.

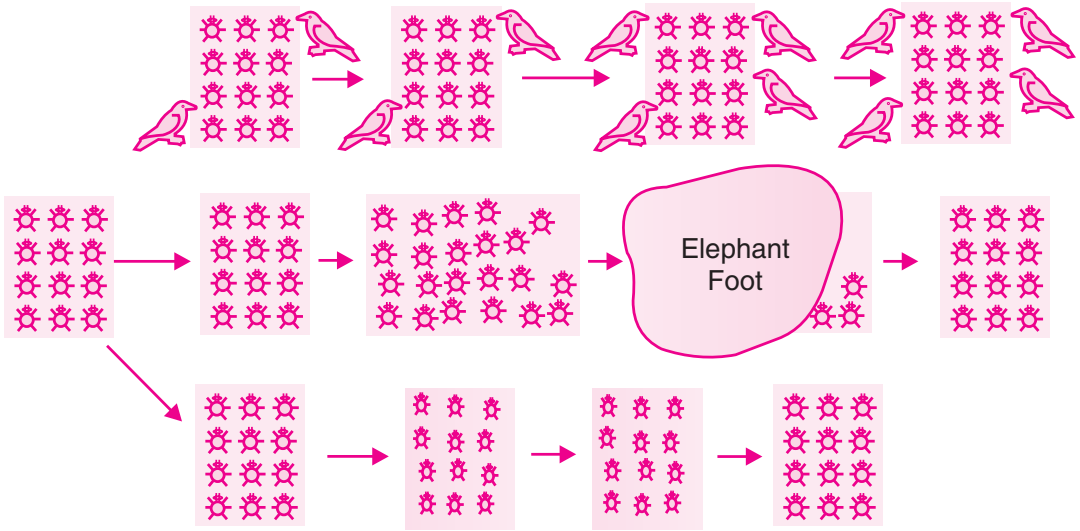
Q7. *Male individual has 23 pairs of chromosomes, female individual has 23 pairs of chromosomes. Then why don't an offspring have 46 pairs of chromosomes which is obtained by the fusion of these two eggs.*

Ans. Male individual has 23 pairs of chromosomes but the gamete that is formed by the meiotic cell division contain only half the number of chromosomes *i.e.*, 23 chromosomes in male sperm and 23 chromosomes in female egg.

It is the fusion of this sperm and egg which leads to an offspring with 23 pairs of chromosomes.



Q8. *Study the given figure and say what information it gives you.*



Variations in a population – inherited and otherwise.

Ans. Do yourself.

VI. VALUE-BASED QUESTION

Q1. *A group of class X students prepared a street play to educate masses on gender disparity to stop sex determination of girl child and abort it.*

(a) In human being, what is the chance of giving birth to a girl child?

(b) Who is responsible for the birth of a female child and why?

(c) What value is depicted among the group members of class X?

Ans. (*a*) The chance of giving birth to a girl child is 50%.

(*b*) Male (father) is responsible for the birth of a female child as only the male individual is a carrier both of X and Y chromosomes which will determine the sex of the foetus.

(*c*) The group members show team work, collaborative leadership, participating citizenship etc.

TEST YOUR SKILLS

Q1. *Name two human traits that show variations.*

Q2. *Who is known as the 'father of genetics'?*

Q3. *What is microevolution?*

Q4. *What is the probability that a human progeny will be a boy?*

Q5. *What is a gene?*

Q6. *What is genetic drift?*

Q7. *State the importance of variations.*

Q8. *What are fossils? Give its two uses.*

Q9. *Give the difference between homologous and analogous organs.*

Q10. *State Darwin's theory of evolution.*

Q11. *What are acquired traits and inherited traits?*

❐❐❐

10 Light—Reflection and Refraction

SYLLABUS

Reflection of light by curved surfaces, Images formed by spherical mirrors, centre of curvature, principal axis, principal focus, focal length, Mirror formula (Derivation not required), Magnification.

Refraction, Laws of refraction, refractive index.

Refraction of light by spherical lens, Image formed by spherical lenses, Lens formula (Derivation not required), Magnification, Power of a lens applications of spherical mirrors and lenses.

Facts that Introduction

Light waves do not require any material medium for travelling hence called electromagnetic waves.

Speed of light in vacuum is 3×10^8 m/s.

Light travels in straight line. The path along which light travels is called ray of light.

Bundle of light rays is called beam of light.

When light falls on any surface it may reflect regularly/irregularly or it may be refracted or absorbed.

On regular surface like mirror, plane surfaces etc., light reflects regularly and on rough surface light reflects irregularly.

When light falls on transparent surface it changes its path, bends and gets refracted.

If light travels from denser medium to rarer medium it bends away from the normal (DRAN).

When light travels from rarer medium to denser medium it bends towards the normal (RDTN).

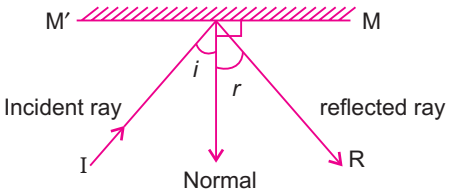
Images are of two types—real image and virtual image.

Real image is formed due to actual meeting of light rays at a point after reflection or refraction.

LAWS OF REFLECTION

(*i*) The angle of incidence (*i*) is equal to the angle of reflection (*r*)

(*ii*) The incident ray, the normal ray and the reflected ray, all lie in the same plane.



$\angle i = \angle r$

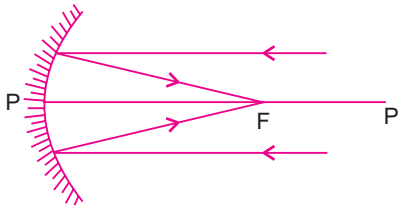
Image Formed by Plane Mirror

(*i*) It is of same size, virtual and erect.

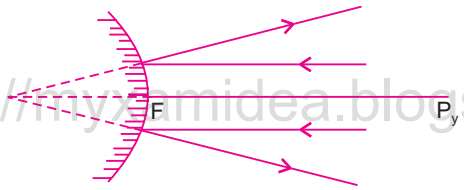
(*ii*) Formed as behind the mirror as the object is in front of it.

(*iii*) The image is laterally inverted.

Image Formed by Spherical Mirror



Concave Mirror: Reflecting surface is curved inward.



Convex mirror: Reflecting surface is bulged out.

Pole: Centre of the mirror.

Principal focus: It is a point where light rays coming parallel to the principal axis actually converge or appear to converge.

Distance from pole to principal focus is called focal length of given mirror.

Focal length is half of the radius of curvature $f = \frac{R}{2}$ in case of mirror.

Concave mirror may form real or virtual image. Convex mirror always forms a virtual, erect and diminished image of an object.

Virtual image is formed when rays do not actually meet, but appear to meet at a point when produced backwards.

Real image can be obtained on the screen but virtual image cannot be obtained on the screen.

LAWS OF REFRACTION

(*i*) The incident ray, the refracted ray and the normal to the separating surface at the point of incidence all lie in the same plane.

(*ii*) The ratio of sine of the angle of incidence (*i*) to the sine of angle of refraction (*r*) is a constant. It is known as Snell's law.

$$\text{Snell's law} = \frac{\sin i}{\sin r} = \text{constant} = n_{21}$$

Here n_{21} is known as the refractive index of the second medium with respect to the first medium.

$$n_{21} = \frac{\text{Speed of light in first medium } (v_1)}{\text{Speed of light in second medium } (v_2)}$$

Refractive index of second medium w.r.t. first medium is given by n_{21}.

Absolute refractive index (n)

$$n = \frac{\text{Speed of light in vacuum } (c)}{\text{Speed of light in given medium } (v)}$$

- **Mirror formula** $\quad \frac{1}{v} + \frac{1}{u} = \frac{1}{f}$ $\qquad$ **Lens formula** $\quad \frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

	Convex lens	***Concave lens***
1.		
2.	Real focus	Virtual focus
3.	Converging lens	Diverging lens
4.	It can form real or virtual image.	It forms only virtual image.

MAGNIFICATION

$$m = \frac{\text{Size of the image } (h')}{\text{Size of the object } (h)} = \frac{v}{u}$$

Power of a lens is the reciprocal of its focal length (f).

$$P = \frac{1}{f}$$

S.I. unit of power = dioptre.

The power of convex lens is positive and concave lens is negative.

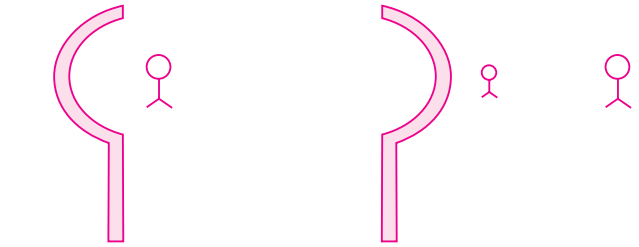
$$P = P_1 + P_2 + P_3 \ldots\ldots\ldots \quad \text{(for combination of lenses)}$$

NCERT IN-TEXT ACTIVITIES SOLVED

ACTIVITY 10.1

- Take a large shining spoon. Try to view your face in its curved surface.

- The image obtained is larger.
- Move the spoon slowly away from your face.
- The image becomes inverted.
- Reverse the spoon and repeat the activity.
- The image is diminished and virtual.



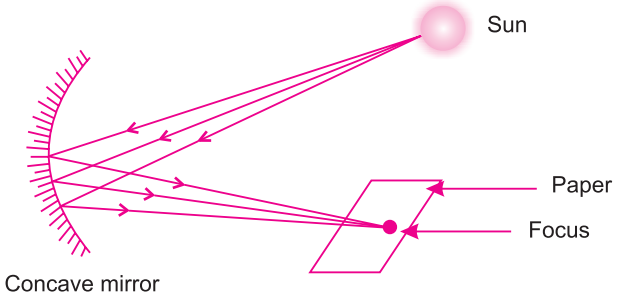
Enlarged image Diminished image

ACTIVITY 10.2

- Hold a concave mirror in your hand and direct its reflecting surface towards the sun.
- Direct the light reflected by the mirror on to a sheet of paper held close to the mirror.
- Move the sheet of paper back and forth gradually until you find on the paper sheet a bright, sharp spot of light.
- Hold the mirror and the paper in the same position for a few minutes.

Observation: The paper initially turns blackish, burns producing smoke. Eventually it catches fire.

Conclusion: The light from the sun is converged at a point on the paper. This point is focus of the concave mirror.



ACTIVITY 10.3

- Take a concave mirror. Find out its approximate focal length. Let f = 10 cm.
- Mark a line on table with a chalk. Place the concave mirror on a stand. Place the stand over the line such that its pole lies over the line.
- Draw with a chalk two more lines parallel to the previous line such that the distance between two successive lines is equal to the focal length of the mirror. These lines will correspond to the positions of the points P, F and C respectively.
- Keep a bright object say a burning candle, at a position far beyond C. Place a paper screen and move it in front of the mirror till you obtain a sharp bright image of the candle flame on it.

- Observe the image carefully. Note down its nature position and relative size with respect to the object size.
- Repeat the activity, by placing the candle—

  (*a*) just beyond C, (*b*) at C, (*c*) between F and C,

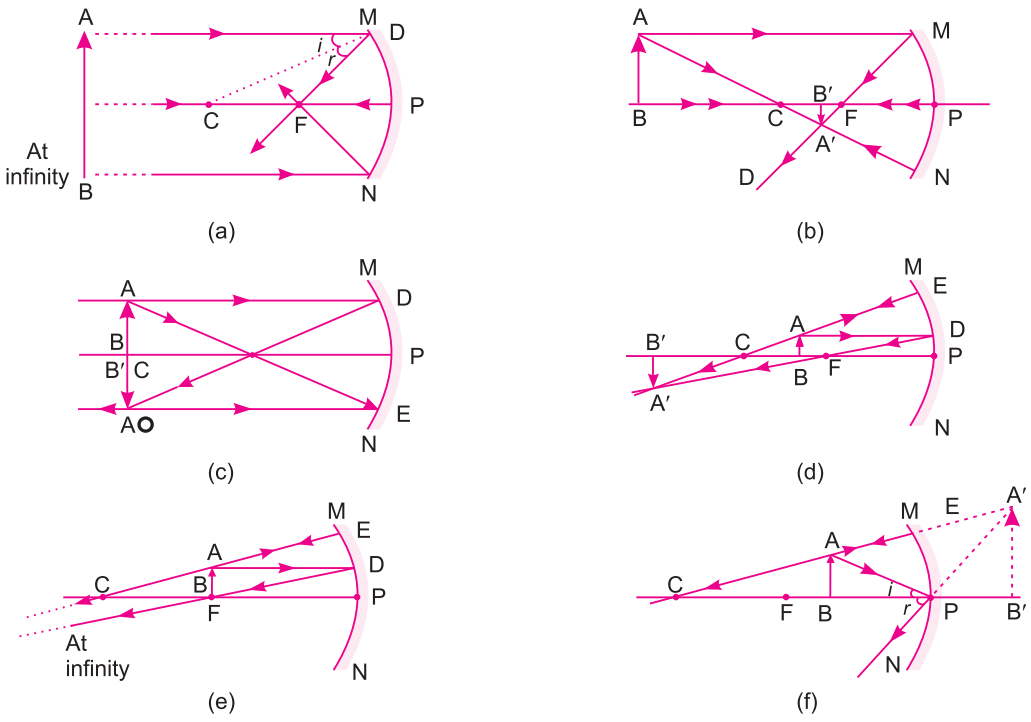
  (*d*) at F, (*e*) between P and F.
- In one of the cases, the image is not obtained on the screen *i.e.,* when object is between P and F.

Observation:

Observation Table

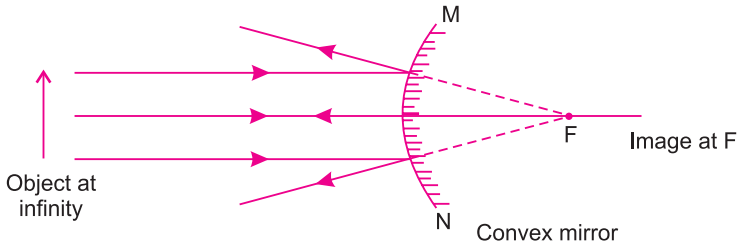
Position the object	*Position of the image*	*Size of the image*	*Nature of the image*
(*a*) At infinity	At F	Highly diminished, point sized	Real and inverted
(*b*) Beyond C	Between F and C	Diminished	Real and inverted
(*c*) At C	At C	Same size	Real and inverted
(*d*) Between C and F	Beyond C	Enlarged	Real and inverted
(*e*) At F	At infinity	Highly enlarged	Real and inverted
(*f*) Between P and F	Behind mirror	Enlarged	Virtual and erect

ACTIVITY 10.4



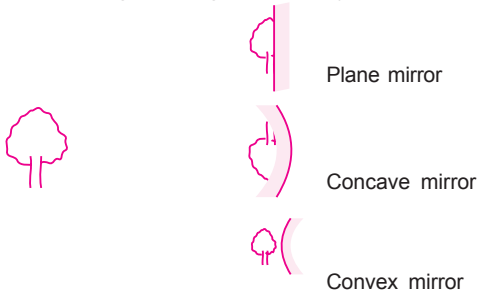
ACTIVITY 10.5

- Take a convex mirror. Hold it in one hand.
- Hold a pencil in the upright position in the other hand.
- Observe the image of the pencil in the mirror.
  Observation: The image is erect, diminished and virtual.
- Move the pencil away from the mirror slowly.
  Observation: The image formed is smaller, and erect.



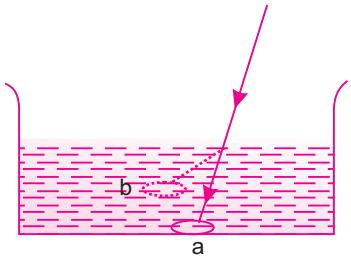
ACTIVITY 10.6

- Observe the image of a distant object, say a distant tree, in a plane mirror.
  Observation: The full length is not seen in a small plane mirror.
- Now use concave mirror to see the full length image of the object.
  Observation: The full length image is not obtained in concave mirror.
- Now use
  Observation: In this case, a full length image of an object is obtained in a small mirror.



ACTIVITY 10.7

- Place a coin at the bottom of a bucket filled with water.
- With your eye to a side above water, try to pick up the coin in one go.
  Observation: One cannot pick up the coin in one go, because of refraction of light, the coin does not appear to be at its original position.



a - Real position of coin
b - Apparent position of coin

ACTIVITY 10.8

- Place a large shallow bowl on a table and put a coin in it.
- Move away slowly form the bowl. Stop when the coin just disappears from your sight.
- Ask a friend to pour water gently into the bowl without disturbing the coin.
- Keep looking for the coin from your position.

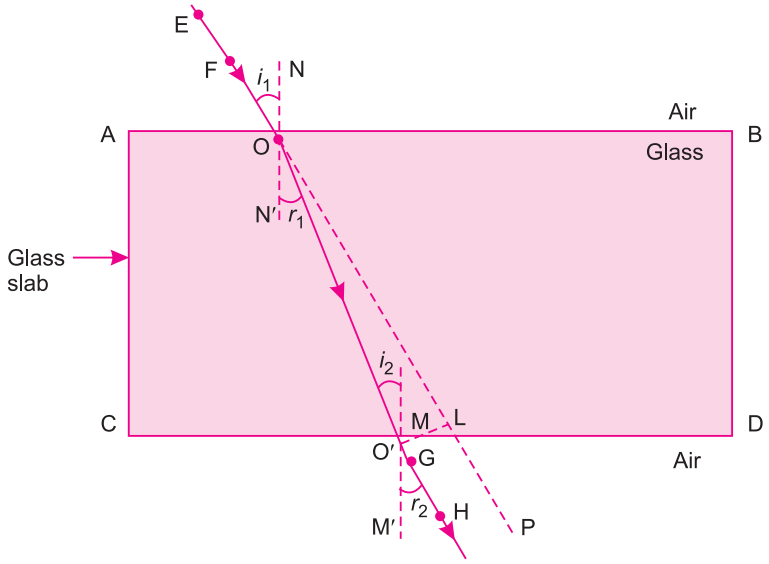
Observation: The coin becomes visible again and slightly raised above its actual position on pouring water into the bowl. This is because of refraction of light.

ACTIVITY 10.9

- Draw a thick straight line in ink, over a sheet of white paper placed on a table.
- Place a glass slab over the line in such a way that one of its edges makes an angle with the line.
- Look at the portion of the line under the slab from the sides. The line appears to be bent at the edges.
- Now, place the glass slab such that it is normal to the line. The part of line under the glass slab appears to be bent.
- Look at the line from the top of the glass slab. The line appears to be raised. It is due to the refraction of light.

ACTIVITY 10.10

- Fix a sheet of white paper on a drawing board using drawing pins.
- Place a rectangular glass slab over the sheet in the middle.
- Draw the outline of the slab with a pencil. Let us name the outline as ABCD.
- Take four identical pins.
- Fix two pins, E and F vertically such that the line joining the pins is inclined to the edge AB.
- Look for the images of the pins E and F through the opposite edge. Fix two pins, say G and H, such that these pins and the images of E and F lie on a straight line.
- Remove the pins and the slab.
- Join the positions of tip of the pins E and F and produce the line up to AB. Let EF meet AB at O. Similarly, join the positions of tip of the pins G and H and produce it up to the edge CD. Let HG meet CD at O′.
- Join O and O′. Also produce EF up to P, as shown by a dotted line.

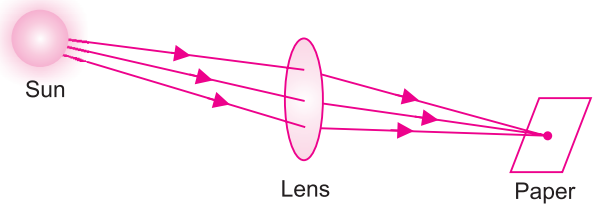


ACTIVITY 10.11

- Hold a convex lens in your hand. Direct it towards the sun. (Do not look at the sun through the lens, or else it may cause permanent damage to eye).
- Focus the light from the sun on a sheet of paper. Obtain a sharp bright image of the sun.
- Hold the paper and the lens in the same position for a while keep observing the paper.

Observation: The paper begins to burn producing smoke, it may catch fire after a while.

Conclusion: The light rays from the sun gets converged when it passes through the lens and bright spot is formed on the paper, that is the focus of the sun.



ACTIVITY 10.12

- Take a convex lens. Find its approximate focal length in a way described in activity 10.11.
- Draw five parallel straight lines, using chalk, on a long Table such that the distance between the successive lines is equal to the focal length of the lens.
- Place the lens on a lens stand. Place it on the central line such that the optical centre of the lens lies just over the line.
- The two lines on either side of the lens correspond to F and 2F of the lens respectively. Mark them with appropriate letters such as $2F_1$, F_1, F_2 and $2F_2$, respectively.
- Place a burning candle, far beyond $2F_1$ to the left. Obtain a clear sharp image on a screen on the opposite side of the lens.

- Note down the nature, position and relative size of the image.
- Repeat this activity by placing object just behind $2F_1$, between F_1 and $2F_1$, at F_1, between F_1 and O. Note down and tabulate the observations.

Observations for a convex lens

Position of the object	*Position of the image*	*Relative size of the image*	*Nature of the image*
At infinity	At focus F_2	Highly diminished, point-sized	Real and inverted
Beyond $2F_1$	Between F_2 and $2F_2$	Diminished	Real and inverted
At $2F_1$	At $2F_2$	Same size	Real and inverted
Between F_1 and $2F_1$	Beyond $2F_2$	Enlarged	Real and inverted
At focus F_1	At infinity	Infinitely large or highly enlarged	Real and inverted
Between focus F_1 and optical centre O	On the same side of the lens as the object	Enlarged	Virtual and erect

ACTIVITY 10.13

- Take a concave lens. Place it on a lens stand.
- Place a burning candle on one side of the lens.
- Look through the lens from the other side and observe the image.
  Try to get the image on a screen, if possible or else observe the image directly through the lens.
- Note down the nature, relative size and approximate position of the image.
- Move the candle away from the lens.
  Note the change in the size of the image. Record your observations by placing a candle at position too far away from the lens.

Observations for a concave lens

Position of the object	*Position of the image*	*Relative size of the image*	*Nature of the image*
At infinity	At focus F_1	Highly diminished, point-sized	Virtual and erect
Between infinity and optical centre O of the lens.	Between focus F_1 and optical centre O	Diminished	Virtual and erect

NCERT IN-TEXT QUESTIONS SOLVED

Q1. *Define the principal focus of a concave mirror.*

Ans. It is a point on the principal axis where the rays of light parallel to principal axis meet.

Q2. *The radius of curvature of a spherical mirror is 20 cm. What is its focal length?*

Ans. $R = 20$ cm

$R = 2f$

$f = \frac{R}{2}, \qquad f = \frac{20}{2} = 10$ cm.

Focal length is 10 cm.

Q3. *Name a mirror that can give an erect and enlarged image of an object.*

Ans. Concave mirror.

Q4. *Why do we prefer a convex mirror as a rear-view mirror in vehicles?*

Ans. Convex mirror can cover a wider range and give erect and diminished image. Hence convex mirror is used as a rear-view mirror to get wider field of view.

Q5. *Find the focal length of a convex mirror whose radius of curvature is 32 cm.*

Ans. Radius of curvature $R = 32$ cm

$R = 2f$

$\therefore \quad f = \frac{R}{2} = \frac{32}{2} = 16$ cm.

Q6. *A concave mirror produces three times magnified (enlarged) real image of an object placed at 10 cm in front of it. Where is the image located?*

Ans.

Magnification $m = -3$

Object distance $u = -10$ cm (concave mirror)

$m = \frac{-v}{u}$

$\therefore \quad v = -mu = -(-3)\ (-10) = -30$ cm.

Image formed $v = 30$ cm in front of the concave mirror.

Q7. *A ray of light travelling in air enters obliquely into water. Does the light ray bend towards the normal or away form the normal? Why?*

Ans. The light bends towards the normal on entry into water because water is optically denser than air.

Q8. *Light enters from air to glass having refractive index 1.50. What is the speed of light in the glass? The speed of light in vacuum is 3×10^8 m/s.*

Ans. The speed of light in vacuum is $= 3 \times 10^8$ m/s

Refractive index of glass $n_g = 1.50$

$n_g = \frac{c}{v}$

Speed of light in glass $v_g = \frac{c}{n_g} = \frac{3 \times 10^8}{1.50}$

$= 2 \times 10^8$ m/s.

Q9 *Find out from following table the medium having highest optical density. Also find the medium with lowest optical density.*

Material medium	*Refractive index*	*Material medium*	*Refractive index*
Air	1.0003	Canada Balsam	1.53
Ice	1.31		
Water	1.33	Rock sald	1.54
Alcohol	1.36		
Kerosene	1.44	Carbon disulphide	1.63
Fused quartz	1.46	Dense flint glass	1.65
Turpentine oil	1.47	Ruby	1.71
Benzene	1.50	Sapphire	1.477
Crown glass	1.52	Diamond	2.42

Ans. Diamond has highest optical density *i.e.,* 2.42 and air has the lowest optical density *i.e.,* 1.0003.

Q10. *You are given kerosene, turpentine and water. In which of these does the light travel fastest? Use the information given in table above.*

Ans. Refractive index of kerosene = 1.44

Refractive index of turpentine = 1.47

Refractive index of water = 1.33

Lower the refractive index faster is the speed of light in that medium. Hence light will travel fastest in water.

Q11. *The refractive index of diamond is 2.42. What is the meaning of this statement?*

Ans. As refractive index $= \dfrac{\text{speed of light in air}}{\text{speed of light in diamond}}$

This means the ratio of the speed of light in the air and the speed of light in diamond is equal to 2.42.

Q12. *Define 1 dioptre of power of a lens.*

Ans. 1 dioptre is the power of a lens whose focal length is 1 metre.

$$1 \text{ D} = 1 \text{ m}^{-1}$$

Q13. *A convex lens forms a real and inverted image of a needle at a distance of 50 cm from it. Where is the needle placed in front of the convex lens if the image is equal to the size of the object? Also find the power of the lens.*

Ans.

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$v = +50$ cm. Convex lens as image is of same size hence

$$u = -50 \text{ cm}$$

$$\frac{1}{f} = \frac{1}{(50\text{ cm})} - \frac{-1}{(-50\text{ cm})}$$

$$= \frac{1}{50} + \frac{1}{50} = \frac{1}{25}\text{cm}$$

$$f = +25\text{ cm} = +0.25\text{ m}.$$

Q14. *Find the power of a concave lens of focal length 2 m.*

Ans. Focal length of concave lens $f = -2$ m

$$\text{Power of concave lens P} = \frac{1}{f}$$

$$\therefore \quad \text{P} = \frac{1}{-2} = -0.5\text{ D}.$$

QUESTIONS NCERT FROM TEXTBOOK

Q1. *Which one of the following materials cannot be used to make a lens?*

(*a*) *Water* (*b*) *Glass*

(*c*) *Plastic* (*d*) *Clay*

Ans. (*d*) Clay

Q2. *The image formed by a concave mirror is observed to be virtual, erect and larger than the object. Where should be the position of the object?*

(*a*) *Between the principal focus and the centre of curvature*

(*b*) *At the centre of curvature*

(*c*) *Beyond the centre of curvature*

(*d*) *Between the pole of the mirror and its principal focus*

Ans. (*d*) Between the pole of the mirror and its principal focus.

Q3. *Where should an object be placed in front of a convex lens to get a real image of the size of the object?*

(*a*) *At the principal focus of the lens*

(*b*) *At twice the focal length*

(*c*) *At infinity*

(*d*) *Between the optical centre of the lens and its principal focus*

Ans. (*b*) At twice the focal length.

Q4. *A spherical mirror and a thin spherical lens have each a focal length of –15 cm. The mirror and the lens are likely to be*

(*a*) *both concave*

(*b*) *both convex*

(*c*) *the mirror is concave and the lens in convex.*

(*d*) *the mirror is convex but the lens is concave.*

Ans. (*a*) Both concave.

Q5. *No matter how far you stand from a mirror, your image appears erect. The mirror is likely to be*

(*a*) *plane.* (*b*) *concave.*

(*c*) *convex* (*d*) *either plane or convex.*

Ans. (*d*) either plane or convex.

Q6. *Which of the following lenses would you prefer to use while reading small letters found in a dictionary?*

(*a*) *A convex lens of focal length 50 cm.*

(*b*) *A concave lens of focal length 50 cm.*

(*c*) *A convex lens of focal length 5 cm.*

(*d*) *A concave lens of focal length 5 cm.*

Ans. (*c*) A convex lens of focal length 5 cm.

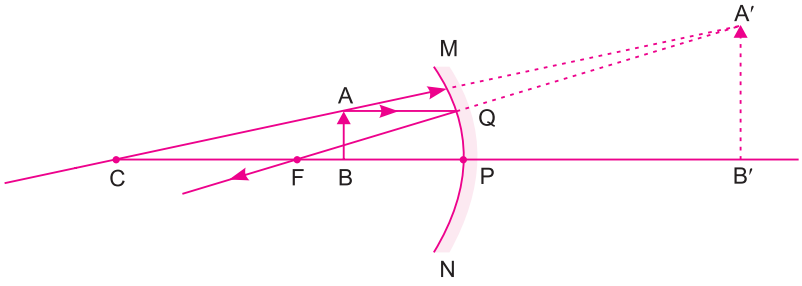
Q7. *We wish to obtain an erect image of an object, using a concave mirror of focal length 15 cm. What should be the range of distance of the object from the mirror? What is the nature of the image? Is the image larger or smaller than the object? Draw a ray diagram to show the image formation in this case.*

Ans. Focal length of concave mirror = 15 cm.

Object should be place in front of given concave mirror at a distance less than 15 cm.

Image formed is virtual and erect.

Image size is larger than object.



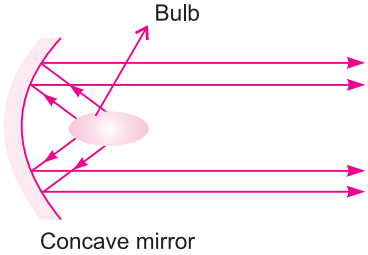
Q8. *Name the type of mirror used in the following situations.*

(*a*) *Headlight of a car.* (*b*) *Side/rear-view mirror of a vehicle*

(*c*) *Solar furnace.*

Support your answer with reason.

Ans. (*a*) For headlight of a car— Concave mirror is used to get a powerful beam of light after reflection.



(*b*) Convex mirror is used for side/rear view mirror of a vehicle. Convex mirror forms an erect and diminished image of vehicles and gives wider view of rear.

(*c*) In solar furnace concave mirror is used as a reflector, it concentrates sun light at a point where the temperature increases sharply to 180°C – 200°C.

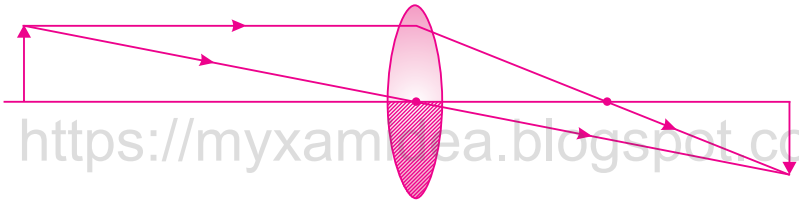
Q9. *One-half of a convex lens is covered with a black paper. Will this lens produce a complete image of the object? Verify your answer experimentally? Explain your observations.*

Ans. Yes, one-half of a convex lens when covered with a black paper, the lens produces a complete or full image of an object.

To verify experimentally:

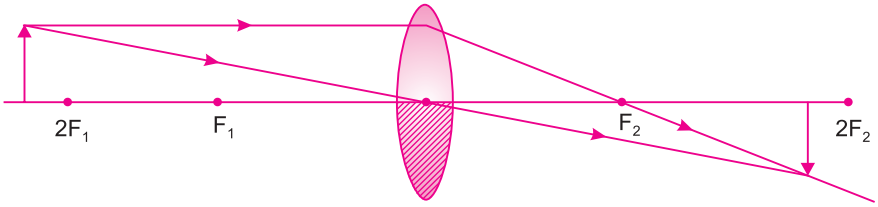
Take a convex lens, cover half part of it as shown in the figure, with a paper. Place it on a stand. Focus a distant object on a screen, the image obtained on the screen is complete.

Observation and conclusion: Image formed on the screen does not depend on the size of the lens. The brightness of the image decreases as less number of rays pass through the lens.



Q10. *An object 5 cm in length is held 25 cm away from a converging lens of focal length 10 cm. Draw the ray diagram and find the position, size and the nature of the image formed.*

Ans.



$f = 10$ cm

$u = -25$ cm

$h_o = 5$ cm

Convex lens

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\therefore \quad \frac{1}{V} = \frac{1}{f} + \frac{1}{u}$$

$$= \frac{1}{10} + \frac{1}{(-25)}$$

$$= \frac{5-2}{50} = \frac{3}{50}$$

$$\therefore \quad V = \frac{50}{3} - 16.67 \text{ cm}$$

Height of the image formed

$$\frac{h_i}{h_o} = \frac{v}{u}$$

$$\frac{h_i}{5} = \frac{16.67}{-25}$$

$$h_i = -3.33$$

Hence, the image formed at 16.67 cm from the lens on the other side. The size of the image is 3.3 cm, *i.e.,* reduced and inverted.

Q11. *A concave lens of focal length 15 cm forms an image 10 cm from the lens. How far is the object placed from the lens? Draw the ray diagram.*

Ans. Concave lens

$$f = -15 \text{ cm}$$

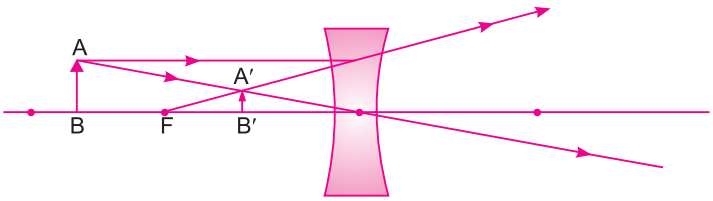
$$v = -10 \text{ cm}$$

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{-10} - \frac{1}{u} = \frac{1}{-15}$$

$$\therefore \quad \frac{1}{u} = -\frac{1}{30} \qquad \therefore u = -30 \text{ cm}$$

Ray diagram



Q12. *An object is placed at a distance of 10 cm from a convex mirror of focal length 15 cm. Find the position and nature of the image.*

Ans. Convex mirror

$$f = +15 \text{ cm}, \qquad u = -10 \text{ cm}.$$

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$$

$$\frac{1}{15} = \frac{1}{v} + \frac{1}{(-10)}$$

$$\frac{1}{v} = \frac{1}{15} + \frac{1}{10}$$

$$\frac{1}{v} = \frac{5}{30} \qquad v = +6 \text{ cm}$$

The image is formed 6 cm behind the mirror, virtual image is formed.

Q13. *The magnification produced by a plane mirror is +1. What does this mean?*

Ans. Magnification, $m = +1$

+ indicates virtual image.

1 indicates that the object size and image size is same.

Q14. *An object 5.0 cm in length is placed at a distance of 20 cm in front of a convex mirror of radius of curvature 30 cm. Find the position of the image, its nature and size.*

Ans. $$f = \frac{R}{2} = \frac{30}{2} = 15 \text{ cm}$$

$f = +15$ cm, $u = -20$ cm, $h = 5.0$ cm

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

$$\therefore \quad \frac{1}{v} + \frac{1}{(-20)} = \frac{1}{15}$$

$$\frac{1}{v} = \frac{1}{15} + \frac{1}{20}$$

$$\frac{1}{v} = \frac{7}{60} \qquad \therefore v = \frac{60}{7} \text{ cm}$$

Image is virtual behind the mirror and erect.

$$\frac{h_i}{h_o} = \frac{v}{u}$$

$$\Rightarrow \quad \frac{h_i}{5} = \frac{8.57}{20}$$

$$h_i = 3.33 \text{ cm}$$

Q15. *An object of size 7.0 cm is placed at 27 cm in front of a concave mirror of focal length 18 cm. At what distance from the mirror should a screen be placed, so that a sharp focussed image can be obtained? Find the size and the nature of the image.*

Ans. Concave mirror $u = -27$ cm, $f = -18$ cm, $h = 7.0$ cm

Mirror formula $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

$\therefore \quad \frac{1}{v} + \frac{1}{(-27)} = \frac{1}{(-18)}$

$\therefore \quad \frac{1}{v} = \frac{-1}{18} + \frac{1}{27} = \frac{-3+2}{54} = \frac{-1}{54}$

$v = -54$ cm.

$\frac{h_i}{h_o} = \frac{v}{u}$

$\therefore \quad h_i = \frac{v \times h_o}{u}$

$= \frac{54 \times 7}{27} = 14$ cm

The image is real, inverted and enlarged.

Q16. *Find the focal length of a lens of power –2.0 D. What type of lens is this?*

Ans. $P = -2.0$ D

$P = \frac{1}{f}$

$\therefore \quad f = \frac{1}{P} = \frac{1}{-2.0\text{ D}} = -0.5$ m.

$\therefore$ The lens is concave lens as f = –ve.

Q17. *A doctor has prescribed a corrective lens of power +1.5 D. Find the focal length of the lens. Is the prescribed lens diverging or converging?*

Ans. $P = +1.5$ D, $P = \frac{1}{f}$

Focal length of the lens $f = \frac{1}{P} = \frac{1}{+1.5\text{ D}} = +0.67$ m

Power of the lens is +ve, and it is converging lens *i.e.,* convex lens.

MORE QUESTIONS SOLVED

I. MULTIPLE CHOICE QUESTIONS

1. Focal length of plane mirror is

(*a*) at infinity (*b*) zero

(*c*) negative (*d*) none of these

2. Image formed by plane mirror is

(*a*) real and erect (*b*) real an inverted

(*c*) virtual and erect (*d*) virtual and inverted

3. A concave mirror gives, real, inverted and same size image if the object is placed

(*a*) at F (*b*) at infinity

(*c*) at C (*d*) beyond C

4. Power of a lens is –40, its focal length is

(*a*) 4 m (*b*) – 40 cm

(*c*) – 0.25 m (*d*) – 25 m.

5. A concave mirror gives virtual, erect and enlarged image if the object is placed:

(*a*) at infinity (*b*) between F and C

(*c*) between P and F (*d*) at F.

6. The mirror that always gives virtual and erect image of the object but image of smaller size than the size of the object is

(*a*) Plane mirror (*b*) Concave mirror

(*c*) Convex mirror (*d*) none of these

7. All the distances in case of spherical mirror are measured in relation to

(*a*) object to image

(*c*) the focus of the mirror (*d*) the image to the object.

8. The radius of curvature and focal length of a concave mirror are

(*a*) positive (*b*) negative

(*c*) both (*d*) none of these

9. The object distance in both concave as well as convex mirror is

(*a*) negative (*b*) positive

(*c*) zero (*d*) none of these

10. The ratio of the speed of light in vacuum to that in a medium is known as

(*a*) magnification (*b*) refraction

(*c*) refractive index (*d*) Snell's law

11. In optics an object which has higher refractive index is called

(*a*) optically rarer (*b*) optically denser

(*c*) optical density (*d*) refractive index

12. The optical phenomena, twinkling of stars, is due to

(*a*) atmospheric reflection (*b*) total reflection

(*c*) atmospheric refraction (*d*) total refraction

13. Convex lens focus a real, point sized image at focus, the object is placed

(*a*) at focus (*b*) between F and 2f

(*c*) at infinity (*d*) at 2f

14. The unit of power of lens is

(*a*) metre (*b*) centimeter

(*c*) diopter (*d*) m^{-1}

15. The radius of curvature of a mirror is 20 cm the focal length is

(*a*) 20 cm (*b*) 10 cm

(*c*) 40 cm (*d*) 5 cm

16. The refractive indices of some media are given below:

Medium	*Refractive index*
X	1.51
Y	1.72
Z	1.83
W	2.42

In which of these is the speed of light minimum and maximum, respectively.

(*a*) X-minimum, W-maximum (*b*) Z-minimum, W-maximum

(*c*) W-minimum, X-maximum (*d*) X-minimum, Z-maximum

17. The power of a lens is + 1.6 D. The nature of lens is

(*a*) Convex lens (*b*) Concave lens

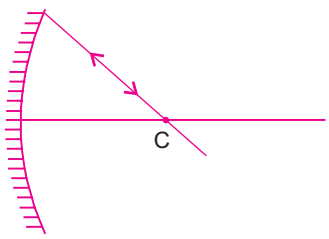
(*c*) both concave an convex

18. An incident ray makes 60° angle with the surface of the plane mirror, the angle of its refraction is

(*a*) 60° (*b*) 90°

(*c*) 30° (*d*) 0°

19. The angle of reflection in the given figure is



(*a*) 90° (*b*) 180°

(*c*) 0° (*d*) 30°

20. A mirror that has very wide field view is

(*a*) concave (*b*) convex

(*c*) plane (*d*) none of these

21. If the object is placed at focus of a concave mirror, the image is formed at

(*a*) infinity (*b*) focus

(*c*) centre of curvature (*d*) between F and O.

Answers

1. (*a*)	**2.** (*c*)	**3.** (*c*)	**4.** (*c*)	**5.** (c)	**6.** (*c*)	**7.** (*b*)
8. (*b*)	**9.** (*a*)	**10.** (*c*)	**11.** (*b*)	**12.** (*c*)	**13.** (*c*)	**14.** (*c*)
15. (*b*)	**16.** (*c*)	**17.** (*a*)	**18.** (*c*)	**19.** (*c*)	**20.** (*b*)	**21.** (*a*)

II. VERY SHORT ANSWER TYPE QUESTIONS (*1 Mark*)

Q1. *What is light?*

Ans. Light is a form of electromagnetic radiation that causes the sensation of sight. It doesn't require any material medium to travel.

Q2. *Name some phenomenon associated with light during image formation by mirrors.*

Ans. Reflection.

Q3. *Define reflection of light.*

Ans. The phenomenon of coming back of light in the same medium after striking a plane and polished surface is called reflection of light.

Q4. *Define incident ray, reflected ray, normal ray, angle of incidence and reflection.*

Ans. Incident ray – light which falls on the mirror/ polished surface is called incident ray.

Reflected ray – ray of light which goes back in the same medium after striking the surface is called reflected ray.

Normal – the perpendicular drawn to the reflecting surface is called normal at that point.

Angle of incidence – the angle between the incident ray and the normal is known angle of incidence.

Angle of reflection – the angle between reflected ray and the normal is known angle of reflection.

Q5. *State laws of reflection.*

Ans. Incident ray, reflected ray and normal at the point of incidence all lie in the same plane. The angle of incidence is equal to the angle of reflection.

Q6. *What are the properties of image formed by a plane mirror?*

Ans. Image is virtual and erect.

- Size of the image is equal to that of object
- Image is laterally inverted.
- The image formed by a plane mirror is always at the same distance as the object is in front of it.

Q7. *What are spherical mirrors?*

Ans. Mirrors whose reflecting surface are part of a sphere are called spherical mirrors.

Q8. *Define pole, centre of curvature, radius of curvature, principal axis, aperture, focus and focal length of a spherical mirror.*

Ans. **Pole:** the centre of reflecting surface. It is represented by letter P.

Centre of Curvature: The centre of the sphere of which the mirror forms the part. Represented by "C".

Radius of Curvature: The radius of the sphere of which the mirror forms the part. Represented by "R".

Principal axis: The straight line joining the pole (P) and the centre of curvature. It is normal to the mirror at its pole.

Aperture: The diameter of the spherical mirror is called its aperture. The reflecting surface of the mirror.

Focus: The point of the principal axis at which the rays parallel to principal axis meet (concave mirror) or appear to meet (convex mirror) after reflection. Represented by F.

Focal Length: The distance between the pole and the principal focus of a spherical mirror is called focal length. Represented by *f*.

Q9. *Write the position, nature and size of images formed by concave mirror.*

Ans. **Table:** Image formation by a concave mirror for different positions of the object

Position of the Object	*Position of the image*	*Relative size of the image*	*Nature of the image*
At infinity	At the focus F	Highly diminished point-sized	Real and inverted.
Beyond C	Between F and C	Diminished	Real and inverted
At C	At C	Same size	Real and inverted
Between C and F	Beyond C	Enlarged	Real and inverted
At F	At infinity	Highly enlarged	Real and inverted
Between P and F	Behind the mirror	Enlarged	Virtual and erect

Q10. *Give some uses of concave mirror.*

Ans. (*a*) Used in torches, search lights and vehicle headlights.
(*b*) Used as shaving mirror.
(*c*) Used by dentist.
(*d*) Used in solar furnance.

Q11. *Give uses of convex mirror.*

Ans. (*a*) Used as rear view mirror in vehicles.
(*b*) Used to see full length image of a tall building.

Q12. *Give the sign conventions for spherical mirrors.*

Ans.

S. No.	*Various distances*	*Concave mirror*	*Convex mirror*
1.	Object distance 'u'	–ve	–ve
2.	Image Distance 'v'	+ve if behind the mirror, –ve if in front of the mirror	always +ve
3.	Focal Length	–ve	+ve
4.	Height of virtual image	+ve	+ve
5.	Height of real Image	–ve	–ve

Q13. *State mirror formula and write it mathematically.*

Ans. The relation between focal length of mirror, distance of the object and distance of the image is known as mirror formula. It is given by

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$$

u = Image distance

v = Object distance

f = Focal length

Q14. *Give the relation between focal length and radius of curvature.*

Ans. $f = \frac{R}{2}$

Q15. *Define magnification of mirror.*

Ans. The ratio of height of the image to the height of the object is called magnification. It is represented by 'm'.

m = Height of image (h')/Height of object (h) = $\frac{-v}{u}$

Magnification of real image is negative and of virtual image is positive.

Q16. *Define refraction of light.*

Ans. The change in direction of light, when it travels from one medium to another medium is called refraction of light.

Q17. *State laws of refraction.*

Ans. The ratio of sin of angle of incidence to the sin of angle of refraction for a light of given colour and for a given pair of media is constant. This is called Snell's law.

i.e., $\frac{\sin i}{\sin r}$ = Constant

The incident ray, refracted ray and the normal at the point of incidence lie on the same plane.

Q18. *What do you observe when light ray passes through rectangular slab?*

Ans. (*a*) Angle of incidence is equal to angle of emergence.

(*b*) Incident ray is parallel to the emergent ray.

(*c*) Lateral displacement is proportional to the thickness of glass slab.

(*d*) Lateral displacement is proportional to the angle of incidence.

Q19. *Define lateral displacement.*

Ans. Lateral displacement is the perpendicular distance between the incident ray and the emergent ray.

Q20. *Define refractive index.*

Ans. Refractive index is defined as the ratio of speed of light in medium 1 to the speed of light in medium 2 and is represented as n_{21} and is read as refractive index of medium 2 with respect to medium 1.

n_{21} = speed of light in medium 1/speed of light in medium 2.

Q21. *Define absolute refractive index.*

Ans. When medium 1 is vacuum, then refractive index of medium 2 is considered with respect to vacuum. This is called absolute refractive index.

Q22. *What is the unit of refractive index?*

Ans. It has no unit.

Q23. *Define optical density.*

Ans. The ability of the medium to refract light is called optical density.

Q24. *What is the relation between optical density, refractive index and speed of light?*

Ans. The medium with higher refractive index in which speed of light is less is known as optically denser medium and the medium with lower refractive index in which the speed of light is more is known as optically rarer medium.

Q25. *State lens formula and write it mathematically.*

Ans. The **relationship** between object distance (u), image distance (v), and focal length of lens is known as lens formula. It is given by $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

Q26. *Define magnification of lens.*

Ans. $$\text{Magnification } (m) = \frac{\text{Height of image } (h')}{\text{Height of object } (h)} = \frac{v}{u}$$

For convex lens 'm' can be more than, less than or equal to one.

For concave lens 'm' is less than one.

Q27. *Define a lens.*

Ans. A transparent material bounded by two surfaces of which one or both surfaces are spherical forms a lens.

Q28. *What are the two types of lenses?*

Ans. **Spherical lens:** combination of two spherical refracting surfaces.

Spherical lens

Convex lens	**Concave lens**
Two spherical surfaces bulging outwards	Two spherical surfaces curved inwards
Thicken at middle, Converging	Thicken at the ends, Diverging

Q29. *Define centre of curvature, principal axis, optical centre, aperture, focus and focal length for a lens.*

Ans. **(a) Centre of curvature:** It is the centre of the spheres of which the each surface of the lens forms a part. Represented by C or 2f.

(b) Principal axis: An imaginary straight line passing through the two centres of curvatures.

(c) Optical centre: It is the central point of the lens. Represented by O.

(d) Aperture: It is the diameter of circular outline of a spherical lens.

(e) Focus: The point at which rays of light parallel to principal axis converges (convex lens) or appears to diverge (concave lens) after refraction. Represented by F.

(f) Focal length: The distance between focus and optical centre is called focal length. It is represented by f.

Q30. *Write nature, position and relative size of image formed by convex lens.*

Ans. **Table:** Nature, position and relative size of the image formed by a convex lens for various positions of the object

Position of the object	*Position of the image*	*Relative size of the image*	*Nature of the image*
At infinity	At focus F_2	Highly diminished, point-sized	Real and inverted
Beyond $2F_1$	Between F_2 and $2F_2$	Diminished	Real and inverted
At $2F_1$	At $2F_2$	Same size	Real and inverted
Between F_1 and $2F_1$	Beyond $2F_2$	Enlarged	Real and inverted
At focus F_1	At infinity	Infinitely large or highly enlarged	Real and inverted
Between focus F_1 and optical centre O	On the same side of the lens as the object	Enlarged	Virtual and erect

Q31. *Write nature, position and relative size of image formed by cancave lens.*

Ans. **Table:** Nature, position and relative size of the image formed by a concave lens for various positions of the object

Position of the object	*Position of the image*	*Relative size of the image*	*Nature of the image*
At infinity	At focus F_1	Highly diminished, point-sized	Virtual and erect
Between infinity and optical centre O	Between focus F_1 and optical centre O	Diminished	Virtual and erect

Q32. *Give sign conventions for spherical lenses.*

Ans.

S. No.	Various distances	Convex lens	Concave lens
1.	Object distance (u)	–ve	–ve
2.	Image (v)	+ve real, –ve virtual	–ve
3.	Focal length (f)	+ve	–ve
4.	Height of the object (h)	+ve	+ve
5.	Height of the image (h')	–ve for real +ve for virtual	+ve

Q33. *Define power of a lens.*

Ans. The degree of convergence or divergence of light rays achieved by lens is expressed in terms of power. It is given by

$$P = \frac{1}{f} \qquad f = \text{focal length in metre}$$

Q34. *What is the S.I. unit of power? Define it.*

Ans. The S.I. unit of power is dioptre denoted by "D" 1 dioptre is the power of a lens whose focal length is 1 metre.

- Power of a convex lens is +ve
- Power of a concave lens –ve

Q35. *What is the magnification of a plane mirror?*

Ans. $m = +1$

Q36. *What is the radius of curvature of plane mirror?*

Ans. Infinity.

Q37. *Which lens bends a light ray more or less with a shorter or with longer focal length?*

Ans. The lens with the shorter focal length bends the light more.

Q38. *If a convex lens is used to focus sunlight on a paper, where the paper should be placed so that it catches fire.*

Ans. At the Principal focus.

Q39. *What happens if a light falls on a glass slab making 90° at its surface?*

Ans. It undergoes normal refraction that is there is no deviation in the light.

40. *Where should be an object placed in front of convex lens so as to use it as a magnifier?*

Ans. Between the pole and the focal length.

Q41. *What is silvering of mirror?*

Ans. Silvering of mirror means coating the surface of mirror with a thin layer of silver, aluminium or some other shiny, opaque material.

III. SHORT ANSWER TYPE QUESTIONS (*2 or 3 Marks*)

Q1. *State the laws of reflection of light.*

Ans. Laws of reflection of light are:

(i) The angle of incidence is equal to the angle of reflection and

(*ii*) The incident ray, the normal to the mirror at the point of incidence and the reflected ray, all lie in the same plane.

Q2. *What are the properties of the image formed by plane mirror?*

Ans. Image formed by plane mirror is always virtual and erect. The size of the image is equal to that of the object. The image formed is as far behind the mirror as the object is in front of it and the image is laterally inverted.

Q3. *Define pole and centre of curvature of spherical mirrors.*

Ans. **Pole:** The centre of the reflecting surface of a spherical mirror is a point called the pole. It lies on the surface of the mirror. It is represented by "P".

Centre of Curvature: The reflecting surface of a spherical mirror forms a part of a sphere this sphere has a centre and this point is called the centre of curvature of the spherical mirror.

Q4. *Give the uses of concave mirrors.*

Ans. (*i*) Concave mirror are used in torches, search-lights and vehicle headlights to get powerful parallel beams of light.

(*ii*) They are also used as shaving mirrors to see a large image of the face.

(*iii*) Dentists use concave mirrors to see large images of the teeth of patients.

(*iv*) Large concave mirrors are used in making solar furnaces, solar cookers etc.

Q5. *Give the uses of convex mirrors.*

Ans. Convex mirrors are commonly used as rear-view mirrors in vehicles. As these mirrors can give an erect image, wider field of view, these mirrors are used in vehicles to see the traffic behind.

Q6. *Give the laws of refraction of light.*

Ans. The laws of refraction of light are

(*i*) The incident ray, the refracted ray and the normal to the interface of two transparent media at the point of incidence all lie in the same plane.

(*ii*) The ratio of sine of angle of incidence to the sine of angle of refraction is constant, for the light of a given colour and for the given pair of media. This law is also known as Snell's law of refraction.

Q7. *What is refractive index?*

Ans. If '*i*' is the angle of incidence and '*r*' is the angle of refraction then

$$\frac{\sin i}{\sin r} = \text{Constant}$$

This constant value is called the refractive index of the second medium with respect to the first.

Q8. *What is absolute refractive index of the medium?*

Ans. When the refractive index of medium 2 is considered with respect to vacuum. This is called the absolute refractive index of the medium.

$$\frac{n}{2} = \frac{\text{Speed of light in 2}}{\text{Speed of light in 1}}$$

Q9. *Two medium with refractive index 1.31 and 1.50 are given. In which case*

(i) bending of light is more?

(ii) speed of light is more?

Ans. (*i*) Bending of light is more in the medium where refractive index is 1.50.

(*ii*) Speed of light is more in the medium with refractive index 1.31

Q10. *When a ray of light entering from air is incident on the surface of a glass slab at an angle of 90°, what will be the measure of angle of refraction. Why does a ray change its path when it passes from one medium to another medium?*

Ans. The angle of refraction will be zero. A light ray changes its path when it passes from one medium to another medium.

Q11. *Refractive index of kerosene oil is 1.44 and that of water is 1.33. A ray of light enters from kerosene oil to water. Where would light ray bend and why?*

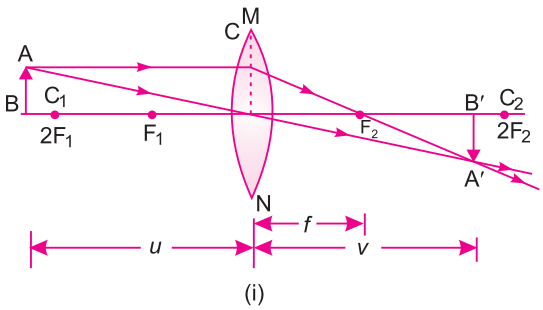
Ans. A ray of light enters from kerosene oil to water *i.e.,* refractive index 1.44 to 1.33 *i.e.,* from denser to rarer medium. Hence the ray of light bends away from the normal.

Q12. *Which is optically denser out of the two medium M_1 = 1.71 (refractive index) and M_2 = 1.36 (refractive index). How does speed of light change when it travels from optically rarer to denser medium.*

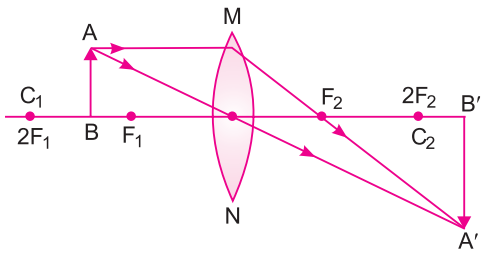
Ans. Medium M_1 with refractive index 1.71 is optically denser than the other medium M_2. Speed of light decreases when it travels from rarer to denser medium.

Q13. *Draw a ray diagram of image formed when an object is placed in front of convex lens (i) beyond 2 f and (ii) between f and 2f.*

Ans.



(i)



(ii)

Q14. *Comment on the size, position of the image formed by a concave mirror of focal length 18 cm when an object is placed:*

(i) at 22 cm *(ii) 14 cm* *(ii) 40 cm.*

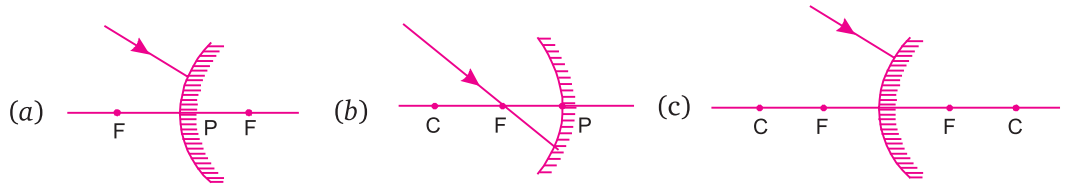
in front of mirror without calculations.

Ans. (*i*) When the object is placed at 22 cm, the image is formed beyond 36 cm, real, inverted image is magnified.

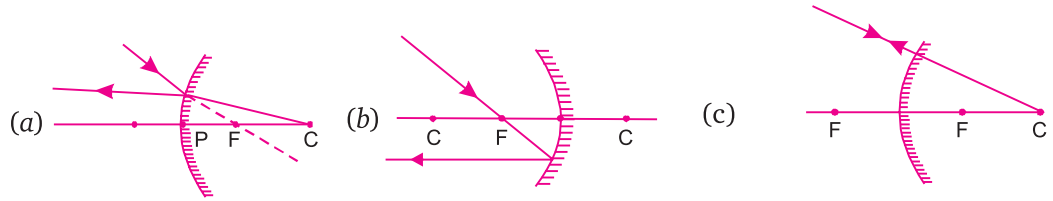
(*ii*) When the object is at 14 cm then the image formed is virtual, behind the mirror and magnified.

(*iii*) When the object is placed beyond 40 cm, then the image is formed between 18 cm and 36 cm, it is real inverted and diminished image.

Q15. *Complete the following ray diagrams:*

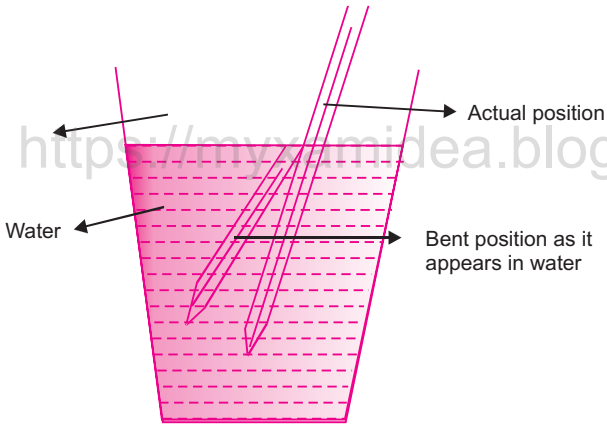


Ans.



Q16. *With the help of a ray diagram show how a pencil appears when dipped in water.*

Ans.



A ray of light (as we see pencil in air passing into water) travels from rarer to denser medium *i.e.,* from air to water, it bends towards the normal, hence the pencil appears to be bent in water as shown in the diagram.

Q17. *State the mirror formula, lens formula and power of lens.*

Ans. Mirror formula

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

(v = image distance, u = object distance, f = focal length)

Lens formula

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

Power of lens

$$P = \frac{1}{f} \qquad f = \text{focal length in metres}$$

Q18. *Define power of lens. What is the S. I. unit of power of a lens? If power of lens is +2D what is the nature and focal length of the lens?*

Ans. **Power of lens:** The degree of convergence or divergence of light rays obtained by a lens is expressed in terms of its power.

Power of a lens is defined as the reciprocal of its focal length.

$$P = \frac{1}{f}$$

S.I. unit of power of a lens is 'diopter'

$$P = +2 \text{ D.}$$

Lens is convex and the focal length of the lens is +0.50 m.

$$\left(P = \frac{1}{f}, \qquad 2 \text{ D} = \frac{1}{f}, \qquad \therefore f = \frac{1}{2} = 0.05\right)$$

Q19. *If the speed of light in water is 2.25×10^8 m/s and the speed in vacuum is 3×10^8 m/s. Calculate the refractive index of water.*

Ans. $$\text{Refractive index of water} = \frac{\text{Speed of light in 1 medium (air)}}{\text{Speed of light in 2 medium (water)}}.$$

$$\therefore \qquad n_m = \frac{c}{v}$$

$$n_m = \frac{3 \times 10^8}{2.25 \times 10^8}$$

$$n_m = 1.33$$

$\therefore$ The refractive index of water = 1.33.

Q20. *The refractive index of water is 1.33 and kerosene is 1.44. Calculate the refractive index of kerosene with respect to water.*

Ans. Refractive index of water = n_w = 1.33

Refractive index of kerosene = n_k = 1.44

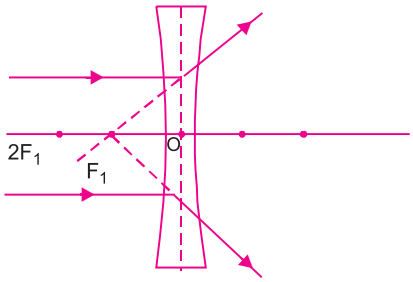
$\therefore$ Refractive index of kerosene with respect to water is

$$n_{kw} = \frac{n_k}{n_w} = \frac{1.44}{1.33}$$

$$= 1.082$$

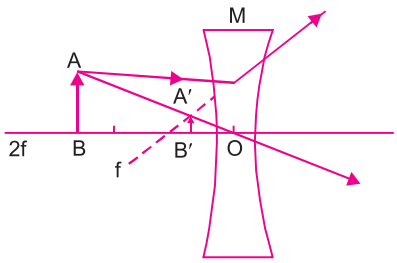
Q21. *Draw ray diagrams to show the image formed by a concave lens for the object placed at (i) infinity (ii) Between f and 2f of the lens.*

Ans. (*i*) object at infinity



Object ⟶ at infinity
Image ⟶ at focus
Size of image ⟶ Point sized
Nature ⟶ virtual and erect

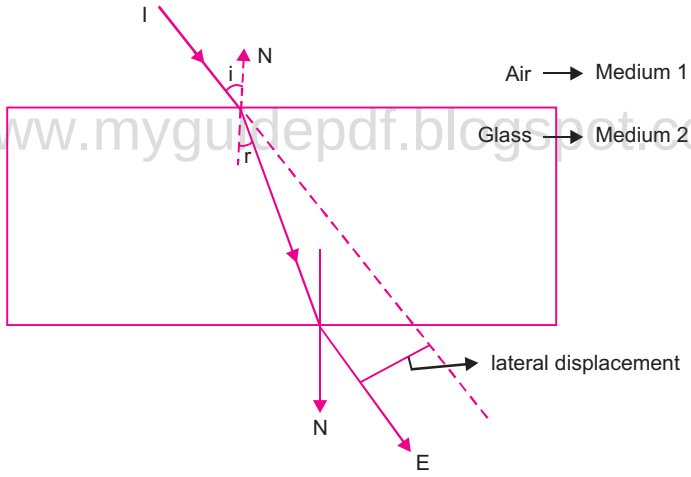
(*ii*) object between *f* and 2*f*



Object ⟶ between *f* and 2*f*
image ⟶ between O and F.
Size of image ⟶ Diminished
Nature ⟶ virtual and erect.

Q22. *Draw a ray diagram to show the path of light when it travels through glass slab.*

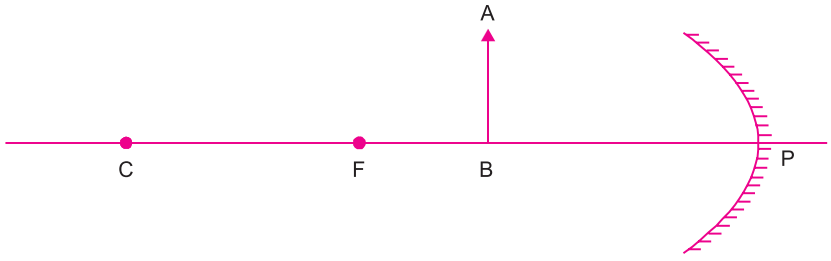
Ans.



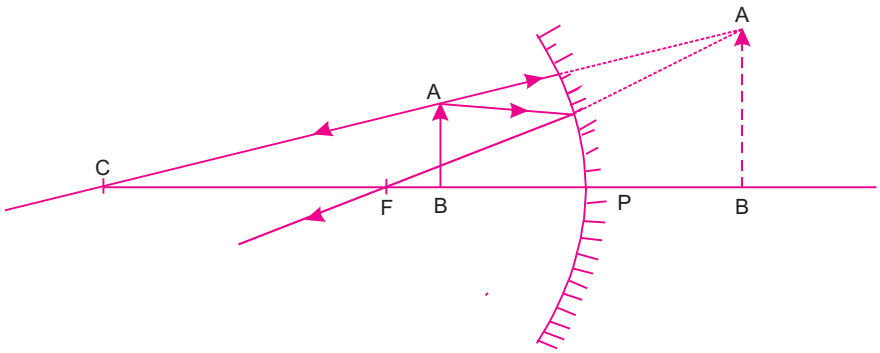
Incident ray I enters the glass slab forms an angle of incidence '*i*'. Its bends towards the normal and forms an angle of refraction '*r*'.

The emergent ray is parallel to the incident ray.

Q23. *Draw the following diagram in your answer book and show the formation of image of the object AB with the help of suitable rays.* (CBSE 2008)



Ans.

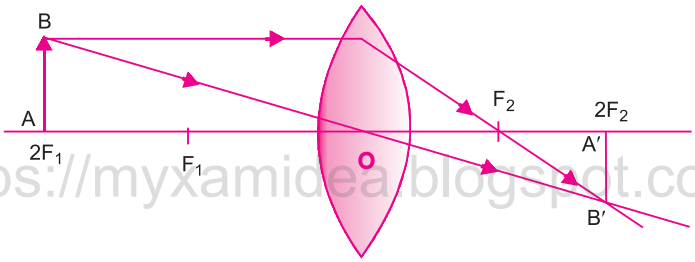


Q24. *Draw ray diagrams to represent the nature, position and relative size of the image formed by a convex lens for the object placed:*

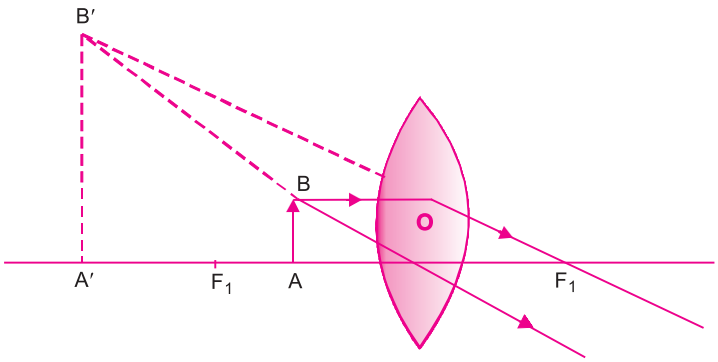
(a) At 2F

(b) Between F_1 and the optical centre O of lens (CBSE 2008)

Ans. (*a*)



(*b*)



Q25. *Which kind of mirrors are used in the headlights of a motor-car and why?* (CBSE 2008)

Ans. Concave mirror, to get the parallel beam of light.

Q26. *(a) It is desired to obtain an erect image of an object using a concave mirror of focal length 20 cm.*

(i) What should be the range of distance of the object from the mirror?

(ii) Will the image be bigger or smaller than the object?

(iii) Draw a ray diagram to show the image formation in this case.

(b) One-half of a convex lens of focal length 20 cm is covered with a black paper.

(i) Will the lens produce a complete image of the object?

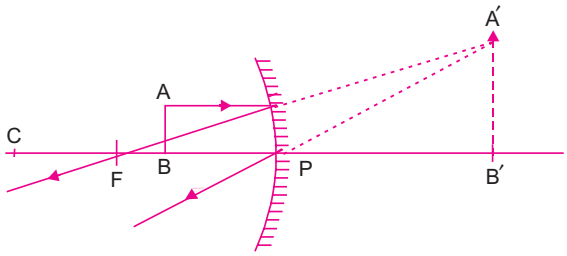
(*ii*) *Show the formation of image of an object placed at* $2F_1$ *of such covered lens with the help of a ray diagram.*

(*iii*) *How will the intensity of the image formed by half covered lens compare with non-covered lens?* *(CBSE 2008)*

Ans. (*a*) (*i*) Range of the object distance is 0 to 20 cm from the pole.

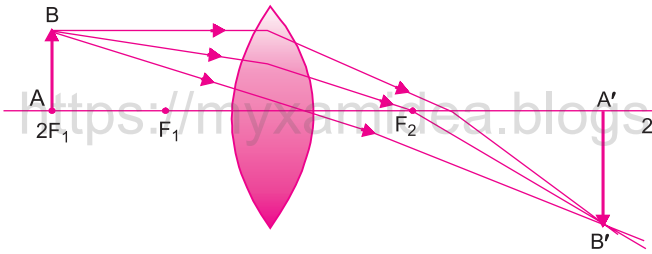
(*ii*) Image will be bigger than the object.

(*iii*) Ray diagram:



(*b*) (*i*) Yes, complete image will be formed.

(*ii*)

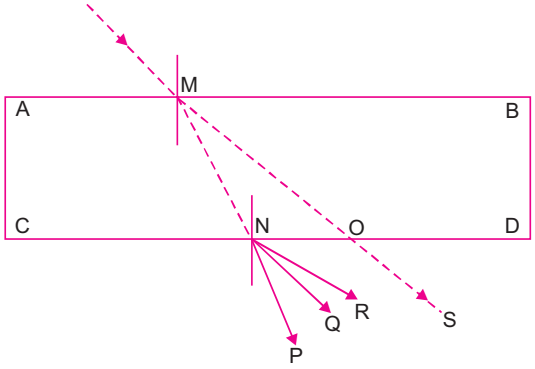


(*iii*) Intensity will be reduced as the light falling on the lower (covered) portion will not reach the position of image.

Q27. *Which type of mirrors are used to give an erect and enlarged image of an object?* (CBSE 2008)

Ans. Concave mirror.

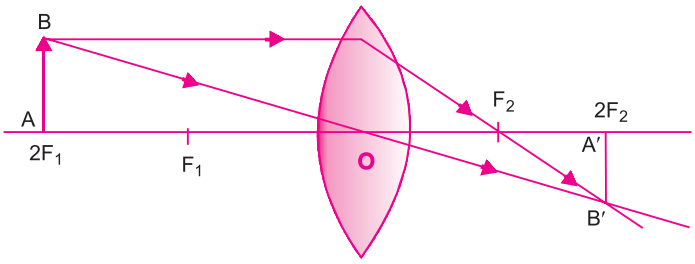
Q28. *If a light ray IM is incident on the surface AB as shown, identify the correct emergent ray.* (CBSE 2008)



Ans. Q as it has to be parallel to S.

Q29. *An object of 2 cm high is placed at a distance of 64 cm from a white screen on placing a convex lens at a distance of 32 cm from the object it is found that a distant image of the object is formed on the screen. What is the focal length of the convex lens and size of the image formed on the screen? Draw a ray diagram to show the formation of the image in this position of the object with respect to the lens.* (CBSE 2008)

Ans. Since the object-screen distance is double of object-lens separation, the object is at a distance of $2f$ from lens and the image should be of the same size of the object.



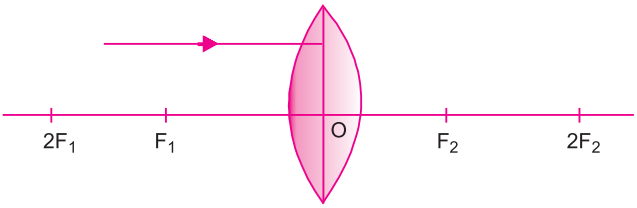
So $2f = 32 \Rightarrow f = 16$ cm

Height of image = Height of object = 2 cm

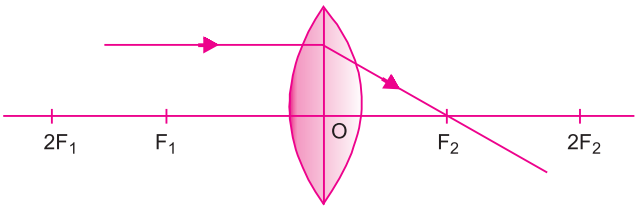
Q30. *The power of a lens is –4.0 D. What is the nature of this lens?* (CBSE 2008)

Ans. Negative power is associated with only concave lens.

Q31. *Redraw the given diagram and show the path of refracted ray.* (CBSE 2008)



Ans.



Q32. *A convex lens has a focal length of 10 cm. At what distance from the lens should the object be placed so that it gives a real and inverted image 20 cm away from the lens? What would be the size of the image formed if the object is 2 cm high? With the help of a ray diagram show the formation of the image by the lens in this case.* (CBSE 2008)

Ans. $f = +10$ cm, $v = +20$ cm as image is real and inverted. Height of the object = 2 cm (say +ve)

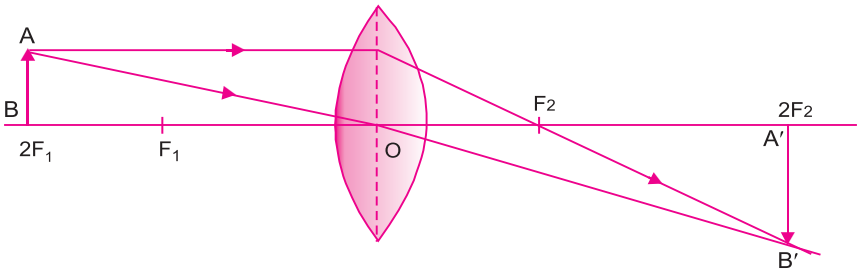
Using $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$, we get

$$\frac{1}{u} = \frac{1}{v} - \frac{1}{f}$$

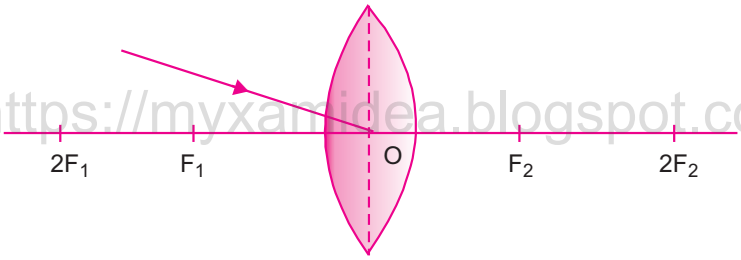
$$= \frac{1}{+20} - \frac{1}{10} = \frac{+1-2}{20} = \frac{-1}{20}$$

$u = -20$ cm $(= 2f)$

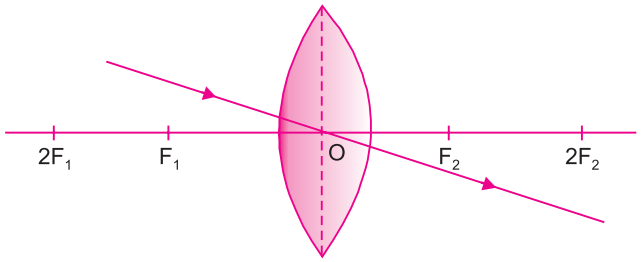
Image will be of the same size as that of object (as $u = v$) and hence, the height of the image will be 2 cm.



Q33. *Redraw the given diagram and show the path of the refracted ray.*



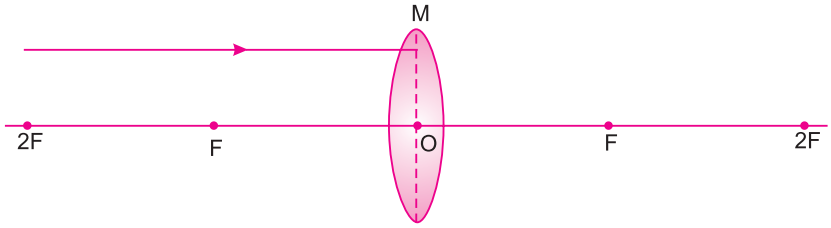
Ans.



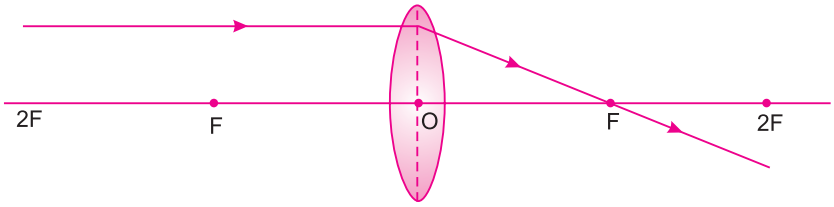
Q34. *Why does a ray of light bend when it travels from one medium into another?*

Ans. Due to change in velocity in the medium and to reduce the time taken to travel the same, a ray of light bends when it travels from one medium to another.

Q35. *Draw the given diagram in your answer book and complete it for the path of ray of light beyond the lens.*

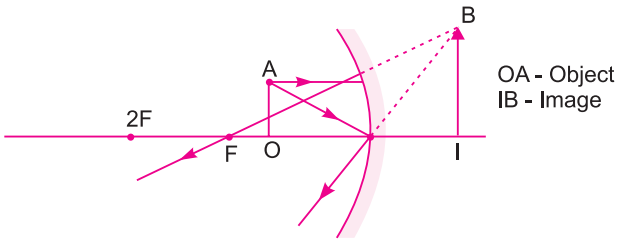


Ans.

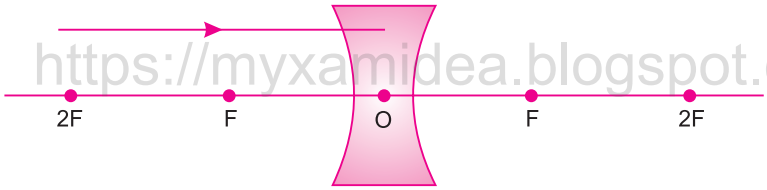


Q36. *What are the minimum number of rays required for locating the image formed by a concave mirror for an object? Draw a ray diagram to show the formation of virtual image by a concave mirror.*

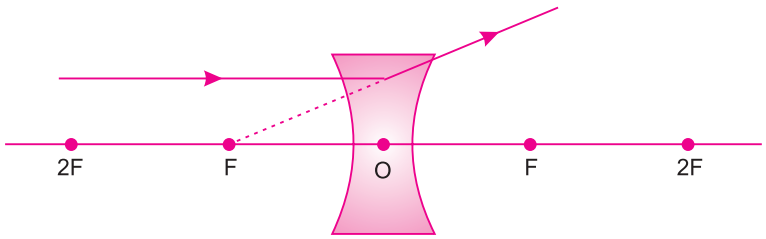
Ans. Two rays:



Q37. *Take down this diagram on to your answer book and complete the path of the ray.*



Ans.

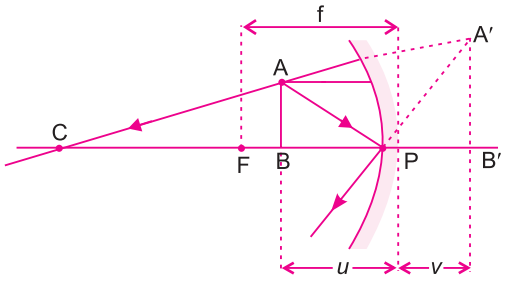


Q38. *What kind of mirrors are used in big shopping stores to watch activities of customers?*

Ans. Convex mirror as the image is independent of position of the object.

Q39. *Draw a ray diagram to determine the position of image formed of an object placed between the pole and the focus of a concave mirror.*

Ans.



IV. LONG ANSWER TYPE QUESTIONS (*5 Marks*)

Q1. *With the help of a ray diagram show the type of images formed when object is placed at the following positions in front of concave mirror.*

(*a*) *at infinity* (*b*) *beyond C*

(*c*) *at F* (*d*) *at C*

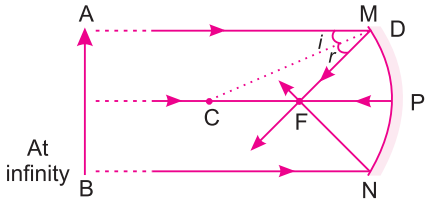
(*e*) *between F and C* (*f*) *between F and O*

$\because$ *C = centre of curvature*

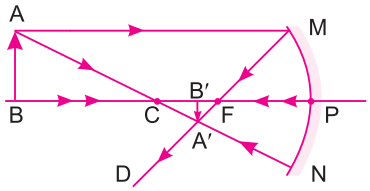
F = focus

O = optical centre of the mirror

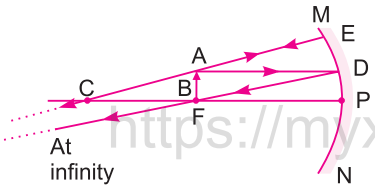
Ans.



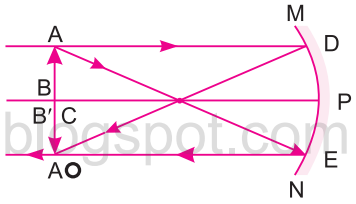
(a)



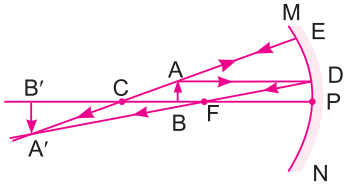
(b)



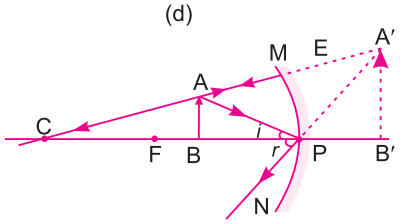
(c)



(d)



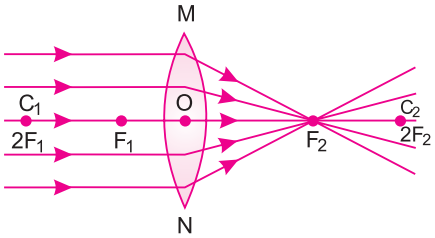
(e)



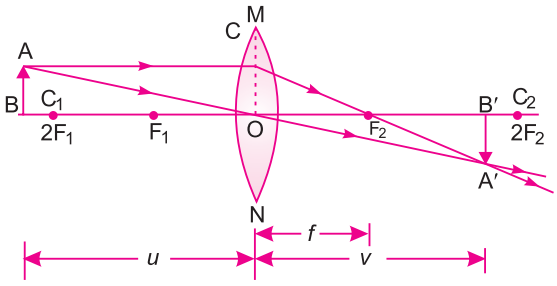
(f)

Q2. *With the help of a ray diagram show the position, size and the nature of the image formed by a convex lens for various positions of the object.*

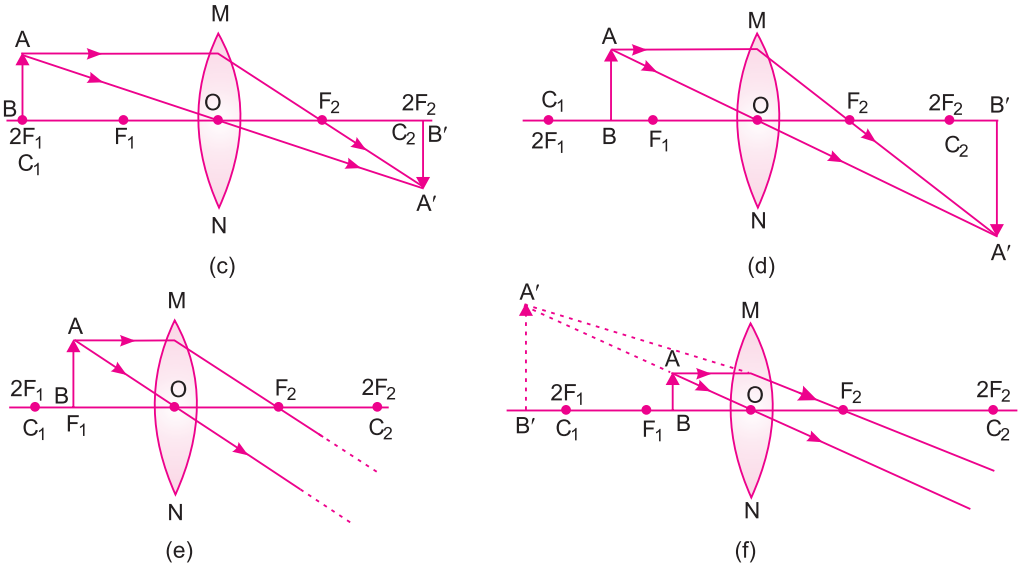
Ans.



(a)



(b)



Q3. *Name the type of mirror used in the following situations:*

(i) Rear view mirror in vehicles

(ii) Solar furnace

(iii) Torch

(iv) Solar cooker

(v) To get the full length image of tall building.

Ans. (*i*) Rear view mirror in vehicles – convex mirror as it gives virtual image, diminished and cover the wider view.

(*ii*) Solar furnace – concave mirror to concentrate all parallel beam of light.

(*iii*) Torch – concave mirror is used.

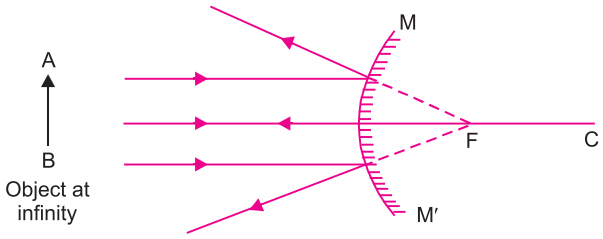
(*iv*) Solar cooker – concave mirror is used to concentrate the heat rays at a point.

(*v*) Convex mirror is used to view a full length tall building.

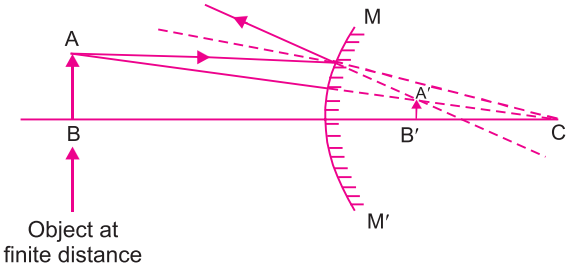
Q4. *Draw and explain the ray diagram formed by a convex mirror when*

(a) object is at infinity. *(b) object is at finite distance from the mirror.*

Ans. (*a*) When the object is at infinity, the image is formed at focus. 'F'.



(*b*) When the object is at finite distance the image is formed behind the mirror, it is virtual image and diminished in size.



Q5. *A convex lens has a focal length of 15 cm. At what distance from the lens should the object be placed so that is forms on its other side a real and inverted image 30 cm away from the lens? What would be the size of image formed if the object is 5 cm high? With the help of a ray diagram show the formation of the image by the lens in this case.*

Ans. $f = 15$ cm

$v = +30$ cm as image is real and inverted

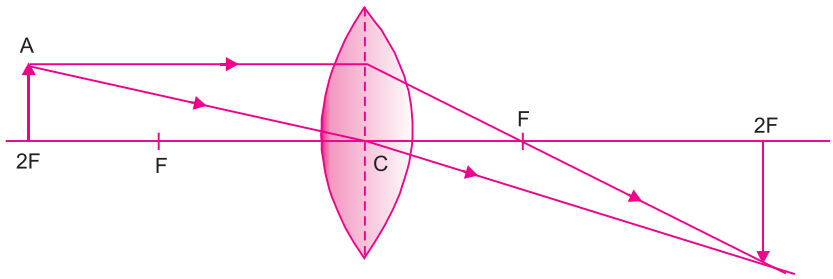
using $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$, we get

$$\frac{1}{u} = \frac{1}{v} - \frac{1}{f}$$

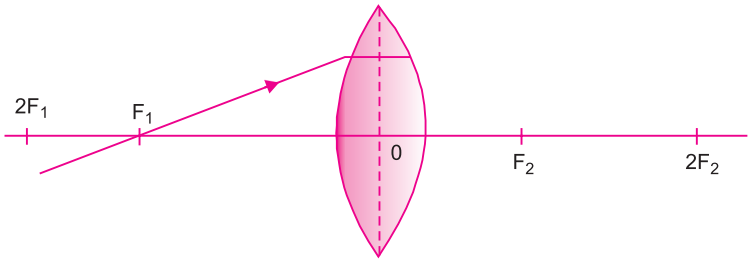
$$= \frac{1}{30} - \frac{1}{15} = \frac{1-2}{30} = -\frac{1}{30}$$

$u = -30$ cm $(= 2f)$

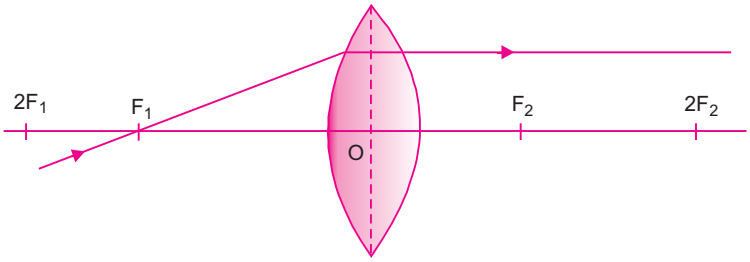
So, image should be of the same size as the object. Height of image = 5 cm.



Q6. *Redraw the given diagram and show the path of retracted ray.*



Ans.



Q7. *A convex lens has a focal length of 12 cm. At what distance from the lens should an object of height 6 cm be placed so that on the other side of the lens its real and inverted image is formed 24 cm away from the lens? What would be the size of the image formed? Draw a ray diagram to show the image formed in this case.*

Ans. $f = +12$ cm

Real and inverted image so $v = +24$ cm

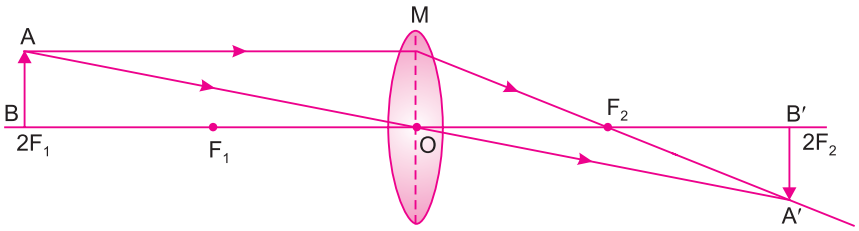
Using $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$, we get

$$\frac{1}{u} = \frac{1}{v} - \frac{1}{f}$$

$$\frac{1}{24} \quad \frac{1}{12} \quad \frac{1-2}{24} \quad \frac{1}{24}$$

$u = -24$ cm $(= 2f)$

So image will be of the same size as the object. Height of image = 6 cm.



V. QUESTIONS ON HIGH ORDER THINKING SKILLS (HOTS)

Q1. *Amit visited a fair and saw a mirror in which he got a very funny image. The above part of his body was big in size, middle part was of normal size and the lower part of the body showed very small size. What kind of mirror is this?*

Ans. Upper part – Concave mirror; Middle part : Plane mirror; Lower part : Convex mirror.

Q2. *Nidhi wanted the image of her pencil to be double the size of its original size. Name the mirror used for getting such image.*

Ans. Concave mirror.

Q3. *Give the mirror image of "AMBULANCE"*

Ans. ƎƆИAJUBMA

Q4. *An incident ray makes an angle of 60° with the mirror. What is the angle of reflection?*

Ans. 60°.

Q5. *Define the following.*

(*a*) *What is ray?*

(*b*) *What is beam?*

(*c*) *What is reflection of light?*

(*d*) *What is reflector?*

(*e*) *What is focal length?*

(*f*) *What is principal focus?*

(*g*) *What is refraction?*

(*h*) *What is optically rare medium?*

(*i*) *What is optically denser medium?*

(*j*) *What is power?*

(*k*) *What is 1 dioptre?*

Ans. (*a*) It is the path of light.

(*b*) Group of parallel light rays emitted by the source of light.

(*c*) Bouncing back of light after striking any surface.

(*d*) The surface which reflects the light.

(*e*) The distance between the pole and the principal focus of the spherical mirror.

(*f*) A point of the principal axis where the rays of light parallel to principal axis meet.

(*g*) Bending of light ray when it travels from one medium to another.

(*h*) When the speed of light is more as compared to other medium.

(*i*) When the speed of light is less as compared to another medium.

(*j*) The degree of convergence or divergence of light rays achieved by a lens is expressed in terms of its power

(*k*) It is the power of lens whose focal length is 1 m.

Q6. *What are the two types of reflection?*

Ans. (*i*) Regular (*ii*) Irregular

Q7. *Write the laws of reflection.*

Ans. (*a*) The angle of incidence is equal to angle of reflection.

(*b*) The incident ray, the normal to the mirror at the point of incidence and the reflected ray, all lie in the same plane.

Q8. *Give characteristics of image formed by plane mirror*

Ans.
- Image is virtual and erect.
- Size is same as of the object.
- It is formed at same distance.

Q9. *Give uses of plane mirror.*

Ans.
- Looking glass
- Used in submarines

- Solar cooker
- Kaleidoscope

Q10. *Name two types of spherical mirror.*

Ans.
- Concave mirror
- Convex mirror

Q11. *Give uses of concave mirror.*

Ans.
- Used as reflectors in car headlights, searchlights, etc.
- Used as shaving mirror.
- Used in solar cooker to focus the sunlight on one point.

Q12. *Give uses of convex mirror.*

Ans.
- It is used as the rear view mirror in cars.
- It is used in street lights as it diverge the light over larger area.

Q13. *What are the two types of refractive index?*

Ans.
- Relative refractive index– It is the ratio of speed of light in one medium to the speed of light in another medium
- Absolute refractive index– It is the ratio of light in vacuum to the speed of light in another medium

Q14. *Why do we prefer a convex mirror as a rear view mirror in vehicles?*

Ans. Convex mirrors are used as rear view mirror in cars because it produces erect and diminished image of the traffic behind the vehicle. It also gives a wider view.

Q15. *Name the type of mirror used in the following situations.*

(*a*) *Headlights of a car.*

(*b*) *Side/rear-view mirror of a vehicle.*

(*c*) *Solar furnace.*

Ans. (*a*) Concave mirror

(*b*) Convex mirror

(*c*) Concave mirror

Q16. *The magnification produced by a plane mirror is +1. What does this mean?*

Ans. This means that the size of the image is equal to the size of the object.

Q17. *Find the focal length of a lens of power –2.0 D. What type of lens is this?*

Ans. Given, Power = –2.0

The given lens is concave (power of concave lens is –ve)

$$P = \frac{1}{f} \text{ (in metre)}$$

$$-2.0 = \frac{1}{f}$$

$$f = \frac{1}{-2}\,\text{m}$$

$$f = -50\ \text{cm}$$

$\therefore$ The focal length is – 50 cm.

VI. VALUE-BASED QUESTION

Q1. *In a small town fair Akshay took his friend and showed him a mirror in which his image showed upper half body very fat and lower body very thin. Akshay's friend got upset but Akshay explained him by showing his similar image in the mirror.*

(*a*) *Name two mirrors used in this fair shop.*

(*b*) *Name the mirror in which the size of image is small.*

(*c*) *What value of Akshay is reflected?*

Ans. (*a*) Concave and convex mirror.

(*b*) Convex mirror gives small size image.

(*c*) Akshay showed compassion and empathy.

TEST YOUR SKILLS

Q1. *The power of a lens is – 40, what is its focal length?*

Q2. *State laws of reflection.*

Q3. *What are the properties of image formed by a plane mirror?*

Q4. *Give two uses of convex mirror.*

Q5. *What is refractive index?*

Q6. *Draw a ray diagram to show the image formed by a concave lens for the object placed at infinity.*

Q7. *Draw a ray diagram to show the path of light when it travels through glass slab.*

Q8. *State the lens formula and mirror formula.*

Q9. *The refractive index of water is 1.33 and kerosene is 1.44 calculate the refractive index of kerosene with respect to water.*

Q10. *Draw and explain the ray diagram formed by a convex mirror when:*

(*a*) *object is at infinity.*

(*b*) *object is at finite distance from the mirror.*

Q11. *Differentiate between concave lens and convex lens.*

❐❐❐

11 Human Eye and Colourful World

SYLLABUS

Functioning of a lens in human eye, defects of vision and their corrections, applications of lenses. Refraction of light through a prism, Dispersion of light, Scattering of light, Applications in daily life.

Facts that Matter

Human eye resembles a camera. It has a lens screen, ciliary muscles, cornea etc. Their functions are as follows:

Cornea: Thin membrane of eye through which light enters the eye first and gets refracted.

Iris: It is a dark muscular diaphragm that controls the size of the pupil.

Pupil: Small hole in the iris, appears black because no light is reflected from it. Pupil regulates and controls the amount of light entering the eye.

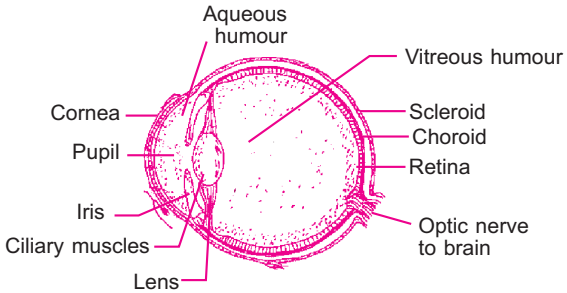
Eye lens: Transparent crystalline lens, made up of fibres, jelly like material, convex in nature.

Ciliary muscles: It holds the lens and can modify the lens curvature.

Retina: It is a screen in the eye, delicate membrane with lot of light sensitive cells called rods and cones. These cells get activated on illumination and produce electrical signals.

Optic nerve: It is a nerve connecting eye and brain. It sends the electrical signals to brain.

Diameter of human eye is approx. 2.3 cm.



The human eye

Power of Accommodation: The ability of the eye lens to see far and near objects by adjusting its focal length. It occurs through following mechanism:

(a) Relaxation of ciliary muscles: Lens becomes thin, focal length of eye 'f' increases. One can see distant objects.

(*b*) Contraction of ciliary muscles: Lens becomes thick, focal length of eye '*f*' decreases. One can see near objects.

Least distance of distinct vision (near point D): The minimum distance at which objects can be seen most distinctly without strain.

For normal vision in young adult D = 25 cm.

Far Point: The farthest point (for normal vision it is at infinity) upto which the eye can see objects clearly.

Persistence of vision: The image formed on retina remains for about 1/10th of a second and is called persistence of vision.

Used in cinematography: Sequence of showing 24 images or more per second, appears to be in motion.

Light sensitive cells

Rods	*Cones*
1. Respond to intensity of light.	1. Respond to colour.
2. Enables to see in dim light.	2. Become active in bright light.
3. Cannot distinguish various colours.	3. It can distinguish between various colours.

Colour blindness: It is a genetic disorder caused due to absence of cone cells in the retina.

Vision is normal but eye cannot distinguish between colours.

[People with colour blindness are not issued driving license.]

Retina of chicks (birds) have mostly cones and few rods. So the chick wakes up with sunrise and sleeps by sunset.

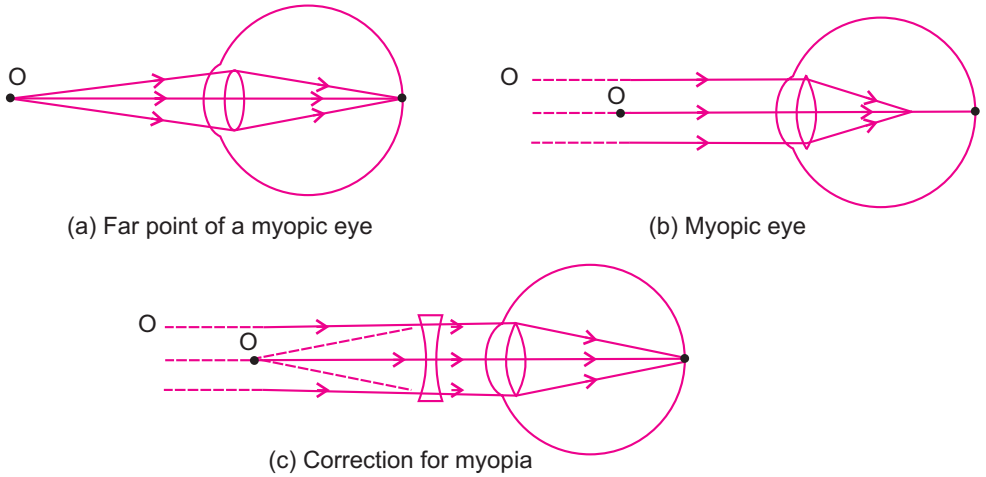
Cataract: The crystalline lens of some old people becomes hazy or even opaque due to the development of a membrane over it, which leads to the loss of vision of eye. It can be corrected by surgery.

Defects of vision, cause and remedy:

I. Myopia, II. Hypermetropia III. Presbyopia.

	Myopia	*Hypermetropia*	*Presbyopia*
Symptoms:	Cannot see distant object clearly.	Cannot see nearby objects clearly.	Power of accommodation decreases with ageing.
	Image is formed in front of retina.	Image is formed behind retina.	Nearby objects are not visible clearly.
Correction:	Use of concave lens with appropriate focal length.	Use of Convex lens with appropriate focal length.	Can be corrected by using bifocal lenses.
Cause:	(*i*) Due to thickening of lens.	Eye lens may be thinner.	Due to the gradual weakening of the ciliary muscles.
	(*ii*) Eye ball may be elongated.	Eye ball may be oval.	

Myopic eye, correction for myopia with concave lens.



(a) Far point of a myopic eye (b) Myopic eye

(c) Correction for myopia

(a), (b) The myopic eye, and (c) correction for myopia with a concave lens

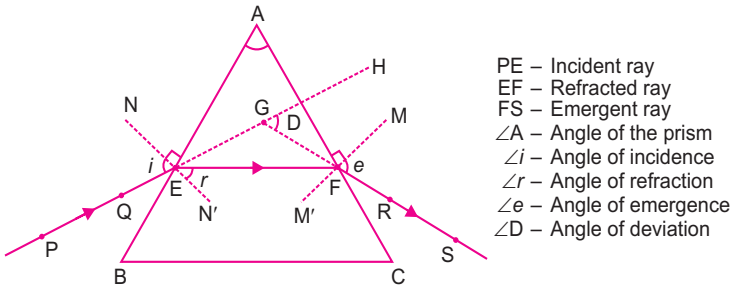
Hypermetropic eye, correction with convex lens.

(a) (b)

(a) The hypermetropic eye, and (b) correction for hypermetropia with a convex lens

Refraction of light through a prism. Prism has two triangular bases and three rectangular lateral surfaces. The surfaces are inclined to each other.

The angle between two lateral faces is called the angle of prism.

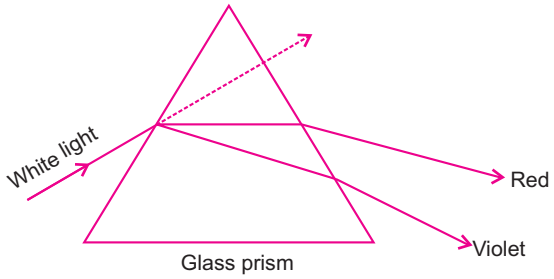


Refraction of light through a triangular glass prism

Incident ray enters the prism, gets refracted, it bends towards the normal and when it moves out of the prism, it now bends away from the normal and forms emergent ray. The peculiar shape of the prism makes, the emergent ray bend at an angle to the direction of the incident ray. This angle formed is called angle of deviation.

Dispersion : The splitting of white light into its components due to different bending ability for colours when it pass through prism is called dispersion.

Dispersion of white light.



Spectrum : The band of seven colours obtained due to splitting of light is called spectrum. The red colour light bends the least and the violet colour light bends the maximum.

Rainbows : Rainbow is a natural spectrum that appears in the sky after rain shower. The water droplet present in the atmosphere splits light.

Atmospheric Refraction : Refraction of light by the Earth's atmosphere.

Twinkling of Stars : The light of star when enters Earth's atmosphere undergoes refraction, the light bends towards the normal as light travels from rarer to denser medium so the position of star spotted in sky is different from its actual position.

Star is a point sized source of light and the amount of light entering air changes. Sometimes it appears brighter and at some time hazier as the light travels from far distant and the atmosphere is not same always.

Sun is visible 2 minutes before actual sunrise and about 2 minutes after the actual sunset because of atmospheric refraction.

Sky appears blue: The small sized particles of air scatter blue light (shorter wavelength) that enter our eyes.

Sky appears black: When there is no atmosphere (space) or no light (night), the scattering does not take place.

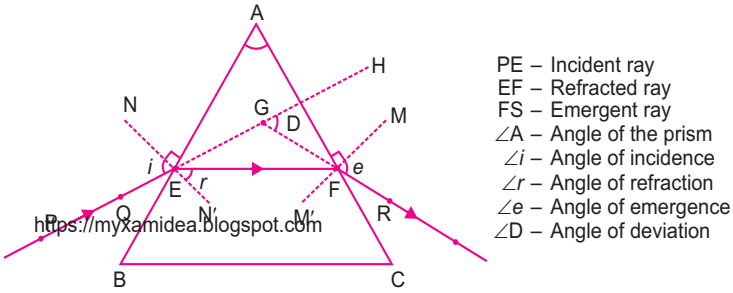
Sky appears red: During sunrise/sunset the sun is near the horizon, light passes through larger distance in the earth's atmosphere. Most of the blue light is scattered away. The red light does not get scattered and reaches our eyes.

NCERT IN-TEXT ACTIVITIES SOLVED

ACTIVITY 11.1

- Fix a sheet of white paper on a drawing board using drawing pins.
- Place a glass prism on it in such a way that it rests on its triangular base. Trace the outline of the prism using a pencil.
- Draw a straight line PE inclined to one of the refracting surfaces, say AB, of the prism.

- Fix two pins, say at points P and Q, on the line PE as shown in figure below:
- Look for the images of the pins, fixed at P and Q, through the other face AC.
- Fix two more pins, at points R and S, such that the pins at R and S and the images of the pins at P and Q lie on the same straight line.
- Remove the pins and the glass prism.
- The line PE meets the boundary of the prism at point E. Similarly, join and produce the points R and S. Let these lines meet the boundary of the prism at E and F, respectively. Join E and F.
- Draw perpendiculars to the refracting surfaces AB and AC of the prism at points E and F, respectively.
- Mark the angle of incidence ($\angle i$), the angle of refraction ($\angle r$) and the angle of emergence ($\angle e$) as shown in figure below.



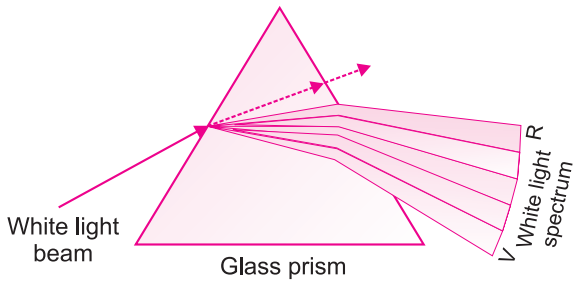
Refraction of light through a triangular glass prism

ACTIVITY 11.2

- Take a thick sheet of cardboard and make a small hole or narrow slit in its middle.
- Allow sunlight to fall on the narrow slit. This gives a narrow beam of white light.
- Now take a glass prism and allow that light from the slit to fall on one of its faces as shown in figure below.
- Turn the prism slowly until the light that comes out of it appears on a nearby screen.
- You will find a beautiful band of colours. This happens because prism split the white light that is incident on it and a band of colours is obtained.

  The blue light bends the most and red light bends the least.

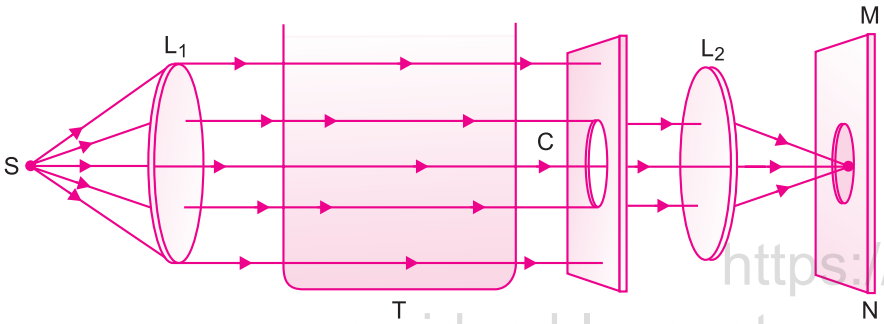
Observation:



Dispersion of white light by the glass prism

ACTIVITY 11.3

- Place a strong source (S) of white light at the focus of a converging lens (L_1). This lens provides a parallel beam of light.
- Allow the light beam to pass through a transparent glass tank (T) containing clear water.
- Allow the beam of light to pass through a circular hole (c) made in a cardboard. Obtain a sharp image of the circular hole on a screen (MN) using a second converging lens (L_2), as shown in figure below.
- Dissolve about 200 g of sodium thiosulphate (hypo) in about 2 L of clean water taken in the tank. Add about 1 to 2 mL of concentrated sulphuric acid to the water. What do you observe?



An arrangement for observing scattering of light in colloidal solution.

Observation: Sulphur particles precipitate in water from sodium thiosulphate. The beaker appears to give blue light on its sides as the scattering of light takes place. While the light obtained on the screen is red in colour because all blue light has scattered and red light travels through the beaker, will not get scattered due to small particles in beaker and passes straight and gets collected on the screen.

NCERT IN-TEXT ACTIVITIES SOLVED

Q1. *What is meant by power of accommodation of the eye?*

Ans. The ability of the eye to focus the distant objects as well as the nearby objects on the retina by changing the focal length of the eye lens is called power of accommodation.

Q2. *A person with a myopic eye cannot see objects beyond 1.2 m distinctly. What should be the type of the corrective lens used to restore proper vision?*

Ans. A person with a myopic eye can use concave lens to restore proper vision.

Q3. *What is the far point and near point of the human eye with normal vision?*

Ans. The far point is infinity and the near point is 25 cm of the human eye with normal vision.

Q4. *A student has difficulty reading the blackboard while sitting in the last row. What could be the defect the child is suffering from? How can it be corrected?*

Ans. A student is suffering with the eye defect named myopia, in this defect person can see nearby objects clearly but cannot see far off objects distinctly. It can be corrected by using concave lens.

QUESTION FROM NCERT TEXTBOOK

Q1. *The human eye can focus objects at different distances by adjusting the focal length of the eye lens. This is due to*

(*a*) *presbyopia* (*b*) *accommodation*

(*c*) *near-sightedness* (*d*) *far-sightedness*

Ans. (*b*) accommodation

Q2. *The human eye forms the image of an object at its*

(*a*) *cornea.* (*b*) *iris.*

(*c*) *pupil.* (*d*) *retina.*

Ans. (*d*) retina.

Q3. *The least distance of distinct vision for a young adult with normal vision is about*

(*a*) *25 m.*

(*c*) *25 cm.* (*d*) *2.5 m.*

Ans. (*a*) 25 cm

Q4. *The change in focal length of an eye lens is caused by the action of the*

(*a*) *pupil.* (*b*) *retina.*

(*c*) *ciliary muscles.* (*d*) *iris.*

Ans. (*c*) ciliary muscles.

Q5. *A person needs a lens of power –5.5 dioptres for correcting his distant vision. For correcting his near vision he needs a lens of power +1.5 dioptre. What is the focal length of the lens required for correcting* (*i*) *distant vision, and* (*ii*) *near vision?*

Ans. The focal length of a lens is given by

$$\left(P = \frac{1}{f}\right), \quad f = \frac{1}{P}$$

(*i*) For distant vision

$$f = \frac{1}{-5.5\text{D}} = -0.18$$

(*ii*) For near vision

$$f = \frac{1}{P} \text{ i.e., } f = \frac{1}{1.5D} = 0.67\ m$$

Q6. *The far point of a myopic person is 80 cm in front of the eye. What is the nature and power of the lens required to correct the problem?*

Ans. For the myopic eye

$$u = -\alpha$$
$$v = -80 \text{ cm}$$
$$f = 1$$
$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f} \text{ lens formula}$$
$$\frac{1}{-80\,\text{cm}} = \frac{1}{-\alpha} = \frac{1}{f}$$

$\therefore$ $f = -80 \text{ cm} = -0.80 \text{ m}$

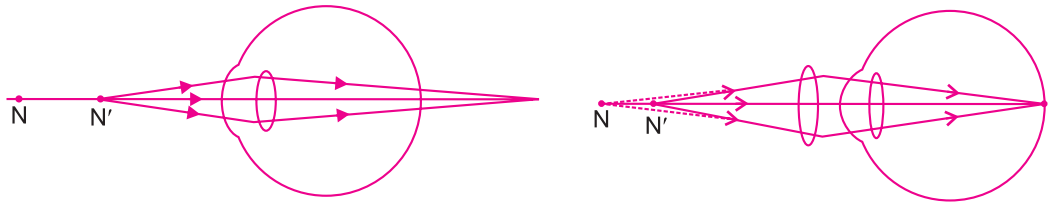
Power of the lens is $P = \frac{1}{f}$

$\therefore$ $P = \frac{1}{-0.80 \text{ m}} = -1.25\ D$

A concave lens; $P = -1.25\ D$.

Q7. *Make a diagram to show how hypermetropia is corrected. The near point of a hypermetropic eye is 1 m. What is the power of the lens required to correct this defect? Assume that the near point of the normal eye is 25 cm.*

Ans.



(a) (b)

(a) The hypermetropic eye, and (b) correction for hypermetropia with a convex lens

$$u = -25 \text{ cm}, v = -1 \text{ m} = -100 \text{ cm}$$
$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$
$$= \frac{1}{-100} - \frac{1}{(-25)} = \frac{1}{100} + \frac{1}{25}$$
$$= \frac{-1+4}{100} = \frac{3}{100} \text{ or } f = \frac{1}{3} \text{ m}$$
$$P = \frac{1}{f} = \frac{1}{1/3} = 3\text{D (convex lens)}$$

Q8. *Why is a normal eye not able to see clearly the objects placed closer than 25 cm?*

Ans. Ciliary muscles can contract the lens of human eye to a certain limit because of which a person with normal vision can see the nearby objects clearly only if placed at 25 cm but if the object is placed closer to the eye than it cannot see the objects clearly.

Q9. *What happens to the image distance in the eye when we increase the distance of an object from the eye?*

Ans. The image distance in the eye remains the same. On increasing the distance of an object from the eye, the focal length of the eyes changes due to ciliary muscles which helps an eye to focus the object image on retina.

Q10. *Why do stars twinkle?*

Ans. Stars twinkle due to atmospheric refraction of light from the stars and changing density of air around the earth.

Q11. *Explain why the planets do not twinkle.*

Ans. Planets are much closer to earth and behave like extended source.

Q12. *Why does the sun appear reddish early in the morning?*

Ans. When the sun rises early in the morning (or set in the evening), the light from sun travels through the thicker layer of air and larger distance of the atmosphere surrounding the earth. Hence the blue light scatters the most but red light does not scatters and reaches our eyes.

Q13. *Why does the sky appear dark instead of blue to an astronaut?*

Ans. In space there are no particles, air, gases, water droplets etc., present to scatter the light. So when the astronauts look at the sky in the space, there is no light entering our eyes, hence it appears dark.

MORE QUESTIONS SOLVED

I. MULTIPLE CHOICE QUESTIONS

1. The image formed on the retina of human eye is

(*a*) virtual and erect (*b*) real and inverted

(*c*) virtual an inverted (*d*) real and erect

2. The change in the focal length of human eye is caused due to

(*a*) ciliary muscles (b) pupil

(*c*) cornea (d) iris

3. The least distance of distinct vision for a young adult with normal vision is

(*a*) 25 m (*b*) 20 m

(*c*) 25 cm (*d*) 20 cm

4. The persistence of vision for normal eye is

(*a*) $\left(\frac{1}{10}\right)$th of a second (*b*) $\left(\frac{1}{16}\right)$th of a second

(*c*) $\left(\frac{1}{6}\right)$th of a second (*d*) $\left(\frac{1}{18}\right)$th of a second

5. The light sensitive cell present on retina and is sensitive to the intensity of light is:
(*a*) cones (*b*) rods
(*c*) both rods and cones (*d*) none of these

6. The phenomenon of light responsible for the working of the human eye is
(*a*) reflection (*b*) refraction
(*c*) power of accommodation (*d*) persistence of vision.

7. Which of the following colours is least scattered by fog, dust of smoke?
(*a*) Violet (*b*) Blue
(*c*) Red (*d*) Yellow

8. The coloured light that refracts most while passing through a prism is
(*a*) Yellow (*b*) Violet
(*c*) Blue (*d*) Red

9. The amount of light entering the human eye is controlled by
(*a*) Ciliary muscles (*b*) Pupil
(*c*) Cornea (*d*) Iris

10. Which part of the eye refracts light entering the eye from external objects?
(*a*) Lens (*b*) Cornea
(*c*) Iris (*d*) Pupil

11. The component of white light with greatest wavelength is
(*a*) Violet (*b*) Red
(*c*) Green (*d*) Blue

12. The focal length of human eye lens can be changed due to
(*a*) Iris (*b*) Ciliary muscles
(*c*) Contact lens (*d*) Spectacles

13. Colour blindness is caused due to
(*a*) lack of rod cells (*b*) absence of optic nerve
(*c*) lack or cone cells (*d*) none of these

14. Long-sightedness or hypermetropia can be corrected by
(*a*) Contact lens (*b*) Concave lens
(*c*) Convex lens (*d*) Bifocal lens

15. A student of class 10, is not able to see clearly the black board Question when seated at a distance of 5 m from the board, the defect he is suffering from is
(*a*) Myopia (*b*) Hypermetropia
(*c*) Presbyopia (*d*) Astigmatism

16. The part of eye that determines the colour of the eye of a person is
(*a*) Pupil (*b*) Cornea
(*c*) Retina (*d*) Iris

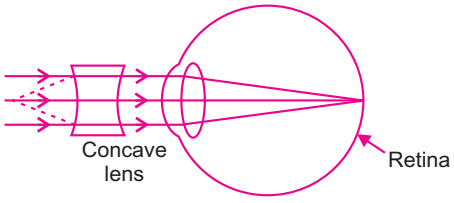
17. The glass has greater refractive index for
(*a*) Violet light (*b*) Green light
(*c*) Blue light (*d*) Red light

18. The colour of sky is blue during day time, red during sunset and black at night. This is due to

(*a*) Scattering of light (*b*) Small particles present in atmosphere

(*c*) Atmospheric refraction (*d*) All of the above.

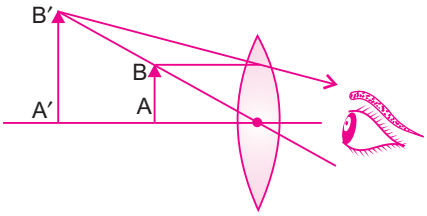
19. The eye defect represented by the figure is



(*a*) Myopia (*b*) Hypermetropia

(*c*) Cataract (*d*) Presbyopia

20. The following illustration represents the



(*a*) Correction of eye defect (*b*) working of a simple microscope

(*c*) both (a) and (b) (*d*) none of the above

Answers

1. (*b*)	**2.** (*a*)	**3.** (*c*)	**4.** (*b*)	**5.** (*b*)
6. (*b*)	**7.** (*c*)	**8.** (*b*)	**9.** (*b*)	**10.** (*b*)
11. (*b*)	**12.** (*b*)	**13.** (*c*)	**14.** (*c*)	**15.** (*a*)
16. (*d*)	**17.** (*a*)	**18.** (*d*)	**19.** (*a*)	**20.** (*b*)

II. VERY SHORT ANSWER TYPE QUESTIONS (*1 Mark*)

Q1. *Name the transparent membrane through which light enters first in the eye.*

Ans. Cornea.

Q2. *What is the diameter of human eye?*

Ans. 2.3 cm

Q3. *Name the light sensitive part of the eye where image of an object is formed.*

Ans. Retina

Q4. *What is the function of iris?*

Ans. Iris controls the size of the pupil.

Q5. *What are light sensitive cells?*

Ans. Rods and cones.

Q6. *What type of image is formed on the retina?*

Ans. Real, inverted image.

Q7. *Why is inverted image formed on the retina of human eye?*

Ans. The inverted image is formed due to the eye lens which is convex in shape. Through it the light rays enters to form the real, inverted image.

Q8. *What type of signals are generated and sent to the brain by light sensitive cells of retina?*

Ans. Electrical signals.

Q9. *Which part of the human eye controls the amount of light entering the eye?*

Ans. Pupil.

Q10. *What is the function of crystalline lens of human eye?*

Ans. The crystalline lens provides the proper focal length required to focus objects at different distances on the retina.

Q11. *What holds the crystalline lens in the human eye?*

Ans. Ciliary muscles.

Q12. *Which part of the human eye helps in changing the thickness of lens?*

Ans. Ciliary muscles.

Q13. *Name the disease in which crystalline lens of human eye becomes opaque.*

Ans. Cataract.

Q14. *Which is the range of vision of normal eye?*

Ans. 25 cm to infinity.

Q15. *Define least distance of distinct vision.*

Ans. The minimum distance at which the objects can be seen clearly without any strain is called least distance of distinct vision. It is the near point of eye and is equal to 25 cm.

Q16. *What is persistence of vision?*

Ans. When the image is formed on retina it remains there for 1/16th of a second and this property of eye is called persistence of vision.

Q17. *Define the power of accommodation of human eye.*

Ans. The ability of eye to see nearby as well as far off objects at the same time is called power of accommodation.

Q18. *In which type of eye defect far point of the eye gets reduced?*

Ans. Myopia.

Q19. *In which type of eye defect near point of the eye becomes more than 25 cm?*

Ans. Hypermetropia.

Q20. *What is presbyopia?*

Ans. It is the defect of eye in which one cannot see nearby as well as far objects clearly.

Q21. *What type of lens should be used to correct the presbyopia?*

Ans. Bi-focal lens. Concave-convex lens. 

Q22. *What is dispersion of light?*

Ans. The splitting of light into its various components (*i.e.*, 7 colours) is called dispersion of light.

Q23. *Define angle of prism.*

Ans. The angle formed due to two lateral faces of the prism is called the angle of prism.

Q24. *What is spectrum?*

Ans. The band of seven colours obtained due to the dispersion of white light is called spectrum.

Q25. *In visible spectrum which colour has longest wavelength.*

Ans. Red.

Q26. *Give one main difference between the lens of human eye and lens of camera.*

Ans. Lens of human eye has flexible aperture, its focal length can be changed. In camera focal length can not be changed for a lens.

Q27. *What is Tyndall effect?*

Ans. Scattering of light in the nature due to small particles present in the atmosphere is called Tyndall effect.

III. SHORT ANSWER TYPE QUESTIONS (*2 or 3 Marks*)

Q1. *How does eye control the amount of light entering it?*

Ans. The amount of light entering the eye is controlled by the pupil and further the size of the pupil is controlled by iris.

Q2. *The image formed on retina is inverted but we see the object erect. Why?*

Ans. The image formed on retina is inverted, this image is formed on the light sensitive cells called rods and cones of the retina which generates electrical signals. This signal reaches brain via optic nerve. It is the brain that interprets this image and while processing the image it helps in perceiving objects as they are.

Q3. *Why do birds fly back to their nest in the evening?*

Ans. Birds lack light sensitive cells called rods, due to lack of these cells they cannot see the objects clearly in less/dim light.

Q4. *Why danger signals are red?*

Ans. Danger signals are of red colour, as it scatters the least and can be seen from the maximum distance.

Q5. *Why do you take time to see objects when you enter a dim lighted room from outside in the sun?*

Ans. In the sun light the size of pupil, is small but when one enters the dim light, it takes some time for iris to adjust the size of pupil and the light sensitive cells take some time to get activated.

Q6. *Why are two eyes more helpful for us to see as compared to one?*

Ans. Two eyes are more helpful as one eye gives only a view of 150° angle where as two eyes increase the view by making it wide to 180° angle. Two eyes also helps us to see

the objects in dim light or darkness clearly. Two eyes give stereoscopic vision helping us assess the depth of vision.

Q7. *When white light enters the prism, which colour of light deviates/bends the least and which colour bends the most?*

Ans. The light that bends the least is red colour and the light that bends the maximum is violet colour light.

Q8. *Explain the phenomenon which causes twinkling of stars.*

Ans. The phenomenon is atmospheric refraction. In this case the star are point source illuminated objects which are very far from us when light travels through atmosphere it bends, and due to this the amount of light entering the eye is different each time which gives the twinkling effect.

Q9. *Why does a ray of light splits into different colours on passing through a glass prism?*

Ans. When light rays enter the glass prism the angle at which it bends makes the light split into its seven components because the speed of each component of light is different and due to the bending every component shows its different ability to pass through it.

Q10. *In dispersion of white light through prism, which colour deviates most and which colour the least? Why do they deviate differently?*

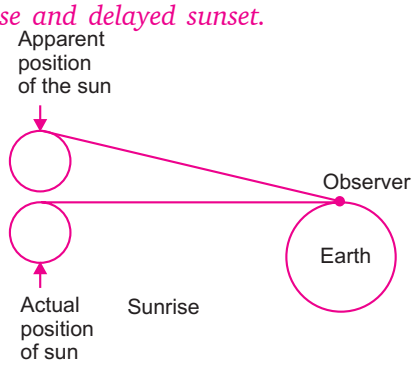
Ans. The colour of light that deviates least is red and violet deviates the maximum. The difference in deviation is due to the difference in wavelength and speed of each colour of light, also due to different bending ability when it passes through the prism.

Q11. *The sun ap*

Ans. Sun appears red during sunset or sunrise because at this time the sun is far from the earth and the light that reaches the earth from the sun scatters the most and all other colours of light gets scattered. The least scattered light is red and it enters our eye.

Q12. *Give reason for early sunrise and delayed sunset.*

Ans.



Sun being far off the light rays entering our eye gets refracted several times due to the atmosphere and the sunrise and sunset are seen to us due to the bending of light and that light enters our eye to visualise the sun at that particular point.

Q13. *Why doesn't planets appear to be twinkling?*

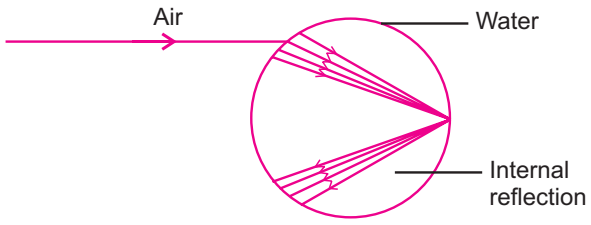
Ans. Planets are big enough and quite closer to the earth, due to these two properties the planets do not appear to be twinkling.

Q14. *What is the direction of rainbow formation? What is the position of red colour in rainbow?*

Ans. Rainbow is always formed in the direction opposite to sun. The position of red colour in the rainbow is at the top.

Q15. *What is internal reflection?*

Ans. When a light rays enters from one medium to another (e.g., rarer to denser *i.e.*, air to water droplet) then a ray of light instead of passing through it reflects in the second medium then it is said to be internal reflection of light.



Q16. *A short-sighted person cannot see clearly beyond 5 cm. Calculate the power of lens required to correct his vision to normal?*

Ans. $f = -5$ cm

$$P = \frac{1}{f} = -\frac{1}{5} = 0.20$$

$\therefore$ Power = 0.2 Dioptre

Q17. *Why can't we see object very close to our eye?*

Ans. The objects are seen only when the image forms on retina when the light rays pass through the lens. The lens has its fixed ability of changing the focal length with the help of ciliary muscles.

Ciliary muscles cannot be contracted beyond a certain limit to change the focal length of eye lens. The objects kept very close to our eye cannot be focused by ciliary muscles.

Q18. *What is night blindness and colour blindness?*

Ans. When a person lacks rod cells in retina he is not able to see the objects clearly in less/dim light, such a defect is called night blindness.

When a person lacks cone cells in retina he is not able to see/distinguish between different colours, such a defect of eye is called as colour blindness.

Q19. *What is myopia? How can it be corrected?*

Ans. Myopia is an eye defect also called short-sightedness. In this type of defect person can see nearby objects clearly but cannot see far off objects clearly. It may be caused due to the increase in the size of eye ball or due to the decrease in the focal length of the eye lens.

Correction–It can be corrected by using concave lens of appropriate focal length.

Q20. *What is hypermetropia? How can it be corrected?*

Ans. Hypermetropia is an eye defect also called as long-sightedness. Person can see a far off objects but cannot see nearby objects. It is because the image is formed beyond retina.

Cause – (*a*) The focal length of the eye lens is too long.

(*b*) The eyeball has become too small.

Correction: It can be corrected by using convex lens of appropriate power.

Q21. *What is presbyopia? How can it be corrected?*

Ans. Presbyopia is caused due to decrease in the power of accommodation of the eyes due to ageing and weakening of ciliary muscles diminishing flexibility of eye lens. A person with this defect cannot see nearby as well as far off objects clearly.

Correction: It can be corrected by using bi-focal lens with both concave and convex lens in it.

Q22. *Why does the sky appears blue during day time, red during sunrise and sunset and black to an astronaut.*

Ans. Sky appears blue during day time because the light of sun gets scattered and the most scattered light is blue, so the sky appears blue.

During evening and early morning when the sun is not over head but it is below the horizon, the only light that reaches our eye is red and hence the sky appear to be reddish in colour.

For an astronaut the sky appears to be black because there is no atmosphere that can refract the light.

Q23. *Give the difference between myopia and hypermetropia.*

Ans.

S.No.	*Myopia*	*Hypermetropia*
1.	Short-sightedness—can see nearby object but cannot see far off objects.	Long-sightedness—can see far off objects but cannot see nearby objects.
2.	Image is formed in front of retina.	Image is formed beyond retina.
3.	The size of eyeball increases.	The size of eyeball decreases.
4.	Focal length of eye lens decreases.	Focal length of eye lens increases.
5.	Corrected by using concave lens.	Corrected by using convex lens.

Q24. *Distinguish between presbyopia and hypermetropia.*

Ans.

S.No.	*Hypermetropia*	*Presbyopia*
1.	Only far-sightedness.	It can be only far-sightedness or both far and short-sightedness.
2.	Eye ball becomes short or the focal length increases.	Ciliary muscles become weak and able to adjust the focal length.
3.	Corrected by using convex lens.	Corrected by using bifocal lens.

Q25. *The near point of hypermetropic eye is 80 cm. What is the nature and power of the lens required to enable him to read a book placed at 25 cm from the eyes?*

Ans. Near point = 80 cm

Object distance u = – 25 cm

v = – 80 cm (convex lens in case of hypermetropia)

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$= \frac{1}{(-80)} - \frac{1}{(-25)}$$

$$\therefore \quad \frac{1}{f} = \frac{-1}{80} + \frac{1}{25} = \frac{-5+16}{400}$$

$$\frac{1}{f} = \frac{+11}{400}$$

$$\therefore \quad f = \frac{400}{11} = 36.36 \text{ cm}$$

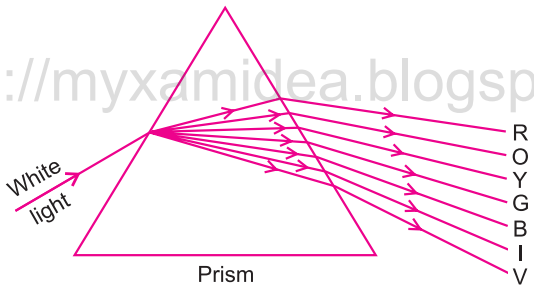
$$f = 0.36 \text{ m}$$

Power of lens P $= \frac{1}{f} = \frac{1}{0.36} = 2.7$ D

Q26. *What is meant by dispersion of white light? Draw a ray diagram to show the dispersion of white light by a glass prism. Give reason why do we get different colours of light?*

Ans. **Dispersion of light:** The splitting of white light into seven colours on passing through a transparent medium like glass prism is called dispersion of light.

Diagram : Dispersion of light



We get different colours because each colour of light has different bending ability when they pass through the glass prism.

Q27. *A student can see objects clearly only when the objects are lying at distances between 60 cm and 320 cm from the eye.*

(a) What kind of eye defect he is suffering from?

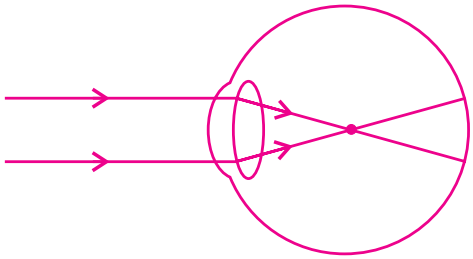
(b) What kind of lens will be required to increase his range from 25 cm to infinity? Explain briefly.

Ans. Student is suffering from myopia. It can be corrected by using concave lens of appropriate focal length and power. The light rays meet before retina and hence concave lens will help the rays to diverge further and help them in meeting on retina.

Q28. *When we see any object through the hot air over the fire, it appears to be wavy, moving slightly. Explain.*

Ans. The objects beyond the hot air appears to be wavy because the medium for light to pass through changes, the light passes from denser to rarer and then again to denser medium thereby causing refraction in the air. Moreover the refractive index of the hot air keeps changing which leads to give the wavy appearance of the object.

Q29. *Study the diagram given below and answer the questions that it follows:*



(*a*) *Name the defect and give reason.*

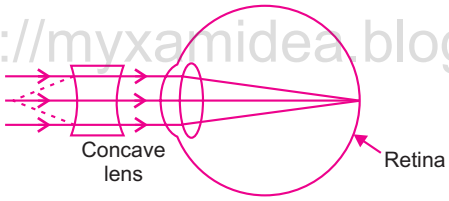
(*b*) *Give 2 causes for this defect.*

(*c*) *Give the correction – draw diagram for the same.*

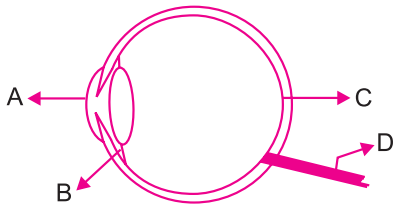
Ans. (*a*) The defect is myopia, short-sightedness

(*b*) It is caused due to the decrease in the focal length of the eye lens and increase in the size of the eye ball.

(*c*) The defect can be corrected by using the concave lens.



Q30. *In the given diagram label A, B, C and D and give the function of B and D.*



Ans. A = Cornea

B = Ciliary muscles

C = Retina

D = Optic nerve

Function of B and D are:

B : Ciliary muscles: It helps in holding the eye lens and changing or adjusting the focal length of the lens.

D : Optic nerve: It sends the electrical signal from retina to the brain.

Q31. *Near point of a hypermetropic eye is at 1 m. Find the focal length, power and nature of lens used to correct this defect.*

Ans. Near point of hypermetropic eye is 1 m *i.e.*, 100 cm. The eye cannot see objects between 100 cm and 25 cm.

$$u = -25 \text{ cm}$$

$$v = -1 \text{ m} = -100 \text{ cm}$$

$$\therefore \quad \frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$= \frac{-1}{100} - \frac{1}{(-25)}$$

$$= -\frac{1}{100} + \frac{1}{25}$$

$$\frac{1}{f} = \frac{-1+4}{100} = \frac{3}{100}$$

$$\therefore \quad f = \frac{100}{3} \text{ cm} = \frac{1}{3} \text{ m}$$

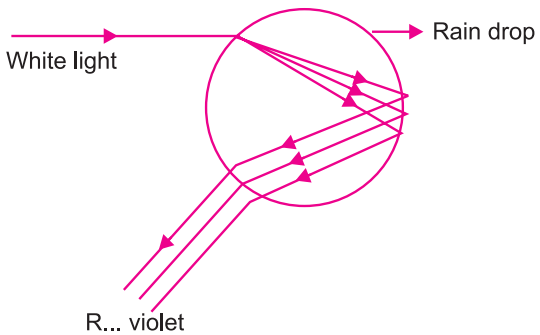
$$P = \frac{1}{f} = \frac{1}{1/3} \text{m}$$

$$\therefore \quad P = +3 \text{ Dioptre}$$

Convex lens of power 3D is used to correct this defect.

Q32. *Draw a labelled diagram of rainbow formation. Also explain the phenomenon of rainbow formation.*

Ans.



When sun light splits due to water drops suspended in air, causing the band of seven colours is called rainbow.

Water droplets acts as tiny prism in the sky. The sunlight when enters these tiny droplets undergo internal reflection and also refract these rays which are dispersed causing a band of seven colours called rainbow.

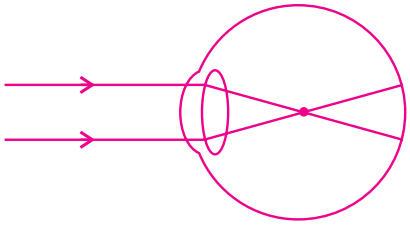
Rainbow is always formed in the direction opposite to the sun.

Q33. (*a*) *Draw a diagram to show the formation of image of a distant object by a myopic eye. How can such an eye defect be remedied?*

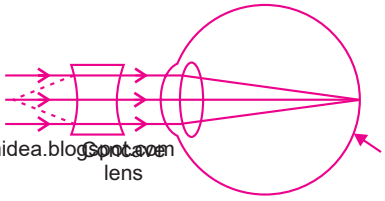
(*b*) *State two reasons due to which this eye defect may be caused.*

(*c*) *A person with a myopic eye cannot see objects beyond a distance of 1.5 m. What would be the power of the corrective lens used to restore proper vision?* (CBSE 2008)

Ans. (*a*) Object at infinity, image is formed in front of retina.



Corrected by concave lens



(*b*) Myopia is caused due to:

(*i*) Elongation of eye ball

(*ii*) Excessive curvature in cornea, focal length decreases.

(*c*) Far point of myopic eye is 1.5 m = u

to change far point to infinity = v

focal length of power → P = ?, F = ?

$$\therefore \quad \frac{1}{f} = \frac{1}{v} - \frac{1}{u} \quad \text{(Lens formula)}$$

$$\frac{1}{f} = \frac{1}{-1.5} - \frac{1}{-\infty} = -\frac{1}{1.5\ \text{m}}$$

$$\therefore \quad f = -1.5\ \text{m}$$

$$\text{P} = \frac{1}{f} = \frac{1}{-1.5} = 0.67 \text{ dioptre.}$$

Q34. *Why is red colour selected for danger signal lights?* (CBSE 2008)

Ans. Red colour light has maximum wavelength, it does not scatter due to atmosphere and reaches our eyes, travels fast and hence used for danger signals.

Q35. (*a*) *What is meant by dispersion of white light? Describe the formation of rainbow in the sky with the help of a diagram.*

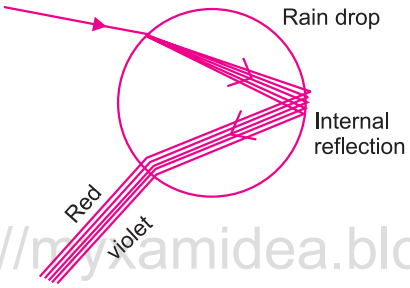
(*b*) *What is hypermetropia? Draw ray diagrams to show the image formation of an objects by*

(*i*) *hypermetropic eye*

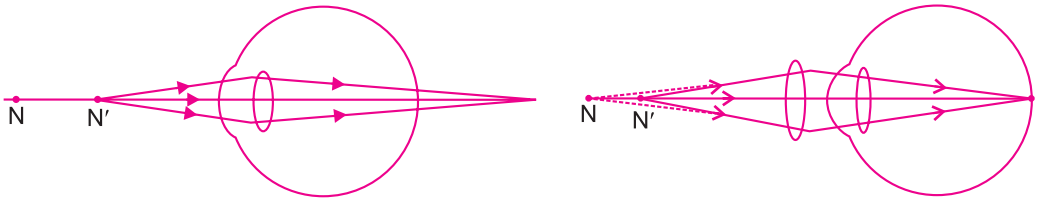
(*ii*) *Correction made with a suitable lens for hypermetropic eye.* (AI CBSE 2008)

Ans. (*a*) The splitting of white light into its constituent seven colours is called dispersion of light.

Rainbow formation in the sky: The water droplets suspended in the atmosphere after rain causes the splitting of sunlight by acting as small prism. The light enters the water droplets, refracts, splits and shows internal reflection. The red colour band is wider than violet or blue colour.



(*b*) **Hypermetropia:** Also called long-sightedness. Person can see long distant objects but cannot see nearby objects distinctly. This is because the eye ball becomes smaller, focal length increases. It can be corrected by using converging lens called convex lens.



(*i*) Hypermetropic eye (*ii*) correction of hypermetropia eye

Q36. (*a*) *Give reasons for the following:*

(*i*) *Colour of the clear sky is blue.*

(*ii*) *The sun can be seen about two minutes before actual sunrise.*

(*iii*) *We cannot see an object clearly if it is placed very close to the eyes.*

(*b*) *What is presbyopia? Write two causes of this defect.* (AI CBSE 2008)

Ans. (*a*) (*i*) Clear sky appears blue because the white light of sun when enters the earth's atmosphere the large number of molecules present in the earth's atmosphere scatter the light. As blue light scatters the maximum it reaches our eyes.

(*ii*) The sun is visible to us 2 minutes before the actual sunrise because of atmospheric refraction. When the sun is below the horizon, the light travelling from rarer to denser medium bends and reaches our eyes creating an impression that it is above the horizon.

(*iii*) A normal human eye has a near point of 25 cm, anything closer to it is not seen clearly.

(*b*) **Presbyopia:** This defect is caused due to ageing. The person suffering from this disease cannot see nearby as well as far off objects. It is caused due to weakening of ciliary muscles. The lens is not able to change the focal length. It can be corrected by using bi-focal lens.

Q37. (*a*) *What is hypermetropia?*

(*b*) *What are the two causes of the defect of vision?*

(*c*) *How can this defect of the eye be corrected? Illustrate your answer by drawing ray diagrams to show the formation of image by*

(*i*) *a hypermetropic eye*

(*ii*) *a hypermetropic eye corrected with a suitable lens.* (CBSE 2008 F)

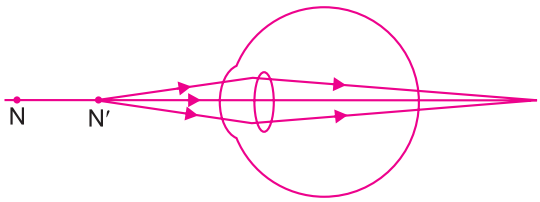
Ans. (*a*) **Hypermetropia:** It is also called long-sightedness. The person with this eye defect can see far off objects but cannot see nearby objects clearly. The image is formed beyond retina.

(*b*) **Two causes**

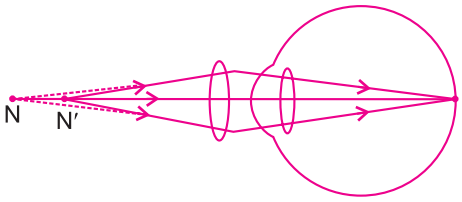
(*i*) Focal length of the lens increases

(*ii*) Eye ball becomes smaller

(*c*) **Correction:** It can be corrected by using a convex lens. It is a converging lens which shifts the image of the object on the retina.



A Hypermetropic eye



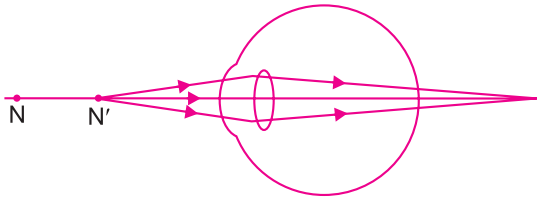
Correction of hypermetropia eye

Q38. *Study the diagram given below and answer the question that it follows:*

(*a*) *Which defect of vision is represented in this case? Give reason for your answer.*

(*b*) *What could be the two causes of this defect?*

(*c*) *With the help of a diagram show how this defect can be corrected by the use of a suitable lens.* (CBSE 2008 C)



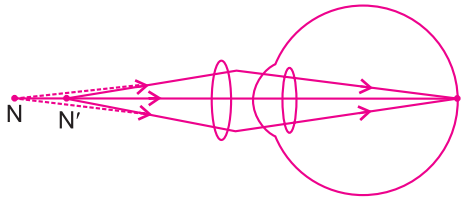
Ans. (*a*) The defect is hypermetropia, as the image of near point is formed beyond retina.

(*b*) Two causes of the defect are:

(*i*) Size of eye ball decreases.

(*ii*) Focal length of the lens increases.

(*c*) This defect can be corrected by using a convex lens of suitable focal length.



Q39. *Why does sky look blue on a clear day?*

Ans. White light scatters due to atmospheric refraction. White light is made up of seven colours out of which, blue light scatters the most hence the sky looks blue.

Q40. *What is hypermetropia? State the two causes of hypermetropia. With the help of ray diagram show:*

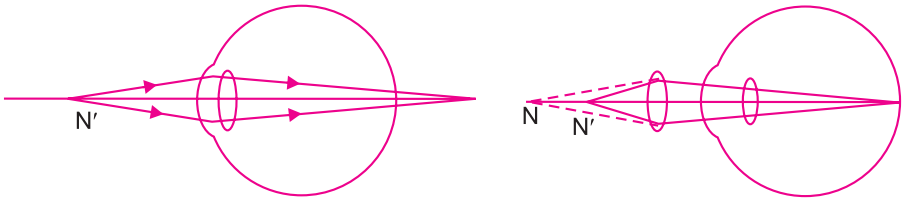
(i) the eye defect hypermetropia.

(ii) correction of hypermetropia by using a lens. (CBSE 2009)

Ans. **Hypermetropia:** Defect of a vision in which a person can see distant objects clearly but cannot see nearby objects clearly.

Causes: (*a*) Focal length of the eye lens is too large.

(*b*) Eye ball has become too small.



Q41. (*a*) *What is myopia? State the two causes of myopia and with the help of a labelled ray diagrams show:*

(i) the eye defect myopia.

(ii) correction of myopia using a lens.

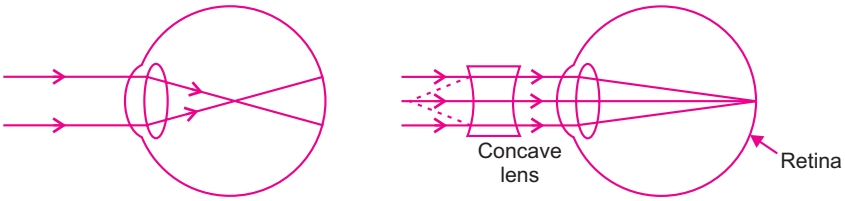
(*b*) *Why is the normal eye unable to focus on an object placed within 10 cm from the eye?* (AI CBSE 2009)

Ans. (*a*) Myopia or short-sightedness—Eye can see objects at short distance. Inability of the eye in viewing long distant objects. The image falls before retina.

Causes: (*i*) Elongation of eye ball.

(*ii*) Excessive curvature in cornea.

Correction: By using concave lens (diverging lens), which shifts the image to the retina by diverging the rays further.



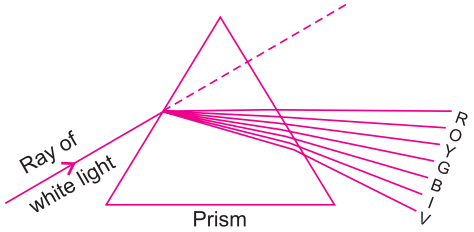
(*b*) The near point of human eye is 25 cm which cannot be changed further hence the objects within 10 cm of the eye cannot be viewed.

Q42. (*a*) *What is dispersion of white light? What is the cause of such dispersion? Draw a diagram to show the dispersion of white light by a glass prism.*

(*b*) *A glass prism is able to produce a spectrum when white light passes through it but a glass slab does not produce any spectrum. Explain why?* (AI CBSE 2009)

Ans. (*a*) Dispersion of white light is splitting of light into its seven constituent colours forming a band of VIBGYOR called spectrum.

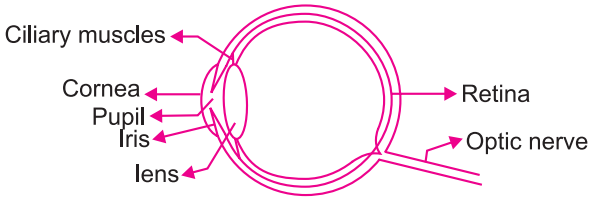
Cause: White light is made up of seven colours, each colour has different speed in different media. Due to different speed, the bending ability varies and the colour



(*b*) Dispersion does not take place in glass slab as two refracting surfaces are parallel. The light does not split into its constituent colours.

IV. LONG ANSWER TYPE QUESTIONS (*5 Marks*)

Q1. *Draw a neat labelled diagram of human eye and explain the working of each part of it.*



Ans. **Working of Human eye**

Human eye consists of various parts which helps us in seeing the objects, the function of various parts are:

(*a*) **Cornea:** It is the transparent membrane which refracts the light entering our eye.

(*b*) **Iris:** Iris controls the size of pupil.

(*c*) **Pupil:** It allows the light entering our eye to pass through it.

(*d*) **Lens:** Adjusts the focal length of the eye to see the objects at different places.

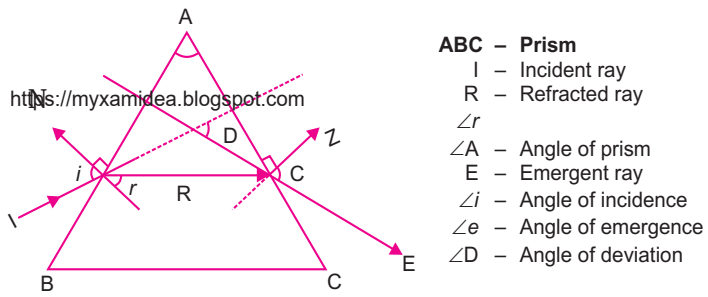
(*e*) **Ciliary muscles:** Helps in changing the focal length of the lens.

(*f*) **Retina:** It is the screen of the eye on which image is formed. It consists of rods and cones.

(*g*) **Optic nerve:** It carries the electrical signals from retina to brain.

Q2. *Describe with the help of diagram, how the refraction of light takes place through a glass prism.*

Ans.



The incident ray I when enters the prism it gets refracted, bends and form $\angle r$ with the normal. Angle of refraction is smaller than the angle of incidence. The incident ray bends towards the normal, as it passes from rarer medium to denser medium. When this refracted ray passes from denser medium to rarer medium it bends away from the normal. This emergent ray has bent out at an angle to the direction of incident ray. This angle is called the angle of deviation $\angle$D.

Q3. *Name three refractive defects of vision with the help of diagram. Explain the reasons and correction of these defects.*

Ans. The three refractive defects of vision are

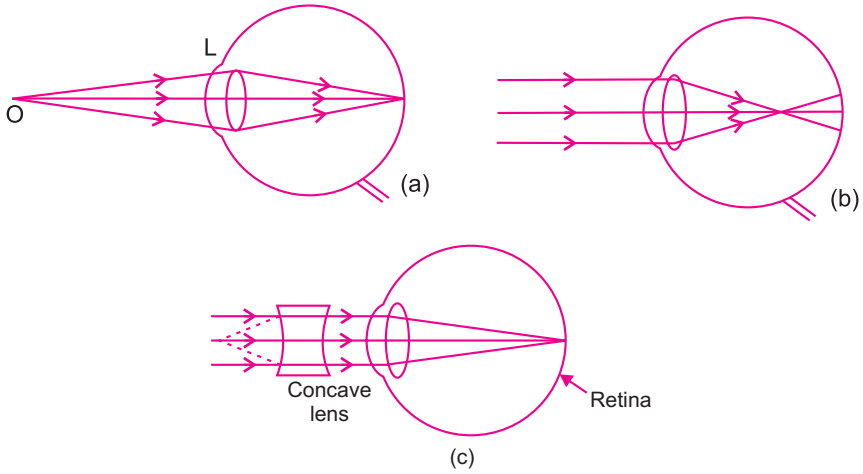
(I) Myopia

(II) Hypermetropia

(III) Presbyopia

(I) Myopia is short-sightedness, the image is formed in front of retina due to the elongation of the eye ball or due to decrease of focal length.

Correction – Using concave lens.



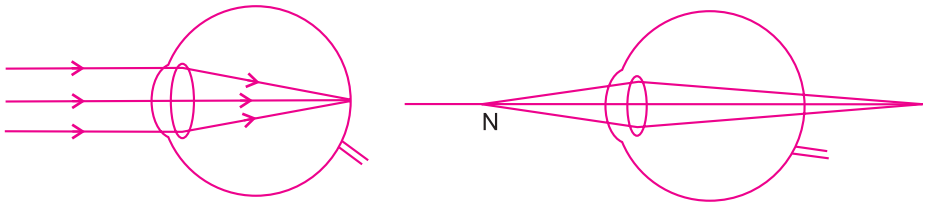
(*a*) Normal eye.

(*b*) Myopic eye, the image is formed in front of retina.

(*c*) Concave lens is used to correct the defect.

(II) Hypermetropia is long-sightedness, the image is formed behind the retina due to shortening of eyeball or due to increase in the focal length of the lens of eye.

Correction: Using convex lens.



Person cannot see nearby objects clearly.

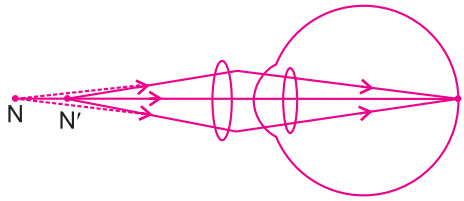


Fig. (*a*) Normal eye, (*b*) Hypermetropia eye, (*c*) Convex lens is used to correct the defect.

(III) Presbyopia: It is the defect of an eye in which the power of accommodation of the eye usually decreases with ageing. Near point changes as well as the far off objects are also not visible clearly. It is caused due to the weakening of ciliary muscles and the reduced flexibility of eye lens.

Such a defect in which a person suffers from both myopia and hypermetropia is called presbyopia. It is corrected by using bifocal lens.

V. QUESTIONS ON HIGH ORDER THINKING SKILLS (HOTS)

Q1. *How does the size of particles present in medium produce different colours of light by its scattering property?*

Ans. The colour of the scattering light in a medium depends on the size of the scattering particles.

(*i*) If the size of particles is very small, it will scatter mainly blue light.

(*ii*) If the size of particles is larger then it will scatter light of longer wavelength i.e., red.

(*iii*) If the size of scattering particles is larger enough, the light appears to be white.

Q2. *Give one use of the following properties of light:*

(*i*) *Scattering of light* (*ii*) *Persistence of vision*

(*iii*) *Power of accommodation* (*iv*) *Refraction of light*

(*v*) *Reflection of light*

Ans. (*i*) Due to scattering of light we can see the different colours of sky and rainbow formation.

(*ii*) Used in cinematography.

(*iii*) Eye can see both nearby and far off objects from same point.

(*iv*) We can see through lenses, eye defects can be corrected, we can see under water.

(*v*) Our eyes can see object only due to reflection of light by the object into our eyes.

Q3. *To correct myopia why we use concave lens and to correct hypermetropia, why do we use convex lens? Why can't we do vice-versa?*

Ans. Myopia is a defect in which the image is formed in front of retina. We need to use diverging lens so that it can further diverge the light rays before it enters our eye and make it possible to meet on the retina.

In case of hypermetropia, the image is formed beyond retina, we need to use convex lens so as to converge the rays and make it possible for the rays to meets on the retina.

Q4. *In presbyopia, we use bi-focal lens with upper portion concave lens and lower portion convex lens. Why is the arrangement so?*

Ans. The upper portion is concave lens so that our eyes can see the distant objects. When the rays come parallel from infinity it will pass through the upper part of spectacles. Whereas for the lower part consists of convex lens which facilitates our eye to see the near objects.

Q5. *Why does light splits into spectrum when it passes through prism only and does not split when it passes through glass slab?*

Ans. Rectangular glass slab has parallel refracting surfaces, the emergent ray is parallel to the incident ray. It slightly gets displaced laterally. While in case of prism the surface is not parallel and the light ray gets deviated at larger angle due to which it splits into its constituent colour.

VI. VALUE-BASED QUESTION

Q1. *Rohan's father is an eye surgeon. He persuaded his father to put a camp in his society for educating people on eye-donation. Rohan made a banner. One donation can give eye-vision to two blind persons.*

(*a*) *Name the part of the eye that is used during eye transplant.*
(*b*) *Name the defect that can be corrected by this transplant.*
(*c*) *What value of Rohan is reflected?*

Ans. (*a*) Cornea is used for eye transplant.
(*b*) Defects caused due to cornea can be corrected by eye donation.
(*c*) Rohan shows sympathy, compassion and empathy in his behaviour.

TEST YOUR SKILLS

Q1. *Draw a neat labelled diagram of human eye.*
Q2. *Define cornea.*
Q3. *Give one main difference between rods and cones.*
Q4. *What is colour blindness?*
Q5. *What is dispersion of white light?*
Q6. *What is myopia? How it can be corrected?*

❐❐❐

15 Our Environment

SYLLABUS

Eco-system, Environmental problems, Ozone depletion, waste production and their solutions, Biodegradable and non-biodegradable substances.

Facts that Matter

1. **Biodegradable substances:** Substances which can be broken down by the action of bacteria and other saprophytes. *E.g.,* paper, cloth, vegetable and plants matter.
2. **Non-Biodegradable substances:** Substances which cannot be broken down by the action of bacteria and other saprophytes. *E.g.,* glass, plastics and metal.
3. All biotic and abiotic components and their interaction make the ecosystem.
4. The biotic components of an ecosystem are all the living organisms. The non-biotic components are the physical factors like temperature, rainfall, wind, soil and minerals. *E.g.,* forests, ponds, lakes and deserts are natural ecosystems.
5. (*a*) Green plants and algae that make food by photosynthesis are called **Producers.**
   (*b*) Organisms that depend on producers for food either directly or indirectly are called **Consumers.**
   (*c*) Microorganisms like bacteria and fungi that breakdown the complex organic substances present in dead plant and animal matter into simple inorganic substances are called **Decomposers.**

FOOD CHAINS AND WEBS

1. The series of organisms that take part in transferring food energy from producers → Consumers → Decomposers is called food chain.
2. Every step of food chain is called trophic level.

Producers/Autotrophs	–	I trophic level
↓		
Primary Consumers/Herbivores	–	II trophic level
↓		
Secondary Consumers/Small carnivores	–	III trophic level
↓		
Tertiary Consumers/Large carnivores	–	IV trophic level

3. In the flow of energy between the different trophic levels, it has been found that:-
   (*a*) Green plants convert 1% of solar energy into food energy.
   (*b*) Only 10% of the energy is transferred from one trophic level to another and 90% energy is lost as heat, in doing work, in growth and reproduction.
   (*c*) As only 10% of energy at each trophic level is transferred to the next, so food chain generally have only 3–4 trophic levels.
   (*d*) The number of organisms gradually decreases from one trophic level to another.
   (*e*) Food chain link with each other to form food web.
4. The flow of energy is unidirectional.
5. The pesticides and chemicals are absorbed by plants from the soil and enter the food chain. Being non-biodegradable, they accumulate progressively at each trophic level. As human occupy the top level of any food chain, so the maximum concentration of chemicals is found in our bodies. This is called biological magnification.
6. Ozone in the higher level of atmosphere blocks the UV radiation.
7. Ozone is a product of UV radiation.

$$O_2 \xrightarrow{\text{UV rays}} O + O$$
$$O + O_2 \longrightarrow O_3$$

   At high level in the atmosphere the UV rays split the oxygen molecules to form oxygen atoms. These combine with the oxygen molecules to form ozone.

8. Ozone causes skin cancer, cataract and reduced crop production.

NCERT IN-TEXT ACTIVITIES SOLVED

ACTIVITY 15.1

- Collect waste materials from your homes. This could include all the waste generated during a day, like kitchen waste (spoilt food, vegetable peels, used tea leaves, milk packets and empty cartons) waste paper, empty medicine bottles/strips/bubble packs, old and torn clothes and broken footwear.
- Bury this material in a pit in the school garden or if there is no space available, you can collect the material in an old bucket/flower pot and cover with at least 15 cm of soil.
- Keep this material moist and observe after every 15 days.
- What are the materials that remain unchanged over long periods of time?
- What are the materials which change their form and structure over time?
- Of these materials that are changed, which ones change the fastest?

Ans. • The materials that remain unchanged over long periods of time are empty medicine bottles, bubble packs, milk packets, broken footwear.
- The materials that change their form are rubber, food, vegetable peels, used tea leaves, empty cartons, waste paper, old and torn clothes, broken footwear if made of leather.
- Out of these the materials that are changed very fast are vegetable peels, used tea leaves and spoilt food.

ACTIVITY 15.2

- Substances that are broken down by biological processes are said to be biodegradable. For example, kitchen waste, vegetables and fruits waste, etc.
- Substances that cannot be broken down by biological processes are said to be non-biodegradable. For example, plastic bottles, polythene bags, etc.
- Some of the non-biodegradable substances are expected to last for hundreds of years without undergoing any changes.
- Biodegradable plastics made with plant based material is available in market. But these plastics also require specific time and condition to biodegrade properly. So if it is not used judiciously and properly it can also cause havoc which may be more than the conventional plastics.

ACTIVITY 15.3
Design an aquarium

- Things required for making an aquarium are a big jar of glass, water, oxygen, food, algae.
- We can provide oxygen through an oxygen pump (aerator) and fish food from market.
- On adding a few aquatic plants and animals it can become a self-sustaining system.
- Aquarium is a self-sustaining man made ecosystem.
- The aquarium cannot be left as it is. It needs to be cleaned once in a while.
  We need not clean the ponds or lakes in the same manner because it contains decompos
  inorganic substance.

ACTIVITY 15.4

- While creating an aquarium care need to be taken not to put any aquatic animal which would eat others, if kept all small animals would be eaten by big animals
- In Pond/Lakes/River.

  Green algae/Plants $\longrightarrow$ Small fish $\longrightarrow$ Big fish
  Producers Primary consumers Secondary consumers
- Yes, the group producers are of primary importance as they are the ultimate producers for all trophic level.

ACTIVITY 15.5

- Pesticides sprayed on farms to protect the crops from pests enter the grains and when consumed by consumers from one tropic level to the other. It gets accumulated in the highest organism.
- To reduce the intake of pesticide we must use the pesticides judiciously on crop plants. We should use alternate biological method to control pests.

ACTIVITY 15.6

- Chemicals responsible for depletion of ozone layer is CFC (Chlorofluorocarbons).
  The regulations put in place to control the emission of these chemicals have succeeded in reducing the damage to the ozone layer. The size of the ozone layer has become smaller in the recent years.

ACTIVITY 15.7

- Waste generated at home is collected and thrown in garbage house.
  Over here the segregation of biodegradable and non-biodegradable materials takes place. All substances that can be recycled are segregated and sent for recycling.
  Those substances which cannot be recycled are kept in the garbage house.
- Municipal corporation deals with this waste by collecting it and sending it for recycling and decomposing the bio-degradable waste and by land filling with those waste items which cannot be recycled nor are biodegradable.

ACTIVITY 15.8–15.10

All research work at class and house level will be conducted by the student to get the answers.

NCERT IN-TEXT QUESTIONS SOLVED

Q1. *Why are some substances biodegradable and some non-biodegradable?*

Ans. Substances which can be decomposed and broken down to simpler substances by micro-organisms acting on it is called bio-degradable and those substances which cannot be acted upon by micro-organisms and are not broken down into simpler substances are called non-biodegradable substances.

Q2. *Give any two ways in which bio-degradable substances would affect the environment.*

Ans. Two ways in which bio-degradable substances would affect the environment are:

(*i*) During decomposition of the substances lot of foul smell spreads in the surrounding areas.

(*ii*) The place where these bio-degradable substance are present with some moisture becomes breeding ground for insects like mosquitoes, housefly which are vectors in carrying parasites that cause different diseases.

Q3. *Give any two ways in which non-biodegradable substances would affect the environment.*

Ans. (*i*) The non-biodegradable substances get accumulated and doesn't get decomposed hence it remains in the ecosystem and causes pollution, chokes the system of many animals and kill them.

(*ii*) These substances due to accumulation cause water and soil pollution *e.g.,* pesticides, detergents, polythene.

Q4. *What are trophic levels? Give an example of a food chain and state the different trophic levels in it.*

Ans. The various levels or stages in a food chain at which the transfer of food takes place is called trophic level, *e.g.,* food chain.

Grass → Grasshopper → frog → snake → peacock

Grass — Producer — I trophic level.

Grasshopper	—	I Consumer (Herbivores)	—	II trophic level.
Frog	—	II Consumer (Carnivores)	—	III trophic level
Snake	—	III Consumer (Carnivores)	—	IV trophic level
Peacock	—	IV Consumer (Carnivores)	—	V trophic level.

Q5. *What is the role of decomposers in the ecosystem?*

Ans. Decomposers breakdown the complex organic substances like plant's and animal's dead body and convert them into simpler inorganic substances.

All the elements that are present in the body on which decomposers act is released back to the nature. Decomposers maintain balance in the nature and plays an important role in the environment.

Q6. *What is ozone and how does it affect any ecosystem?*

Ans. Ozone is a molecule of oxygen with 3 atoms its formula is O_3. The ultra violet radiations split oxygen into free oxygen atoms, these atoms combine with oxygen molecules to form ozone.

$$O_2 \xrightarrow[\text{rays}]{\text{UV}} O + O$$

$$O_2 + O \longrightarrow O_3(\text{Ozone})$$

Ozone in Ecosystem:

At ground level ozone is poisonous but at higher level it is very useful as it protects all living organisms from harmful UV radiations of the sun. It doesn't allow the ultra violet radiations to enter the surface of earth. The UV radiations cause ionizing effect that leads to skin cancer in human beings.

Q7. *How can you help in reducing the problem of waste disposal? Give any two methods.*

Ans. To reduce the problem of waste disposal we can

(*i*) Segregate the bio-degradable waste from non-biodegradable waste before dumping it.

(*ii*) Remove all materials which can be recycled and send it for recycling. *e.g.,* paper, glass, metal, rubber.

QUESTIONS FROM NCERT TEXTBOOK

Q1. *Which of the following groups contain only biodegradable items?*

(*a*) *Grass, flowers and leather* (*b*) *Grass, wood and plastic*

(*c*) *Fruit-peels, cake and lime-juice* (*d*) *Cake, wood and grass*

Ans. (*a*), (*c*) and (*d*).

Q2. *Which of the following constitute a food-chain?*

(*a*) *Grass, wheat and mango* (*b*) *Grass, goat and human*

(*c*) *Goat, cow and elephant* (*d*) *Grass, fish and goat*

Ans. (*b*) Grass, goat and human

Q3. *Which of the following are environment-friendly practices?*

(*a*) *Carrying cloth-bags to put purchases in while shopping*

(*b*) *Switching off unnecessary lights and fans*

(*c*) *Walking to school instead of getting your mother to drop you on her scooter*

(*d*) *All of the above*

Ans. (*d*) All of the above

Q4. *What will happen if we kill all the organisms in one trophic level?*

Ans. If all the organisms in one trophic level are killed then all the organisms of next trophic level which are dependent on these are killed. Next trophic levels will not get food to eat and the entire food chain gets disturbed. At the same time the organisms at the lower trophic level will reproduce and the population will increase in abundance there by disturbing the ecosystem.

Q5. *Will the impact of removing all the organisms in a trophic level be different for different trophic levels? Can the organisms of any trophic level be removed without causing any damage to the ecosystem?*

Ans. The impact of removing all the organisms in a trophic level will be same. If the organisms of any trophic level be removed it will certainly damage the ecosystem.

For example,

Grass → Grass hopper → Frog → Snake → Peacock

In this if all grasshoppers are killed/removed frogs will strive and grass will reproduce in abundance.

If snakes are removed then the number of frogs will increase which will disturb the entire ecosystem.

Q6. *What is biological magnification? Will the levels of this magnification be different at different levels of the ecosystem?*

Ans. The pesticides and chemicals are absorbed by plants from the soil and enter the food chain. Being non-biodegradable they accumulate progressively at each trophic level. As human occupy the top level of any food chain, the maximum concentration of chemicals is found in our bodies. This is called biological magnification.

The level of magnification will be different at different trophic levels, the maximum concentrations will be at the highest trophic level and the chemical will be less at lower trophic levels.

Q7. *What are the problems caused by the non-biodegradable waste that we generate?*

Ans. (*i*) As the non-biodegradable waste cannot be broken down into simpler forms hence they keep on accumulating in nature causing pollution.

(*ii*) They cause diseases.

(*iii*) It also causes biological magnification.

Q8. *If all the waste we generate is bio-degradable, will this have no impact on the environment?*

Ans. If all the waste we generate is bio-degradable and is managed in such a way that it is allowed to decompose then it will have no impact on the environment.

Q9. *Why is damage to the ozone layer a cause for concern? What steps are being taken to limit this damage?*

Ans. Ozone layer in the strastosphere is very helpful in shielding harmful UV rays. In absence of ozone layer heavy damage to organism may occur. It may cause diseases like skin cancer, cataract, reduced crop production etc.

The damage is limited by UNEP (United Nations Environment Programme), it has forged an agreement to freeze for CFC production in 1986.

CFC– Chlorofluorocarbons used as refrigerants and in fire extinguishers.

MORE QUESTIONS SOLVED

I. MULTIPLE CHOICE QUESTIONS

1. Name the thing in our body which helps us to digest food?
(*a*) hormone (*b*) enzymes
(*c*) stomach (*d*) mouth

2. Which human-made material cannot be broken down by the action of bacteria?
(*a*) human flesh (*b*) flesh of dead animal
(*c*) vegetable peels (*d*) plastic

3. Which of the following is an example biodegradable substance?
(*a*) Glass (*b*) Plants
(*c*) Plastics (*c*) Polythene

4. Which of the following is an example non-biodegradable substance?
(*a*) Virgin plastic (*b*) Plastic
(*c*) Plants (*d*) Plant products

5. Which of the following actions may not affect the environment in worse?
(*a*) Plastic bags buried inside the earth.
(*b*) Planting of trees
(*c*) Excessive use of non-biodegradable pesticides
(*d*) Burning of plastic bags.

6. Which of the following constituents do not form ecosystem?
(*a*) Biotic constituents (*b*) Plastic bags
(*c*) Abiotic constituents (*d*) All of these

7. Which of the following is an example of human made ecosystem?
(*a*) Aquarium (*b*) Sunlight
(*c*) Wind (*d*) Water

8. Which of the following is a functional unit of environment?
(*a*) Ecosystem (*b*) Nitrogen
(*c*) Carbon (*d*) Oxygen

9. Which of the following is an example of producers?
(*a*) Plastic pens (*b*) Plastic cans
(*c*) Polythene (*d*) Green plants

10. Which of the following is an example of herbivores?
(*a*) Cow (*b*) Shark
(*c*) Lion (*d*) Tiger

11. Which of the following is the full form of CFC?
(*a*) Chlorofluorine carbon (*b*) Carbonchlorofluorine
(*c*) Chlorinfluid carbon (*d*) Chlorofluorocarbon

12. Which of the following is not an example of abiotic factors?
(*a*) Light (*b*) Plants
(*c*) Heat (*d*) Temperature

13. Which of the following is the full form of UNEP?
(*a*) United Kingdom of Africa (*b*) United State of America
(*c*) United Nations Environment programme (*d*) Union English programme

14. Which of the following is not a biodegradable pollutant?
(*a*) Paper (*b*) Cotton cloth
(*c*) Cotton (*d*) DDT

15. Which of the following is terrestrial ecosystem?
(*a*) A natural forest (*b*) A lake
(*c*) A pond (*d*) An aquarium

16. Which of the following belong to same trophic level?
(*a*) Cockroach and spider (*b*) Lizard and spider
(*c*) Hawk and spider (*d*) Lizard and hawk.

17. By which way autotrophs convert energy of food?
(*a*) Solar energy to chemical energy (*b*) Bio-gas to chemical energy
(*c*) solar energy to bio-gas (*d*) Chemical energy to solar energy

18. Which of the following is omnivore?
(*a*) Lion (*b*) Hawks
(*c*) Jackal (*d*) Man

19. Which of the following is proper sequence of trophic levels?
(*a*) Producers, Herbivores, Top carnivores, Carnivores
(*b*) Top Carnivores, Carnivores, Herbivores, Producers
(*c*) Carnivores, Top Carnivores, Producers, Herbivores
(*d*) Herbivores, Carnivores, Producers, Top Carnivores

20. Which of the following is an example of food chain?
(*a*) Grass → Deer → Lion (*b*) Algae → Diatoms → Fish
(*c*) Fish → Deer → Algae (*d*) Grass → Frog → Birds

21. Which of the following is the formula of ozone?
(*a*) O_3 (*b*) O_2
(*c*) O_4 (*d*) O_6

22. How many atoms of oxygen are there in ozone?
(*a*) 3 (*b*) 4
(*c*) 2 (*d*) 1

23. What is the nature of ozone?
(*a*) It is deadly poisonous (*b*) It is fragrant
(*c*) It is smooth (*d*) It causes purple smoke

24. It which of the following devices CFC's are not produced?
(*a*) Refrigerators (*b*) Fire extinguishers
(*c*) Pressurized cans (*d*) Pencil

25. Which of the following in not an effect of ultraviolet radiations?
(*a*) Causes skin cancer (*b*) Causes sun burn
(*c*) Causes eye disease (*d*) Causes typhoid

Answers

1. (*b*)	**2.** (*d*)	**3.** (*b*)	**4.** (*b*)	**5.** (*b*)	**6.** (*b*)	**7.** (*a*)
8. (*a*)	**9.** (*d*)	**10.** (*a*)	**11.** (*d*)	**12.** (*b*)	**13.** (*c*)	**14.** (*d*)
15. (*a*)	**16.** (*d*)	**17.** (*a*)	**18.** (*d*)	**19.** (*b*)	**20.** (*a*)	**21.** (*a*)
22. (*a*)	**23.** (*a*)	**24.** (*d*)	**25.** (*d*)			

II. VERY SHORT ANSWER TYPE QUESTIONS (*1 Mark*)

Q1. *Name any two groups of producers.*

Ans. Plants and blue-green algae.

Q2. *Name two decomposers.*

Ans. Bacteria and fungi

Q3. *Write the two raw materials for making food, used by living organisms of first tropic level.*

Ans. CO_2 and Water

Q4. *Which component of sunlight is used for the formation of ozone?*

Ans. Ultra violet radiation.

Q5. *Name 4 abiotic components of any ecosystem.*

Ans. Temperature, rainfall, wind, soil.

Q6. *Name two natural ecosystem.*

Ans. Pond ecosystem and forest ecosystem.

Q7. *Name two artificial ecosystem.*

Ans. Garden and crop-field.

Q8. *What are consumers in the food chain?*

Ans. Those organisms which consume the food produced either directly from producers or indirectly by feeding on other organisms are called consumers.

Q9. *Name the natural cleansing agent in an ecosystem.*

Ans. Decomposers, scavengers

Q10. *Expand UNEP*

Ans. United Nations Environment Programme.

Q11. *Define biological magnification.*

Ans. The accumulation of chemicals in the bodies of the organism that belongs to the top most tropic level is called biological magnification.

Q12. *What is bad Ozone?*

Ans. Ozone at ground level is deadly poisonous and is called as bad Ozone.

III. SHORT ANSWER TYPE QUESTIONS (*2 or 3 Marks*)

Q1. *Why is plastic bag called non-biodegradable while paper is not?*

Ans. Plastic bag is not acted upon by decomposers as it cannot be broken down into simple components, so it is called non-biodegradable while paper gets decomposed.

Q2. *Differentiate between natural and artificial ecosystem.*

Ans.

Natural ecosystem	Artificial ecosystem
Naturally occurring ecosystem. *E.g.,* pond, grassland, forest	These are man-made ecosystem. *E.g.,* garden, aquarium, crop-field.

Q3. *Pesticides are useful to farmers yet considered as pollutants. Give reasons.*

Ans. Pesticides kill insects and pests thereby protecting the crops but these pesticides remain on the crops which enter the food chain and gets accumulated in the organisms

and reaches the top most trophic level that causes diseases. When washed away by rain, it causes pollution of water.

Q4. *Why decomposers are necessary in environment?*

Ans. Decomposers act on all biodegradable substances and break them into simple inorganic materials and maintain the balance of materials in the ecosystem and cleanse the environment.

Q5. *Give one advantage and one disadvantage of Ozone.*

Ans. Advantage of Ozone–When it is in the stratosphere it does not allow the ultraviolet radiations to reach the earth, as UV radiations cause skin cancer and cataract.

Disadvantage of ozone: On ground level ozone is poisonous gas.

Q6. *Give one example of grassland ecosystem and one example of pond ecosystem.*

Ans. **Grass land Ecosystem:** Grass → grasshopper → frog → snake → peacock.

Pond Ecosystem : Blue-green algae → small fish → big fish → birds

Q7. *Energy flow in a food chain is unidirectional. Explain.*

Ans. The energy from the sun flows into autotrophs and it passes to herbivores and then to carnivores. The energy does not revert from autotrophs to the solar input or from herbivores back to autotrophs. Hence the flow is unidirectional.

Q8. *State different types of consumers in an ecosystem.*

Ans. The consumers are herbivores, carnivores, omnivores, parasites, saprophytes and decomposers.

Q9. *Differentiate between biodegradable and non biodegradable substances.*

Ans. **Biodegradable:** These substances can be broken down by the action of saprotrophs and other agents, *e.g.,* paper, cloth.

Non biodegradable: These substances cannot be broken down by the action of saprotrophs, *e.g.,* glass, plastics.

Q10. *Define an ecosystem. Explain in detail about its various components.*

Ans. Ecosystem is defined as a well defined unit or area in an environment where biotic and abiotic components interact with each other to maintain balance in nature.

Biotic components – producers, consumers, saprotrophs.

Abiotic components – air, water, sunlight.

Q11. *What is a food chain? List its characteristics features.*

Ans. Food chain is defined as the phenomenon of transfer of energy through series of organisms falling on successive trophic levels.

Example: sun is the ultimate source of energy. Producers or green plants photosynthesize and utilize solar energy. Thereafter the energy is transferred to other successive levels.

Food chain can be depicted as follows:

Plants → grasshopper → frog → snake → decomposers

Q12. *Minimum energy is available at highest trophic level while maximum energy is at lowest level. Explain.*

Ans. Since non-biodegradable substances cannot be broken down into simpler forms hence they keep on accumulating in nature causing ecological imbalance.

Q13. *What is biological magnification?*

Ans. The accumulation of chemicals in the bodies of the organism that belongs to the top most tropic level is called biological magnification. As human beings occupy highest trophic level its maximum concentration was found in human beings only, which resulted in neurological disorders due to damaging of CNS (Central Nervous System).

Q14. *How is ozone layer important to us?*

Ans. Ozone is a pollutant at lower level of atmosphere but is very useful in shielding harmful UV rays. This layer is present in the stratosphere.

In absence of ozone layer heavy damage to organism may occur e.g. skin cancer, cataract etc.

Q15. *What is causing the damage to ozone layer?*

Ans. The CFC emission due to various industrial activities has caused damage to the Ozone layer and has contributed to global warming by allowing a major portion of UV rays to reach the earth's atmosphere through ozone holes.

Q16. *What are the problems caused by the non-biodegradable waste that we generate?*

Ans. Non-biodegradable waste doesn't decompose under the action of bacteria and other microorganisms.

- When these substances, e.g., polythene, plastics are buried under soil render that area barren and leads to soil pollution.
- These wastes don't burn completely in presence of oxygen and release toxic gases which causes air pollution.
- The substances may be harmful on accumulating in food chain like DDT due to biomagnification.

Q17. *Why is damage to ozone layer a cause for concern? What steps are being taken to limit this damage?*

Ans. Ozone layer doesn't allow harmful ultra violet rays of the sun to reach the earth's surface.

In order to stop further depletion of ozone layer we must scale down the use of CFC's in form of aerosols, refrigerants etc and check their release in the atmosphere.

Moreover stress should be laid on using eco-friendly techniques and proper disposal of toxic material.

Q18. *Why are bacteria and fungi called decomposers? List any two advantages of decomposers to the environment.* (CBSE 2008)

Ans. Bacteria and fungi are called decomposers as they break down the dead remains and waste of organisms. They convert the organic complex substance into simple inorganic substances that go into the soil and are used up by plants.

Two advantages of decomposers:

1. They return the components back to nature and creates balance in the environment.
2. They act as cleansing agents of the atmosphere.

Q19. (*a*) *Distinguish between producers and decomposers.*

(*b*) *Classify the following as producers and decomposers.*

Green plants, bacteria, fungi, blue-green algae. (CBSE 2008 F)

Ans. (*a*)

Producers	Decomposers
1. Producers convert simple inorganic substances into complex organic substances	Decomposers break the complex organic substances into simple inorganic substances.
2. Producers are autotrophs that can prepare food with CO_2, H_2O, chlorophyll and sunlight *e.g.,* green plants.	Decomposers decompose the complex substances present in the plants, animals *e.g.*, bacteria, fungi.

Q20. *Why is the ozone layer getting depleted at the higher levels of the atmosphere?* (CBSE 2008)

Ans. Ozone is present at higher levels of the atmosphere where CFC – Cholorofluorocarbons reach, chlorine separates and acts on O_3 to split it into O_2 and (O). The conditions required to do this are available at higher levels *i.e.,* clouds and sunlight.

Q21. *Name any two abiotic components of an environment.* (CBSE 2009)

Ans. Water, air.

Q22. *What are the two main components of our environment?* (CBSE 2009)

Ans. Biotic (living components) ⟶ Plants, animals

Abiotic (non-living components) ⟶ Water, air

Q23. *Which compounds are responsible for the depletion of ozone layer?* (AI CBSE 2009)

Ans. Chlorofluorocarbons (CFC)

Q24. *Why are green plants called producers?* (AI CBSE 2009)

Ans. Green plants can prepare complex organic matter as food from simple inorganic substances like CO_2, H_2O in presence of sunlight and chlorophyll. They produce food and hence called producers.

Q25. *Which disease is caused in human beings due to depletion of ozone layer in the atmosphere?* (CBSE 2009 F)

Ans. Skin cancer, cataract.

IV. LONG ANSWER TYPE QUESTIONS (*5 Marks*)

Q1. *Enlist various categories of consumers giving examples of each.*

Ans. The various categories of consumers are:

Herbivores — Grass eating animals, *e.g.,* deer, rabbit.

Carnivores — Flesh eating animals, *e.g.,* tiger, lion.

Omnivores — Animals that eat both plants and other small animals *i.e.,* flesh *e.g.,* crow, human being.

Parasites — Those organisms which depend on other living organisms and harm them for food, *e.g.,* lice, tapeworm.

Saprophytes — Organisms that depend on dead and decaying matter for their food, *e.g.,* fungi, bacteria.

Q2. *What three informations are obtained from the energy flow diagrams?*

Ans. The information we get are:

(*i*) The energy flow is unidirectional, it flows from sun → autotrophs → herbivores → carnivores → decomposers

(*ii*) The flow of energy is 10% *i.e.*, 90% of the energy is used by a given level of food chain for metabolic activities.

(*iii*) The unwanted chemicals like pesticides gets accumulated in the highest organism in the food chain.

Q3. *Explain the interlink of biotic and abiotic factors in any ecosystem.*

Ans. In an ecosystem biotic and abiotic factors are interdependent and interlinked.

For example: The grass in grassland will grow only if it gets **soil** which can hold **water** and gets **sunlight** with proper temperature hence the grass grows in a place which has all abiotic factors responsible for its growth but in desert these abiotic factors are not available for the growth of grass.

Q4. *Explain the formation of ozone layer and its importance.*

Ans. Ozone is formed when high energy ultra violet radiations split oxygen molecule into oxygen atoms. The oxygen atom combines with oxygen molecules to form a new molecules with three oxygen atoms named ozone.

$$O_2 \longrightarrow O + O$$

$$O_2 + O \longrightarrow \underset{\text{Ozone}}{O_3}$$

Importance of Ozone: It is very protective when present in stratosphere it does not allow the harmful ultra violet radiations to enter the earth's surface which can cause skin cancer in human beings.

Q5. *What is biological magnification? Explain giving one example.*

Ans. The accumulation of chemicals in the top most organism of the trophic level or food chain is called biological magnification.

Example: Farmer sprays pesticides on the crops which enters the food chain, from crops these pesticides enter into the organisms that feed on it.

grass ⟶ grasshopper ⟶ frog ⟶ snake ⟶ hawk

In this food chain the maximum amount of pesticide will be found in the top most organism *i.e.*, in hawk the chemical keeps accumulating.

Q6. *What are decomposers? How are they important for the ecosystem?*

Ans. Decomposers are the organisms which act on dead organisms to decompose the body so as to release all the elements back to nature.

They act as cleansing agents, hence they are important in the ecosystem.

Q7. *What is the importance of ozone in the environment why is it depleting? What precautions are taken to preserve it?*

Ans. Ozone is present in the stratosphere. It protects the earth from harmful ultraviolet radiations. UV ray causes various diseases to organisms e.g. skin cancer, cataract in human beings.

Ozone layer is depleting because of chlorides and fluorides. They act on ozone molecules and deplete it. Chlorides, fluorides are present in CFC's which are used in refrigerants and fire extinguishers.

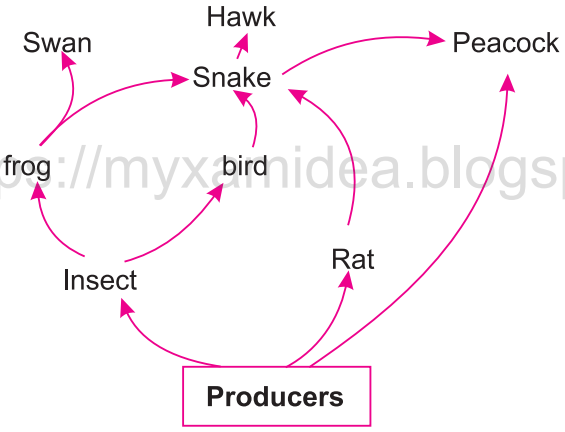
CFC $\longrightarrow$ Chlorofluorocarbon

The precautions taken to preserve the ozone layer is to ban the use of CFC's.

Q8. What are food-chains and food webs? Why are smaller food chains better? What is 10% flow?

Ans. **Food chain:** The flow of food from sun to autotrophs, from autotrophs to herbivores and from herbivores to carnivores is called food chain. A food chain can have two levels or five to six levels also.

Food web: When an organism is eaten by two or more other kinds of organisms, instead of straight chain an interlinked chain is formed, is termed as food web.



Food web

Smaller the food chain the energy available for the next level of consumer in such a chain is more. As the loss of energy at each step takes place and very little energy is left after four trophic levels.

The green plants in terrestrial ecosystem capture about 1% of the sun's energy and convert it into food energy. When green plants are eaten by primary consumers—a great deal of energy is lost for the life processes and only 10% of the energy is available for the next level of consumers.

Q9. *"Damage to the ozone layer is a cause of concern". Justify this statement suggest any two steps to limit this damage.* (CBSE 2008)

Ans. Ozone is a molecule of oxygen with 3 atoms *i.e.,* O_3. It is formed due to sunlight at higher levels with higher wavelength.

$$O_2 \xrightarrow[\text{rays}]{\text{UV}} (O) + (O)$$

$$O_2 + (O) \longrightarrow O_3$$

Ozone is found in stratosphere shielding the earth by protecting it and by not allowing UV rays to reach the earth.

If these rays will reach the earth then many harmful diseases are caused like skin cancer, cataract, it also affects the growth of plants and vegetation.

Two steps to limit the damage of this layer are:

(*i*) Do not use aerosols, or any products which will release CFC (chlorofluorocarbon) in the atmosphere.

(*ii*) Ban on use of CFC as refrigerant and in fire extinguishers.

Q10. *Distinguish between biodegradable and non-biodegradable substances. List two effects of each of them on our environment.* (CBSE 2008)

Ans.

Biodegradable substance	Non-biodegradable substance
1. Substances can be decomposed by micro-organisms	1. Substances cannot be 2. decomposed by micro-organisms.
2. Do not get accumulated in environment.	It gets accumulated in environment.
3. Do not cause any pollution	3. It causes pollution.

Two effects on environment.

(*i*) Releases foul smell while decomposing in surrounding areas.	(*i*) It gets accumulated causing water and soil pollution and causes biological magnification.
(*ii*) It acts as a breeding ground for insects.	(*ii*) It disturbs the ecosystem by interfering in the food chain and killing many animals.

V. VALUE-BASED QUESTION

Q1. *All eco-club students collect the vegetable peels from canteen and use them in compost pit made in their school.*

(a) Name items that can be added in compost pit other than vegetable peels.

(b) What type of reaction is seen in the pit?

(c) State the values seen among eco-club members.

Ans. (*a*) Students can use leftover food and fruit peels, dried leaves.

(*b*) Fermentation i.e., anaerobic decomposition.

(*c*) The eco-club students show team work, collaborative work and good behaviour.

TEST YOUR SKILLS

Q1. *Why is sun considered to be the ultimate source of energy?*

Q2. *In a pond ecosystem all green plants die due to certain chemical. Will the food chain continue?*

Q3. *A dead insect and cockroach are kept covered in the soil. Which organism will decompose first and why?*

Q4. *In a case study an environmentalist states that a place where there were plenty brick kiln has a problem of scarcity of underground water. What could be the reason for the same?*

Q5. *Explain why, when a chemical enters the food chain the maximum concentration of the chemical is found in the highest trophic level?*

Q6. *Explain why, when energy flows in a food chain the maximum energy is found in the lowest trophic level and the least energy is found in the top most trophic level?*

Q7. *Vultures feed on dead animals. It was found that vultures when laid eggs it could not hatch the young ones as some chemical interfered in the food chain. What is this process called?*

Q8. *Which compound is responsible for the depletion of ozone layer?*

Q9. *What are the two main components of our environment?*

Q10. *Expand UNEP.*

Q11. *Define 'biological magnification'.*

Q12. *Name two decomposers.*

Q13. *Differentiat*

Q14. *Energy flow in a food chain is unidirectional. Explain.*

Q15. *What are the problems caused by the non-biodegradable waste that we generate?***Q16.** *Explain the formation of ozone layer and its importance.*

Q17. *Distinguish between:*

(a) producers and decomposers.

(b) biodegradable and non-biodegradable substances.

Q18. *How can you help in reducing the problem of waste disposal? Give any three methods.*

❐❐❐

16 Management of Natural Resources

SYLLABUS

Management of natural resources. Conservation and judicious use of natural resources. Forest and wild life, coal and petroleum conservation. Examples of People's participation for conservation of natural resources.

Big dams: advantages and limitations, Alternatives, if any, Water harvesting, Sustainability of natural resources.

Facts that Matter

1. Ganga Action Plan started in 1985 to remove the pollution in Ganga.
2. The 3 R's. to save environment are
   (*a*) Reduce
   (*b*) Recycle
   (*c*) Reuse
3. Sustainable development encourages forms of growth that meet current basic human needs and needs of future generations.
4. Due to increase in human population the demand for resources is increasing at an exponential rate.
5. Hence our resources need to be managed for the following reasons:
   (*a*) So that they last for generations to come.
   (*b*) So that they are equally distributed.
   (*c*) So that the environment is not harmed when the resources are extracted or used.
6. Forest and Wild Life:
   (*a*) Biodiversity is measured by the number of species found in an area.
   (*b*) Loss of biodiversity leads to loss of ecological stability.
7. The different stakeholders in a forest are:
   (*a*) People who live in or around forests and depend on forest produce for various aspects of their life.
   (*b*) The forest Department of the Government which owns the land and controls the resources from the forests.
   (*c*) The industrialists who use the forest produce but are not dependent on the forests of any one area.
   (*d*) The wildlife and nature enthusiasts who want to conserve nature.

8. The local people depend on forests for fire wood, timber, thatch, bamboo, wood for making implements for agriculture, fishing and hunting, fruits, nuts, medicines, fodder and grazing pasture for cattle.
9. The local people had developed practices for sustainable use of forests.
10. Monocultures of pine, teak and eucalyptus in the forest area destroys biodiversity of the area. The needs of the local people can longer be met. But such plantations are an important source of revenue for the Forest Department.
11. Unlike industrialists, local people will not exploit forests as their life depends on the optimum produce from the forest for generations to come.
12. Conservationists should include local people as a part of the forest system.
13. There are many examples of local people working traditionally for the conservation of forests e.g. the Bishois of Rajasthan.
14. Regular grazing helps in maintaining grasslands. For e.g., when grazing was prohibited in the great Himalayan National Park, the grass first grew very tall and then fell over preventing fresh growth.

Sustainable Management

1. The Chipko movement started in a village called Reni in Garhwal, in the Himalayas during early 1970's. The women of the village hugged the trees, thus preventing the workers of a local contractor from cutting down the trees.
2. People's participation in the management of forests helps to conserve forests. Example—https://myxamidea.blogspot.comre district was given to the people. In return they were given employment in silviculture and harvesting operations, 25% of the final harvest and allowed fuelwood and fodder collection on payment of a nominal fee. As a result by 1983, previously worthless Sal forest was recovered and was valued at 12.5 crore.
3. We should conserve forests because:
   (i) (*a*) Forests are biodiversity hot spots.
   (b) The biodiversity brings about ecological stability.
   (ii) People living in and around forests depend on it for their life.
   (iii) Many industries are based on forest produce.
   (iv) It is our natural heritage that must be passed on to future generations in its pristine form.
4. We can conserve forests by:
   (i) Preventing monoculture in forests.
   (ii) Making the local people a part of the forest system. By involving them in the conservation of forests in return for the use of forest produce and use of forests. This leads to efficient management of forests exhausted in few years.

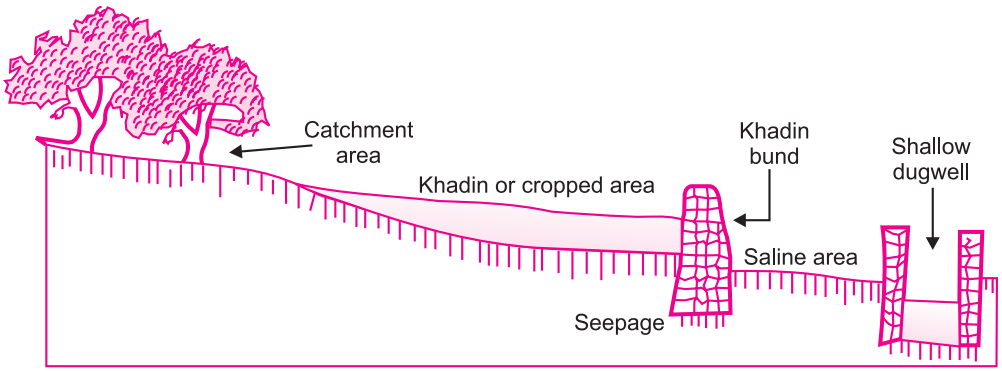
WATER FOR ALL

1. In spite of good monsoon, failure to sustain underground water is due to
   (*a*) Loss of vegetation cover.
   (*b*) Diversion for high water demanding crops.
   (*c*) Pollution from industrial effluents and urban wastes.

2. In ancient times irrigation methods like dams, tanks and canals were used and managed by local people for agriculture and daily needs throughout the year. The use was strictly regulated and optimum cropping patterns based on water availability were arrived at on the basis of centuries of experience.
3. Dams provide water for irrigation and electricity. Canals from dams can irrigate vast areas, e.g., Indira Gandhi Canal. But mismanagement of water results in few people being benefited. For e.g., people near the water source grow water intensive crops like rice and sugarcane, while people living downstream do not get water.
4. Problems associated with large dams:
   (*i*) Social problems because they displace large number of peasants and tribals without adequate compensation or rehabilitation.
   (*ii*) Economic problems because they swallow up high amounts of public money without the generation of proportionate benefits.
   (*iii*) Environmental problems because they contribute enormously to deforestation and loss of biological diversity.

WATER HARVESTING

1. Local water harvesting techniques are beneficial over mega projects because:
   (*a*) They are highly local specific and benefits are localized.
   (*b*) Giving people control over their local water resources ensures that mismanagement and over-exploitation of those resources is reduced/removed.
2. A water harvesting system



Traditional water harvesting system—an ideal setting of the khadin system

3. Coal and petroleum:
   (*a*) Coal and petroleum reserves were formed millions of years ago and these reserves will be exhausted in a few years.
   (*b*) Coal and petroleum contain C, H, O, N and S. When these burn oxides of these components are formed. In insufficient air CO is formed. CO and oxides of N and S are poisonous. CO_2 is a green house gas. Hence we need to use these resources judiciously.

NCERT IN-TEXT QUESTIONS SOLVED

Q1. *What changes can you make in your habits to become more environment-friendly?*

Ans. (*i*) Do not throw garbage on the road side.
(*ii*) Switch off lights, fans, TV when not required.
(*iii*) Use less water for bathing, washing jobs.
(*iv*) Use jute bags instead of polyethene.
(*v*) Walk or cycle to cover short distances.

Q2. *What would be the advantages of exploiting resources with short-term aims?*

Ans. Exploitation of resources with short-term aims means misuse of the resource and harm to the earth.

Q3. *How would these advantages differ from the advantages of using a long-term perspective in managing our resources?*

Ans. In long-term perspective we are managing the resources in such a way that we are accountable for its misuse. We use it wisely and let the future generation also get its benefit of using. Pollution is controlled and minimised.

Q4. *Why do you think there should be equitable distribution of resources? What forces would be working against an equitable distribution of our resources?*

Ans. Equitable distribution of resources will help the resources reach every individual in cheaper and easier way.

The people who need to obtain only money out of these resources would work against it.

Q5. *Why should we conserve forests and wildlife?*

Ans. Conservation of forest is important as forest is useful to us in many ways:
(*i*) Provides raw material for timber industry.
(*ii*) Prevents soil erosion and flood.
(*iii*) Provides medicines, herbs, gum, resin.
(*iv*) Provides habitat to many animals.
(*v*) Maintain water-cycle by bringing rain fall.

Wildlife conservation is important because:
(*i*) It maintains ecological balance in nature.
(*ii*) It also maintains the forests by facilitating growth of plants in different places by dispersing seeds.
(*iii*) By grazing grass it also maintains the soil fertility.
(*iv*) It also helps in cleaning of forest.

Q6. *Suggest some approaches towards the conservation of forests.*

Ans. For conservation of forests:
(*i*) It should be checked that illegal cutting of trees is banned and made a punishable act.
(*ii*) Stakeholders should take care of the maintenance of the forest.
(*iii*) Forest fires should be checked and controlled.
(*iv*) Nearby villages or people should be trained and educated to manage forests.

Q7. *Find out about the traditional systems of water harvesting/management in your region.*

Ans. The traditional systems of water harvesting management:

- *Bandharas* and *tals* in Maharashtra
- *Bundhis* in Madhya Pradesh and Uttar Pradesh
- Kulhs in Himachal Pradesh
- *Khadins*, tanks and *nadis* in Rajasthan.
- *Ahars* and *pynes* in Bihar.

Q8. *Compare the above system with the probable systems in hilly/mountainous areas or plains or plateau regions.*

Ans. Water harvesting system in hilly and mountainous areas is different from plains and from plateau region.

For e.g., in hilly areas like Himachal Pradesh a local system of irrigation was developed called *kulhs*. The water flowing in the streams was diverted into man-made channels which took this water to numerous villages down the hillside.

Whereas water in plains is collected in check dams or tanks, *tals* or *bundhis*.

Q9. *Find out the source of water in your region/locality. Is water from this source available to all people living in that area?*

Ans. The source of water in our region is municipality supply of water and from under ground *i.e.* ground water. There is scarcity of water during summer season and most people don't have access to water.

QUESTIONS FROM NCERT TEXTBOOK

Q1. *What changes would you suggest in your home in order to be environment-friendly?*

Ans. The following changes can be made to be environment friendly:

(*i*) Check the wastage of water, close the taps properly, recycle the water of washing machine into toilets.

(*ii*) Stop the use of bulbs and switch over to CFL lights.

(*iii*) Use solar water heater and cookers, install solar cell panel for electricity.

(*iv*) Reduce the garbage by not throwing such items which can be reused and recycled.

Q2. *Can you suggest some changes in your school which would make it environment-friendly?*

Ans. (*i*) Recycle the waste paper thrown instead of dumping it in garbage.

(*ii*) Rain water harvesting system should be made.

(*iii*) Plant more and more trees.

(*iv*) Make compost of bio-mass collected like food waste, fallen leaves etc.

Q3. *We saw in this chapter that there are four main stakeholders when it comes to forests and wildlife. Which among these should have the authority to decide the management of forest produce? Why do you think so?*

Ans. The local people staying near the forest should be given the authority to decide the management of forest produce. They can keep a check on and control the misuse of the forest and its goods. They are the ones who do not exploit the forest and they know how to manage so it stays there for their future generations to come.

Q4. *How can you as an individual contribute or make a difference to the management of*
(*a*) *forests and wildlife,* (*b*) *water resources and*
(*c*) *coal and petroleum?*

Ans. (*a*) **Forests and wildlife:** Use less paper, do not waste paper, as trees are cut down to make it. Do not buy any animal products which are made by killing them like fur, skin, tusk, horn etc.

(*b*) **Water resources:** Use buckets to take bath instead of shower. Recycle the water from washing machine for toilets use.

(*c*) **Coal and petroleum:** Use public transport or use the transport that uses CNG. Switch off lights, minimise the use of air-conditioner, room heater etc.

Q5. *What can you as an individual do to reduce your consumption of the various natural resources?*

Ans. By following 3 R's

(*a*) **Reduce:** Reduce or minimise the use of resources, by saving electricity by switching off unnecessary lights and fans etc. and by walking whenever possible.

(*b*) **Recycle:** Collect and recycle the products like plastic, paper, glass and metal.

(*c*) **Reuse:** It is better than recycle. Instead of throwing used envelopes. We can reverse it and use it again. The plastic and glass containers, bottles can be reused.

Q6. *List five things you have done over the last one week to:*
(*a*) *Conserve our natural resources.*
(*b*) *Increase the pressure on our natural resources.*

Ans. (*a*) **To conserve our natural resources:** I preferred walking to the nearby places or cycling instead of going by a car. Switched off lights when not required. Minimised the use of water and checked the extra flow of water.

(*b*) **Increase the pressure on our natural resources:** I used air conditioner. Shopped for new clothes.

Q7. *On the basis of the issues raised in this chapter, what changes would you incorporate in your life style in a move towards a sustainable use of our resources?*

Ans. To save various resources. I would follow 3R's reduce, reuse and recycle. Minimize the use of coal and petroleum switch over to CNG and use electrical equipments at the minimum.

Do not waste paper and water. I will not buy goods made by killing animals like fur, leather, tusk, etc.

MORE QUESTIONS SOLVED

I. MULTIPLE CHOICE QUESTIONS

1. Which of the following is a green house gas?
(*a*) Nitrogen dioxide (*b*) Sulphur dioxide
(*c*) Carbon dioxide (*d*) Carbon monoxide

2. Floods can be prevented by
(*a*) afforestation (b) removing top soil
(*c*) deforestation (d) agriculture

3. *Narmada bachao* andolan was to
(*a*) Clean Narmada (*b*) Expand Narmada
(*c*) Save Narmada (*d*) None of above

4. Which of the following is best method from environment point of view?
(*a*) Reduce (*b*) Recycle
(*c*) Reuse (*d*) all of above

5. The full form of UV rays is
(*a*) Ultra violet (*b*) Ultra violent
(*c*) Ultra valve (*d*) Ultimate violet

6. Synthetic material/chemical which depleted Ozone layer is
(*a*) CFC's (chlorofluorocarbon) (*b*) CFL's
(*c*) CO_2 (*d*) None of above

7. What is coliform?
(*a*) group of bacteria (*b*) group of viruses
(*c*) group of microorganisms (*d*) group of diseases

8. What is the name given for replenishment of forest?
(*a*) afforestation (*b*) silviculture
(*c*) deforestation (*d*) sericulture

9. Why should we conserve forest and wild life?

(*a*) To protect biodiversity (*b*) To maintain ecosystem
(*c*) To maintain balance (*d*) To continue food chain

10. Water harvesting is a method which
(*a*) Increase ground water level (*b*) Not practiced in modern days
(*c*) Has no relation with ground water (*d*) Decrease ground water level

11. The movement that focuses on ecological conservation is
(*a*) Chipko movement (*b*) Silent valley project
(*c*) Green revolution (*d*) Operation flood

12. Which of the following is a renewable resource?
(*a*) Petrol (*b*) CNG
(*c*) LPG (*d*) Water

13. Which of the following resource need to be used in a sustainable manner?
(*a*) Solar energy (*b*) Petroleum
(*c*) Water (*d*) Bio gas

14. How is water harvested in hilly areas?
(*a*) by rooftop reharvesting (*b*) by guls/kuls
(*c*) by building tanks (*d*) none of the above

15. When combustion of coal/petrol takes place in insufficient air (oxygen) which gas is released?
(*a*) CO_2 (*b*) Carbon monoxide
(*c*) Nitrogen and CO_2 (*d*) All of above

16. Which of the following resource is used in thermal power plant?
(*a*) Coal (*b*) Kerosene
(*c*) charcoal (*d*) Petroleum

17. Which of the following Dam is built on Ganga?
(*a*) Bhakra nagal Dam (*b*) Sardar Sarovar
(*c*) Tehri Dam (*d*) Krishna Sagar

18. In which village Chipko Movement was started?
(*a*) Khurja village (*b*) Reni village
(*c*) Kaithal village (*d*) Siraspur

19. For which of following activity did Amrita Devi Bishnoi sacrificed her life with 363 people in 1731?
(*a*) to protect river (*b*) to save trees
(*c*) to save crops (*d*) to save wild life

20. In which year Ganga Action Plan came about?
(*a*) 1980 (*b*) 1985
(*c*) 1990 (*d*) 1975

Answers

1. (*c*)	**2.** (*a*)	**3.** (*c*)	**4.** (*d*)	**5.** (*a*)
6. (*a*)	**7.** (*a*)	**8.** (*a*)	**9.** (*b*)	**10.** (*a*)
11. (*a*)	**12.** (*d*)	**13.** (*b*)	**14.** (*d*)	**15.** (*b*)
16. (*a*)	**17.** (*c*)	**18.** (*b*)	**19.** (*b*)	**20.** (*b*)

II. VERY SHORT ANSWER TYPE QUESTIONS (*1 Mark*)

Q1. *What is a natural resource?*
Ans. All the material we obtain from nature and use it is called natural resource.
Q2. *Name two important natural resources.*
Ans. Forest, Water, Wildlife.
Q3. *What are 3 R's used to save environment?*
Ans. Reduce, Recycle and Reuse.
Q4. *Define biodiversity.*
Ans. The number of species found in an area is called biodiversity.
Q5. *Name the bacteria whose presence in the water indicates its contamination with disease causing microbes.*
Ans. Coliform bacteria.
Q6. *Why fossil fuels should be used judiciously?*
Ans. It is because these resources are limited, non-renewable and polluting.
Q7. *State 2 advantages of constructing dam across a river.*
Ans. It helps in generating electricity in irrigation.
Q8. *Name the place where "Chipko Andolan" organised.*
Ans. Reni Village in Garhwal.

Q9. *Who started the "Chipko Movement"?*

Ans. Sunderlal Bahuguna.

Q10. *Name the main constituents of coal and petroleum.*

Ans. Carbon, nitrogen, hydrogen, sulphur.

Q11. *Name the gas responsible for global warming.*

Ans. Carbon dioxide and methane.

Q12. *State two disadvantages of constructing dam.*

Ans. It can cause earthquakes, loss of habitat, submerging of plants releases methane gas that causes green house effect.

Q13. *Name any one stake holder.*

Ans. Bishnoi community in Rajasthan.

Q14. *Name two dam projects which are facing criticism.*

Ans. Tehri dam on river Ganga and Sardar Sarovar dam on river Narmada.

Q15. *What are the products formed when coal and petroleum are burnt?*

Ans. Carbon dioxide, water, oxides of nitrogen and oxides of sulphur.

III. SHORT ANSWER TYPE QUESTIONS (*2 or 3 Marks*)

Q1. *Why do we need to use our resources carefully?*

Ans. It is because these resources are limited and the human population is increasing at very fast rate, the demand for these resources is increasing. For long term usage and to preserve them we need to use our resources carefully.

Q2. *How does mining cause pollution?*

Ans. Mining causes pollution because if produces large amount of slag which is discarded for every tonne of metal that is extracted.

Q3. *Why are forests called as biodiversity hot spots?*

Ans. Biodiversity hot-spot means a place where large number of species are found.

The range of different life forms *i.e.*, bacteria, fungi, ferns, flowering plants, variety of animals likes, insects, birds, reptiles, aves, mammals etc are all found in the forest.

Q4. *For the conservation of forest who can be a stakeholder.*

Ans. (*i*) The people who live in or around forest.

(*ii*) The forest department of the government.

(*iii*) The industrialists.

(*iv*) The wildlife and nature enthusiasts who want to conserve nature.

Q5. *Prejudice against the traditional use of forest areas has no basis. Comment.*

Ans. It can be explained with one example—The great Himalayan Park contain alpine meadows which were grazed by sheep in summer. Nomadic shepherds drove their flock up from the valley every summer. When the National Park was formed this practice was banned. Because of no grazing, the grass first grew very tall and then fell over on the ground preventing fresh growth. Hence the traditional use was helpful for the forest maintenance.

Q6. *Name two industries based on forest produce.*

Ans. Paper industries, bamboo, bidi and tendu leaves industries.

Q7. *Why is it necessary to conserve forest and wildlife?*

Ans. To preserve forest, maintain balance in the eco-system, prevent floods, droughts.

Q8. *What is water harvesting? What is the main purpose of water harvesting?*

Ans. Rain water harvesting is collecting the rain water, allowing it to percolate, discharge down the earth and increase the ground water level. It is done to manage water.

Q9. *Name the products of combustion of coal and petroleum. How do they effect our environment?*

Ans. CO_2, H_2O, oxides of sulphur and nitrogen are released from the combustion of coal and petroleum.

Effect on environment:

(*i*) CO_2 — Green house effect, global warming.

(*ii*) Oxides of sulphur and nitrogen causes acid rain.

Q10. *A tribe is living near the forest. Name two things which they will commonly use from forest.*

Ans. Tribe will use timber, firewood, fruits, gum, medicines from the forest.

Q11. *Give an example of people's participation in the management of forests.*

Ans. Saving of sal forest of Arabari in Midnapore District.

Chipko Movement to protect the trees from cutting down in Reni village Garhwal.

Q12. *Write two advantages of classifying sources as renewable and non-renewable.*

Ans. Classification of resources helps us in deciding the kind of resource we should use judiciously and wisely. The resource that is not limited. It also helps us to know the importance of using renewable source of energy.

Q13. *Which is better—recycle or reuse? Give example.*

Ans. Reuse is better because recycling needs extra energy.

E.g., the glass containers in which we get jam, pickles etc., can be reused at home to keep kitchen stuff but if it goes for recycling then lot of energy and money is spent on recycling it and getting a new bottle.

Q14. *Explain 3R's with one example each.*

Ans. *Reduce*—Less use of products like paper, clothes, plastic, wood, coal, petroleum so that it is not exploited from the nature.

Recycle—To make new items from the used articles like plastic, paper, wood, glass etc.

Reuse—Use the same thing again and again. E.g., use the jam and pickle containers for keeping kitchen stuff etc.

Q15. *Give three changes you will make to stop or lower the use of coal and petroleum.*

Ans. (*i*) Switch off lights when not required, and use CFL bulbs.

(*ii*) Not to use petrol fuel vehicles instead opt for CNG.

(*iii*) Use cycle or walk to go short distances.

Q16. *What are the advantages of water stored in ground?*

Ans. (*i*) Does not evaporate.

(*ii*) Recharges wells.

(*iii*) No danger of mosquito breeding.

(*iv*) Better availability of potable water.

Q17. *Inspite of plenty rainfall in monsoon in some areas of India, there is failure to sustain water availability. Give reasons.*

Ans. (*i*) Loss of forest cover prevents rainwater from seeping down the ground.

(*ii*) Underground water is not recharged.

Q18. *What are three basic cause that has brought criticisms about large dams projects?*

Ans. (*i*) *Social problem*—as its construction displaces large number of tribals and local peasants without proper compensation and rehabilitation.

(*ii*) *Economic problem*—such projects need lot of money for the setup or construction without much of out-put or benefit.

(*iii*) *Environmental problem*—the construction causes deforestration and loss of biological diversity.

Q19. *Give three main uses of fossil fuels.*

Ans. (*a*) Fossil fuels are used for generating electricity *i.e.*, Coal is used in thermal power plants on large scale to produce electricity.

(*b*) Coal and petroleum is also used in industries to prepare goods from raw-materials.

(*c*) Petroleum is used for transportation. In vehicles petrol or diesel is used.

Q20. *List two traditional system of water harvesting.* [CBSE 2008 F]

Ans. *Khadim*, tanks and *nadis* in Rajasthan, *bandharas* and *tals* in Maharashtra.

Q21. *List four changes you would incorporate in your life style in a move towards sustainable use of available resources* [AI CBSE 2008, 2009]

Ans. (*i*) Taking a bus, using cycle or walking.

(*ii*) Using CFL at home and switching off lights when not required.

(*iii*) Using the stairs instead of lift.

(*iv*) Wearing an extra sweater on cold days instead of encouraging the use of heaters.

Q22. *State two reasons each of conserving* [AI CBSE 2008]

(*a*) *Forest and* (*b*) *Wild life*

Ans. (*a*) **Forest:** It needs to be conserved as it is a natural resource, many industries depend on it and will exploit and deplete the forest. It is biodiversity hot-spot.

(*b*) **Wildlife:** It maintains the ecological balance. Hence all animals which are hunted for skin, fur, tusk, horns etc. need protection and their habitat also need to be conserved.

Q23. *What are natural resources? State two factors that work against an equitable distribution of these resources.* [CBSE 2009]

Ans. The resources obtained from the earth and which are naturally occuring are called natural resources.

Two factors which works against an equitable distribution of these resources are:

(*i*) Materialisation and (*ii*) Energisation

Q24. *Why must we conserve our forests? List any two causes for deforestation taking place.* [CBSE 2009]

Ans. We must conserve our forest as they are very useful.

(*i*) It conserves soil by preventing soil erosion, prevents flood and holds lot of water, maintain ground level of water and brings rainfall.

(*ii*) It provides lot of raw material for many industries like timber, sal, wood, bidi, tendu leaves, coir etc.

Two causes of deforestation:

(*a*) Exploitation by industries.

(*b*) Due to increase in population, lot of forest land is converted to build roads and dams for the infrastructure development. Pressure of human settlement is also a major cause.

Q25. *What is Chipko Movement? Why should we conserve forests?* [AI CBSE 2009]

Ans. It is the movement initiated by local people in the Reni Village of Garhwal by preventing the cutting down of trees by hugging the trees. It was initiated by Sunder Lal Bahuguna to stop the commercial exploitation of forest.

We should conserve forest because it is of great benefit to us as it holds soil, water, prevents floods, brings rain fall, maintain ecological balance on the earth.

Q26. *An environmentalist on visit to your school suggested the use of three R's to save the environment. Explain what he meant by three R's and how you would follow his advice at home.* [AI CBSE 2009]

Ans. The 3R's to save the environment means:

(*i*) Reduce—It means we should use less resources. The demand of exploiting resources should be reduced by switching off lights, fans when not required, by not wasting paper, pencil etc.

(*ii*) Recycle—It means, to make new products from the old, used ones, e.g., recycle used paper, plastic bags, glass material and metals like tins, cans, foils etc.

(*iii*) Reuse—It is the best option *i.e.*, use the things, materials again and again. e.g., use the envelope which was already used, make use of plastic bottles, jam and pickle containers etc.

Q27. *List four advantage of water harvesting.* [AI CBSE 2009]

Ans. Water harvesting is useful because

(*i*) It provides water for potable use.

(*ii*) It provides water for irrigation.

(*iii*) It provides water for recharging underground water reservoir.

(*iv*) It provides water for vegetation to grow.

Q28. *How do advantages of exploiting natural resources with short-term aims differ from the advantages of managing our resources with a long-term perspective?* [CBSE 2009 F]

Ans. Exploitation of natural resources with short-term aims means exploiting it for need, money and make them extinct but using the same resources with a long-term perspective means managing the resources wisely, judiciously and using them in such a manner that they are present for future generations to come *i.e.*, sustainable management.

Q29. *What is wild life? How is wild life important for us?* [CBSE 2009 F]

Ans. Wild life means all the animals and plants that grow and live in forest, grow naturally, are not cultivated, domesticated and tamed.

Importance of wildlife:

(*i*) They help in maintaining ecological balance.

(*ii*) They provide aesthetic value for human beings.

Q30. *What is water harvesting? Write any two advantages of it.* [CBSE 2009 F]

Ans. Water harvesting means capturing water to recharge water reservoirs.

Benefits of water harvesting:

(*i*) It provides water for potable use.

(*ii*) It provides water for irrigation.

(*iii*) It increases the ground water level.

(*iv*) It provides water for the growth of vegetation.

Q31. *List any two causes of our failure to sustain availability of underground water.* [CBSE 2009]

Ans. Two causes which led to the failure of sustaining the availability of underground water are:

(*i*) *Population:* With the increase in population the demand is also increasing which is depleting the underground water.

(*ii*) *Industrialisation:* As the industries need more water to manufacture its goods, this led to decrease in the level of underground water.

IV. LONG ANSWER TYPE QUESTIONS (*5 Marks*)

Q1. *What are fossil fuels? How are they formed? Why should we use them judiciously?*

Ans. Fossil fuels are obtained from the remains of plants and animals which got burried under the earth some millions of year ago. They changed into fuel due to tremendous heat and pressure.

The fossil fuels should be used judiciously because they are non-renewable resources, and can not be made again. It releases harmful and polluting gases like CO_2, which causes green house effect and oxides of nitrogen and sulphur which causes acid rain.

Q2. *What is sustainable development? Explain it with respect to forest, wildlife and water resources.*

Ans. The proper management of natural resources using it wisely and judiciously so that it is available for the coming generations also. All these resources are maintained.

The population is increasing, demand for these resources is also increasing but they are limited in nature.

The management would prevent the exploitation of these resources and keep them available for future generations.

Forest—Many industries like timber, wood bidi, tendu leaves etc are dependent on the trees in the forest. They keep cutting the trees for use.

This need to be managed properly and checked that new plantation of trees take place, animals are not harmed and are preserved.

Wildlife—All animals in the forest are disturbed due to the intervention of people into the forest. They are also killed for trade of skin, fur, tusk horn etc. If the animals in the forest are not managed and taken care of then they will be extinct which will disturb the ecological balance of the earth.

Water Resources—The main water resources are rivers, lake, ponds, underground water. The sources of water are getting polluted and the underground water is also discharged, used and the level of water is declining. Hence the recharge of water under the ground by rain water harvesting is necessary.

Q3. *What is rain water harvesting? How can it be done at local level? What are its benefits?*

Ans. Rain water harvesting is the indigenous water saving methods to capture every trickle of water that had fallen on land. For this we need to dig small pits and lakes, build small earthen dams, construct dykes, sand and lime stone reservoirs, set up roof top water collecting units. This will recharge ground water levels and bring rivers back to life.

Water harvesting techniques give people control over their local water resources, ensures, that the mismanagement and over exploitation of these resources is reduced/removed.

The advantage of water stored in the ground are many. It does not evaporate, but spreads out to recharge wells and provide moisture for vegetation over a wide area. It does not provide breeding area for mosquitoes. It is also protected from contamination by human and animal waste.

Q4. *Dams are constructed on the river for multipurpose use give its advantages and disadvantages.*

Ans. **Advantages of dams:**

(*i*) The water stored in the dams is used for irrigation by constructing canals which carry water to the fields.

The Indira Gandhi Canal carries water from Bhakra dam Punjab to villages in Rajasthan desert where it has brought greenery and added life to the soil.

(*ii*) The water in dams is continuously available for the people in the vicinity to make use of it after purification.

(*iii*) The whttps://myxamidea.blogspot.comdam that falls from a certain height gains kinetic energy and rotates turbines to generate electricity. Hence this way it makes hydroelectricity.

Disadvantages of dams:

(*i*) *Social Problems:* Due to dam's construction large number of human settlements are submerged in water, many people become homeless. Govt. must provide adequate compensation for the rehabilitation of these people which is not being done.

(*ii*) *Ecological problems:* Lot of deforestration takes place for the construction of dams, which leads to loss of biodiversity. Many plants get submerged under water and on decomposition this releases methane gas; that is the greenhouse gas; causing global warming.

(*iii*) *Economic problems:* For the construction of dams large funds are required, Govt. invests lot of money in its construction and the benefits or the output is not equivalent.

V. VALUE-BASED QUESTIONS

Q1. *Pritam stays in a village near a forest. He plays the best role of being a stakeholder of the forest by taking care of it, reporting on illegal cutting down of trees and forest fire etc.*

(a) Name two industries based on forest produce.

(b) Give two causes of forest depletion in India.

(c) What values are reflected in Pritam?

Ans. (*a*) Paper, timber.

(*b*) Deforestation and forest fires.

(*c*) Pritam shows the values of personal responsibility and participating citizenship.

Q2. *Arjun's father dropped him to school every day in his car but when he learnt about the pollution he started using school transport thereafter.*

(a) Give two disadvantages of using fossil fuel.

(b) Why should we use these resources wisely and judiciously?

(c) What value of Arjun is reflected?

Ans. (*a*) Two disadvantages of using fossil fuels are: It causes pollution and it is expensive resource which cannot be replenished.

(*b*) These resources are limited and take long time in formation.

(*c*) Arjun is showing responsible behaviour and self-discipline.

Q3. *Today we encounter the problem of water shortage, although it rains well in rainy season. 'Khushi society' has made a provision of rainwater harvesting.*

(a) Suggest two methods of rain water harvesting.

(b) How can you store water without any water-borne diseases and germs multiplying in it?

(c) What values are seen in the members of society?

Ans. (*a*) Roof top and underground rain water harvesting.

(*b*) In close tanks and underground tanks.

(*c*) Members show responsible behaviour, socially just interaction and team work.

Q1. *The forest is located in a place where villages and tribals are dependent on it. Industrialist is the stakeholder of the forest who is cutting down the trees for profits. What could be the harmful effect of this on forest, local people and environment.*

Q2. *People of locality A has constructed tanks, wells, khadims and people in locality B has made lakes, ponds to conserve water.*

What is the best way of conserving the water. Which locality will face water related problems and why?

Q3. *Who should be the best stakeholders of a forest. Explain.*

Q4. *Mention any five changes that you can easily bring to contribute for the conservation of natural resources.*

Q5. *The emission of CO_2 is increasing the threat of global warming. Suggest any four ways how one can check the carbon foot prints.*

Q6. *List two traditional system of water harvesting.*

Q7. *Why is wildlife important to us?*

Q8. *Define 'biodiversity'.*

Q9. *Name the main constituents of coal and petroleum.*

Q10. *Name two gases responsible for global warming.*

Q11. *For the conservation of forest, who can be a stakeholders?*

Q12. *How does mining cause pollution?*

Q13. *Suggest any four ways in your lifestyle to become environment-friendly.*

Q14. *Explain what is meant by 3 R's and how would you implement it?*

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