CHAPTER 1 - CHEMICAL REACTIONS AND EQUATIONS

Question 1: Why should a magnesium ribbon be cleaned before burning in air?

Answer- Because there is a layer of magnesium oxide on magnesium ribbon, which does not allow magnesium to react further with oxygen.

Question 2: Write the balanced equation for the following chemical reactions.

(i) Hydrogen + Chlorine → Hydrogen chloride

(ii) Barium chloride + Aluminium sulphate → Barium sulphate + Aluminium chloride

(iii) Sodium + Water \rightarrow Sodium hydroxide + Hydrogen

Answer- (i) $H_2 + Cl_2 \longrightarrow 2HCl$

(ii) $3BaCl_2 + Al_2 (SO_4)_3 \longrightarrow 3BaSO_4 + 2AlCl_3$

(iii) $2Na + 2H_2O \longrightarrow 2NaOH + H_2$

Question 3: Write a balanced chemical equation with state symbols for the following reactions.

(i) Solutions of barium chloride and sodium sulphate in water react to give insoluble barium sulphate and the solution of sodium chloride.

(ii) Sodium hydroxide solution (in water) reacts with hydrochloric acid solution

(in water) to produce sodium chloride solution and water.

Answer- (i) $BaCl_2(aq) + Na_2SO_4(aq) \rightarrow BaSO_4(s) + 2NaCl(aq)$

(ii) NaOH (aq) + HCl (aq) \rightarrow NaCl (aq) + H₂O (l)

Question 4: A solution of a substance 'X' is used for white washing.

(i) Name the substance 'X' and write its formula.

(ii) Write the reaction of the substance 'X' named in (i) above with water.

Answer- (i). The substance 'X' is calcium oxide. Its chemical formula is CaO.

(ii)	CaO (s) +	$H_2O(l)$	>	Ca(OH) ₂ (aq)
(Calcium oxide	water	(Calcium hydroxide
	(Quick Lime)			(Slaked Lime)

Question 5: Why is the amount of gas collected in one of the test tubes in Activity 1.7 double of the amount collected in the other? Name this gas.



In this reaction Sodium (Na) is oxidized and oxygen (O₂) is reduced.



In this reaction Hydrogen (H₂) is oxidized and Copper (Cu) is reduced.

10 th Science, English Medium, Syllabus of April and Mar EXERCISE
Question 1: Which of the statements about the reaction below are incorrect? 2PbO(s) + C(s)
(a) Lead is getting reduced.
(b) Carbon dioxide is getting oxidised.
(c) Carbon is getting oxidised.
(d) Lead oxide is getting reduced.
(i) (a) and (b) \checkmark (ii) (a) and (c) (iii) (a), (b) and (c) (iv) all
Question 2: $Fe_2O_3 + 2AI \longrightarrow Al_2O_3 + 2Fe$ The above reaction is an example of a
(a) Combination reaction.
(b) Double displacement reaction.
(c) Decomposition reaction.
(d) Displacement reaction. 🖌
Question 3: What happens when dilute hydrochloric acid is added to iron filings? Tick the correct
answer.
(a) Hydrogen gas and iron chloride are produced.
(b) Chlorine gas and iron hydroxide are produced.
(c) No reaction takes place.
(d) Iron salt and water are produced.
Question 4: What is a balanced chemical equation? Why should chemical equations be balanced? Answer- The chemical equation in which number of atoms of reactants and products are equal.
According to law of conservation of mass – "mass can neither be created nor destroyed". Hence we
should balance a chemical equation.
Question 5: Translate the following statements into chemical equations and then balance them.
(a) Hydrogen gas combines with nitrogen to form ammonia.
Answer- $3H_2(g)$ + $N_2(g)$ \longrightarrow $2NH_3(g)$
(b) Hydrogen sulphide gas burns in air to give water and sulphur dioxide.
Answer- $2H_2S(g) + 3O_2(g) \rightarrow 2H_2O + 2SO_2$
(c) Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of
barium sulphate.
Answer- $3BaCl_2(aq) + Al_2(SO_4)_3 \longrightarrow 2AlCl_3 + 3BaSO_4(s)$
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10 th Science, English Medium, Syllabus of April and May (d) Potassium motal reacts with water to give potassium hydroxide and hydrogon gas
(u) Totassium metal reacts with water to give potassium hydroxide and hydrogen gas. Answer, $K(s) + H_{2}O \longrightarrow KOH + H_{2}$
$\mathbf{R}(\mathbf{s}) + \mathbf{R}_{2}\mathbf{O} + \mathbf{R}_{2}\mathbf{O}$
Question 6: Balance the following chemical equations.
(a) $HNO_3 + Ca(OH)_2 \longrightarrow Ca(NO_3)_2 + H_2O$
Answer - $2HNO_3 + Ca(OH)_2 \longrightarrow Ca(NO_3)_2 + 2H_2O$
(b) NaOH + $H_2SO_4 \longrightarrow Na_2SO_4 + H_2O$
Answer - $2NaOH + H_2SO_4 \longrightarrow Na_2SO_4 + 2H_2O$
(c) NaCl + AgNO ₃ \longrightarrow AgCl + NaNO ₃
Answer - NaCl + AgNO ₃ \longrightarrow AgCl + NaNO ₃
(d) $BaCl_2 + H_2SO_4 \longrightarrow BaSO_4 + HCl$
Answer - $BaCl_2 + H_2SO_4 \longrightarrow BaSO_4 + 2 HCl$
Question 7: Write the balanced chemical equations for the following reactions.
(a) Calcium hydroxide + Carbon dioxide $ ightarrow$ Calcium carbonate + Water
Answer - $Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$
(b) Zinc + Silver nitrate → Zinc nitrate + Silver
Answer - $Zn + 2AgNO_3 \longrightarrow Zn(NO_3)_2 + 2Ag$
(c) Aluminium + Copper chloride → Aluminium chloride + Copper
Answer - $2Al + 3CuCl_2 \longrightarrow 2AlCl_3 + 3Cu$
(d) Barium chloride + Potassium sulphate \rightarrow Barium sulphate + Potassium chloride
Answer - $BaCl_2 + K_2SO_4 \longrightarrow BaSO_4 + 2KCl$
Question 8: Write the balanced chemical equation for the following and identify the type of reaction in
each case.
(a) Potassium bromide (aq) + Barium iodide (aq) → Potassium iodide (aq) + Barium bromide(s)
Answer - 2 KBr (aq) + BaI_2 (aq) \rightarrow 2 KI (aq) + $BaBr_2$ (s)
Type- Double Displacement Reaction
(b) Zinc carbonate (s) \rightarrow Zinc oxide (s) + Carbon dioxide (g)
Answer - $ZnCO_3(s)$ \longrightarrow $ZnO(s) + CO_2$
Type- Decomposition Reaction.
(c) Hydrogen (g) + Chlorine (g) → Hydrogen chloride (g)
Answer - $H_2(g) + Cl_2(g) \longrightarrow 2HCl(g)$
Type- Combination Reaction
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(d) Magnesium (s) + Hydrochloric acid (aq) \rightarrow Magnesium chloride (aq) + Hydrogen (g)

Answer - Mg (s) + 2HCl (aq) \longrightarrow MgCl₂ (aq) + H₂ (g)

Type- Displacement Reaction.

Question 9: What does one mean by exothermic and endothermic reactions? Give examples.

Answer- **Exothermic Reactions-** Chemical reactions that release energy in the form of heat, light, or sound are called exothermic reactions. Example: Burning of coke, Respiration etc.

Endothermic Reactions- Reactions that absorb energy or require energy in order to proceed are called

endothermic reactions. For example: Reaction of coke with steam, photosynthesis reaction etc.

Question 10 : Why is respiration considered an exothermic reaction? Explain.

Answer- Because in respiration oxidation of glucose produce energy, So we can consider this an exothermic reaction.

 $C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O + Energy$

Question 11 : Why are decomposition reactions called the opposite of combination reactions? Write

equations for these reactions.

Answer- In combination reactions two or more than two reactants combine to form a single product. But on the other hand in decomposition reactions only a single reactant decompose to form two or more than two products.

 \rightarrow CO₂

 CO_2

ZnO

Combination Reaction- C + O₂

Decomposition Reaction- ZnCO₃

Question 12 : Write one equation each for decomposition reactions where energy is supplied in the

form of heat, light or electricity.

Answer- (a) Thermal decomposition:	CaCO ₃ (s)	Heat	CaO(s)	+	CO ₂ (g)
(b) Decomposition by light:	2Ag Cl (s)	Light	2Ag(s)	+	$Cl_{2}(g)$
(c) Decomposition by electricity:	2H ₂ O (l)	Electricity	2H ₂ (g)	+	O_2

Question 13 : What is the difference between displacement and double displacement reactions? Write

equations for these reactions.

Answer- In a displacement reaction, a more reactive element replaces a less reactive element from a compound.

For example : $Fe(s) +$	CuSO4(aq)	→ FeSO₄(aq)	+	Cu(s)	
Iron	Copper Sulphate (blue)	Iron Sulphate (green)		Copper	
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10 th Science, English Medium, Syllabus of April and May In a double displacement reaction, two atoms or a group of atoms exchange ions or atoms to form new compounds.
For example : AgNO ₃ + NaCl NaNO ₃ + AgCl Silver Nitrate Sodium Chloride Sodium Nitrate Silver Chloride
Question 14 : In the refining of silver, the recovery of silver from silver nitrate solution involved
displacement by copper metal. Write down the reaction involved.
Answer- $2AgNO_3(aq) + Cu(s) \longrightarrow Cu(NO_3)_2(aq) + 2Ag(s)$
Silver nitrate copper copper nitrate pure silver
Question 15 : What do you mean by a precipitation reaction? Explain by giving examples.
Answer- A reaction in which an insoluble solid (called precipitate) is formed is called a precipitation reaction.
For example: $3BaCl_2(aq) + Al_2(SO_4)_3 \longrightarrow 2 AlCl_3 + 3BaSO_4(s)$
Barium chloride aluminium sulphate aluminium chloride barium sulphate (precipitate)
Question 16 : Explain the following in terms of gain or loss of oxygen with two examples each.
(a) Oxidation (b) Reduction
Answer- (a) Oxidation is the gain of oxygen or loss of hydrogen. Examples-
(1) C + O ₂ \longrightarrow CO ₂
(2) $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + Energy$
(b) Reduction is the loss of oxygen or removal of hydrogen. Examples-
(1) $H_2(g) + Cl_2(g) \longrightarrow 2HCl(g)$
(2) $\operatorname{CuO} + \operatorname{H}_2 \longrightarrow \operatorname{Cu} + \operatorname{H}_2 \operatorname{O}$
Question 17 : A shiny brown-coloured element 'X' on heating in air becomes black in colour. Name the
element 'X' and the black coloured compound formed.
Answer- 'X' is copper (Cu) and the black-coloured compound formed is copper oxide (CuO).
$2Cu + O_2 \xrightarrow{Heat} 2CuO$
(Shiny brown in colour) (Black in colour)
Question 18 : Why do we apply paint on iron articles?
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Answer- To prevent iron articles from rusting, we paint them. Paint break the contact of iron with air and moisture.

Question 19: Oil and fat containing food items are flushed with nitrogen. Why?

Answer- Oil and fat containing food items react with atmospheric oxygen to form poisonous fatty acids, due to which they cause a bad smell. This process is known as rancidity. To prevent food from rancidity, we fill food packets with nitrogen gas which is almost inert gas.

Question 20 : Explain the following terms with one example each.

(a) Corrosion (b) Rancidity

Answer- (a) Corrosion - Corrosion is defined as a process where materials, usually metals, deteriorate as a result of a chemical reaction with air, moisture, chemicals, etc. For example, iron, in the presence of moisture, reacts with oxygen to form rust ($Fe_2O_3xH_2O$). We can prevent object from corrosion by painting, greasing or galvanization etc.

(b) Rancidity - Oil and fat containing food items react with atmospheric oxygen to form poisonous fatty acids, due to which they cause a bad smell. This process is known as rancidity. To prevent food from rancidity, we fill food packets with nitrogen gas which is almost inert gas.

CHAPTER 5 -PERIODIC CLASSIFICATION OF ELEMENTS

Question 1: Did Dobereiner's triads also exist in the columns of Newlands' Octaves? Compare and find out.

Answer-Yes, only one triad of Dobereiner's triads (Li, Na, and K) exists in the columns of Newlands' octaves.

Question 2: What were the limitations of Dobereiner's classification?

Answer- Dobereiner could not be classify all the known elements into groups of triads on the basis of their properties.

Question 3: What were the limitations of Newlands' Law of Octaves?

Answer- a) It was applicable up to calcium only.

b) Those elements that were discovered after Newlands' octaves did not follow the law of octaves.

c) He placed some elements together having different chemical properties.

Question 4: Use Mendeleev's Periodic Table to predict the formulae for the oxides of the following elements: K, C, Al, Si, Ba.

Answer - K_2O , CO_2 , Al_2O_3 , SiO_2 , BaO

Question 5 : Besides gallium, which other elements have since been discovered that were left by Mendeleev in his Periodic Table? (any two)

Answer- Scandium and germanium

Question 6: What were the criteria used by Mendeleev in creating his Periodic Table?

Answer- Mendeleev's periodic law- Chemical properties of elements are periodic functions of their atomic masses. According to this law Mendeleev arranged elements in increasing order of their masses.

Question 7: Why do you think the noble gases are placed in a separate group?

Answer- Noble gases like helium, neon, argon etc are inert elements. They exist in atmosphere in very small quantity. Therefore, the noble gases are placed in a separate group.

Question 8: How could the Modern Periodic Table remove various anomalies of Mendeleev's Periodic Table?

- Answer- (1) In modern periodic table elements are placed according to their atomic number in place of atomic mass. So position of hydrogen is justified.
- (2) In modern periodic table isotopes are placed at same place, as all isotopes of an element have same atomic number.

(3) In modern periodic table noble gasses are placed in a different group, but there is not any place for noble gasses in Mandeleev's periodic table.

Question 9: Name two elements you would expect to show chemical reactions similar to magnesium. What is the basis for your choice?

Answer- Calcium (Ca) and strontium (Sr) are expected to show chemical reactions similar to magnesium (Mg).

This is because all these elements have 2 valence electrons, and are present in same group.

Question 10- Name

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

Answer- Hydrogen, Lithium, sodium and Potassium.

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

Answer- Magnesium and Calcium.

(c) Three elements with filled outermost shells.

Answer- Helium, Neon and Argon

Question 11: (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?

Answer- Lithium, sodium and potassium belongs to 1st group and all have 1 valence electron.

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

Answer- Helium and neon both belongs to 18th group and have 0 valence electrons.

Question 12: In the Modern Periodic Table, which are the metals among the first ten elements?

Answer- Lithium (Li) and beryllium (Be).

Question 13: By considering their position in the Periodic Table, which one of the following elementswould you expect to have maximum metallic characteristic?Ga, Ge, As, Se, Be

Answer- Since Be lies to the extreme left hand side of the periodic table, Be is the most metallic among the given elements.

EXERCISE QUESTION-ANSWERS

Question 1: Which of the following statements is not a correct statement about the trends when going from left to right across the periods of 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. \checkmark

(d) The oxides become more acidic.

Question 2: Element X forms a chloride with the formula XCl₂, which is a solid with a high melting point. X would most likely be in the same group of the Periodic Table as

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(a) Na (b) Mg 🗸	(c) A	1	(d) Si				
Question 3: Which element has							
(a) Two shells, both of whic	h are completely filled	with electrons?					
Answer- Neon (2,8).							
(b) The electronic configura	ntion 2, 8, 2?						
Answer- Magnesium.							
(c) A total of three shells, w	ith four electrons in its	valence shell?					
Answer- Silicon (2,8,4).	Answer- Silicon (2,8,4).						
(d) A total of two shells, wit	h three electrons in its	valence shell?					
Answer- Boron (2,3).							
(e) Twice as many electrons	s in its second shell as in	n its first shell?					
Answer- carbon (2,4).							
Question 4: (a) What property	do all elements in the sa	ame column of the F	Periodic Table as boron have in				
common?							
Answer- All have 3 valence elect	rons and have 3 valency.						
(b) What property do all elements	nts in the same column	of the Periodic Tab	le as fluorine have in common?				
Answer- All have 7 valence elect	rons and have -1 valency	1.					
Question 5: An atom has electro	onic configuration 2, 8,	7.					
(a) What is the atomic number	of this element?						
(b) To which of the following el	ements would it be che	mically similar? (At	omic numbers are given in				
parentheses.) N(7)	F(9) P(15) A	r(18)					
Answer- (a) The atomic number of	of this element is 17.						
(b) It would be chemically similar	r to F(9) with configurat	ion as 2, 7.					
Question 6: The position of thre	ee elements A, B and C	in the Periodic Tab	le are shown below –				
	Group 16	Group 17					
	_	Ā					
	-	-					
	В	С					
(a) State whether A is a met	(a) State whether A is a metal or non-metal.						
Answer- Non-metal							

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

Answer- C is less reactive than A, as reactivity decreases down the group.

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

Answer- C will be smaller in size than B as moving across a period, size decrease.

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

Answer- A will form an anion as it is a non-metal so it accepts an electron to complete its octet.

Question 7: Nitrogen (atomic number 7) and phosphorus (atomic number 15) belong to group 15 of the Periodic Table. Write the electronic configuration of these two elements. Which of these will be more

electronegative? Why?

Answer- Nitrogen (7) = 2, 5

Phosphorus (15) = 2, 8, 5

Among these Nitrogen is more electronegative because it have smaller size than phosphorus.

Question 8: How does the electronic configuration of an atom relate to its position in the Modern Periodic Table?

Answer- In the modern periodic table, atoms with similar electronic configurations are placed in the same column. In a group, the number of valence electrons remains the same. Elements across a period show an increase in the number of valence electrons.

Question 9- 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?

Answer- The element with atomic number 12 has same chemical properties as that of calcium. This is because both of them have same number of valence electrons (2).

Question 10: Compare and contrast the arrangement of elements in Mendeleev's periodic Table and the Modern Periodic Table.

Answer-

Mendeleev's periodic Table	Modern Periodic Tab
1. Elements are arranged in the increasing order of	1. Elements are arranged in the increasing order of
their atomic masses.	their atomic numbers.
2. There are a total of 7 groups (columns) and 6	2. There are a total of 18 groups (columns) and 7
periods (rows).	periods (rows).
3. Noble gasses were not discovered then, so noble	3. Noble gasses are placed in a different group.
gasses have not any place.	

CHAPTER 10 -LIGHT - REFLECTION AND REFRACTION

Some Points To Remember To Solve Numericals

Distance of object from	m mirror or lens = u	Distance of image from mirror or lens = v
Focal length of mirror	or lens $=$ f	Height of object = h
Height of image = h'		Magnification = m
Power of lens $=$ P		Radius of curvature of mirror $= R$
For Mirrors		
For convex mirror-	u = -ve (always negative)	
	v = +ve (always positive)	
	f = +ve (always positive)	
For concave mirror-	u = -ve (always negative)	
	v = -ve (negative), But	v = +ve (positive when object is between F and P)
	f = -ve (always negative)	
Nature of image		
When $v = -ve$ OR	Magnification $m = -ve$ then in	nage is real and inverted.
Formulae Foca	l length = $f = \frac{R}{2}$	
Mirro	or formula $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$	
Magn	ification = $m = \frac{h'}{h} = -\frac{v}{u}$	
For Lens		
For convex lens-	u = -ve (always negative)	
	v = +ve (positive), but $v = +ve$	= -ve (negative when object is between O and F)
	f = +ve (Always positive)	
For concave lens-	u = -ve (always negative)	
	v = -ve (always negative)	
	f = -ve (always negative)	
Nature of image		
When $v = +ve$ OR	Magnification $m = -ve$ then i	mage is real and inverted.

<u>Formulae</u>

Power of a lens =
$$P = \frac{1}{f(m)}$$

Lens formula $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

Magnification =
$$m = \frac{h'}{h} = \frac{v}{v}$$

Question 1: Define the principal focus of a concave mirror.

Answer- The point on principal axis, where parallel rays to principal axis, meet after reflecting from the concave mirror is known as principal focus.

Question 2: The radius of curvature of a spherical mirror is 20 cm. What is its focal length?

Answer- Radius of curvature = R= 20 cm

Focal length = $f = \frac{R}{2} = \frac{20}{2} = 10 \text{ cm}$

Question 3: Name the mirror that can give an erect and enlarged image of an object.

Answer- Concave mirror.

Question 4: Why do we prefer a convex mirror as a rear-view mirror in vehicles?

Answer- Convex mirrors give a virtual, erect, and diminished image of the objects placed in front of them. They are preferred as a rear-view mirror in vehicles because they give a wider field of view, which allows the driver to see most of the traffic behind him.

Question 5: Find the focal length of a convex mirror whose radius of curvature is 32 cm.

Answer- Radius of curvature = R = +32 cm

Focal length = $f = \frac{R}{2} = \frac{32}{2} = +16$ cm

Question 6: A concave mirror produces three times magnified (enlarged) real image of object placed

at 10 cm in front of it. Where is the image located?

Answer- Distance of object = u = -10 cm

Magnification
$$= m = 1$$

Distance of image = v = ?

We know that,
$$m = \frac{1}{2}$$

$$3 = \frac{-v}{-10}$$
 $\sum v = 3x10 = 30$ cm

Question 7: A ray of light travelling in air enters obliquely into water. Does the light ray bend towards the normal or away from the normal? Why?

Answer- The light ray bends towards the normal. Because when a ray of light travels from an optically rarer (air) medium to an optically denser (water) medium, it gets bent towards the normal.

Question 8: 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 ms⁻¹

Answer- Refractive index = n = 1.50

Speed of light in vacuum = $c = 3 \times 10^8 \text{ m/s}$

Peed of light in glass = v = ?

Refractive index $=\frac{c}{c}$

$$1.5 = \frac{3 \times 10^8}{v}$$
$$v = \frac{3 \times 10^8}{15} = 2 \times 10^8 \text{ m/s}$$

Question 9: Find out, from Table 10.3, 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	1.53
		Balsam	
Ice	1.31		
Water	1.33	Rock salt	1.54
Alcohol	1.36		
Kerosene	1.44	Carbon	1.63
		disulphide	
Fused	1.46		
quartz		Dense	1.65
		flint glass	D.T.
Turpentine	1.47		
oil		Ruby	1.71
Benzene	1.50		
		Sapphire	1.77
Crown	1.52	\sim	
glass		Diamond	2.42

Table	10.3	Absolute	refractive	index of	fsome	ma	terial	media

Answer- Highest optical density = Diamond

Lowest optical density = Air

Question 10: You are given kerosene, turpentine and water. In which of these does the light travel fastest ? Use the information given in Table 10.3.

Answer- Among kerosene, turpentine and water, light will travel fastest in water because it have lowest refractive index.

Question 11: The refractive index of diamond is 2.42. What is the meaning of this statement?

Answer- This suggests that the speed of light in diamond will reduce by a factor 2.42 compared to its speed in air.

Question 12: Define 1 dioptre of power of a lens.

Answer-1 dioptre is defined as the power of a lens of focal length 1 metre.

Question 13: 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.

Answer-Image is real and inverted and size of image is equal to that of object, So magnification = m = -1

Magnification = m = $\frac{h'}{h} = \frac{v}{u} = -1$

Image distance = v = +50 cm

u = -50 cm

 $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

Now by lens formula

$$\frac{1}{f} = \frac{1}{50} + \frac{1}{50}$$
$$\frac{1}{f} = \frac{2}{50} = \frac{1}{25}$$
$$f = +25 \text{ cm} = \frac{25}{100} = \frac{1}{4}m$$

 $\frac{1}{50} - \frac{1}{-50} = \frac{1}{f}$

Now, power of lens = $P = \frac{1}{f} = \frac{1}{\frac{1}{4}} = +4 D$

Question 14: Find the power of a concave lens of focal length 2 m.

(b) Glass

Answer- Focal length of concave lens = f = -2m

Now, Power of lens = $P = \frac{1}{f} = \frac{1}{-2} = -0.5 D$

EXERCISE QUESTION-ANSWERS

Question 1: Which one of the following materials cannot be used to make a lens?

(a) Water

(c) Plastic

(d) Clay 🗸

Question 2: 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. \checkmark

Question 3: Where should an object be placed in front of a convex lens to get a real image of the size of the object?

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(a) At the principal focus of the lens	
(b) At twice the focal length \checkmark	
(c) At infinity	
(d) Between the optical centre of the lens an	nd its principal focus.
Question 4: A spherical mirror and a thi	n 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 is con	(d) the mirror is convex, but the lens is concave
Question 5: No matter how far you stand	l from a mirror, your image appears erect. The mirror is likely to
be	
(a) plane	(b) concave
(c) convex	(d) Either plane or convex 🗸
Question 6: Which of the following lenses	s 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 \checkmark	(d) A concave lens of focal length 5 cm
Question 7: We wish to obtain an erect in	nage of an object, using a concave mirror of focal length 15 cm.
What should be the range of distance of t	the object from the mirror? What is the nature of the image? Is
the image larger or smaller than the obje	ect? Draw a ray diagram to show the image formation in this case.
Answer- Range of object distance $= 0$ cm to	515 cm
Nature- Image will be virtual, erect	and larger in size.
Question 8- Name the type of mirror used (a) Headlights of a car (b) Side/rear-view mirror of a vehicle	d in the following situations.
(c) Solar furnace	
Support your answer with reason.	
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Answer- (a) **Concave mirror** is used in the headlights of a car. This is because concave mirrors can produce powerful parallel beam of light when the light source is placed at their principal focus.

(b) **Convex mirror** is used in side/rear view mirror of a vehicle. Convex mirrors give a virtual, erect, and diminished image of the objects placed in front of it. Because of this, they have a wide field of view. It enables the driver to see most of the traffic behind him/her.

(c) **Concave mirrors** are used to construct solar furnaces. Concave mirrors converge the light incident on them at a single point to produce a large amount of heat at that point.

Question 9: 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.

Answer- The convex lens will form complete image of an object, even if its one half is covered with black paper. But image will have low intensity.



Question 10: 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.

Answer- Height of object = h = 5 cm

Focal length = f = +10 cm

Object distance = u = -25 cm

Image distance = v = ?

Height or size of image = h' = ?



Distance of image is positive, hence image will be real and inverted





Answer- Focal length = f = -15 cm

Image distance = v = -10 cm

Object distance = u = ?

According to lens formula $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

$$\frac{1}{-10} - \frac{1}{u} = \frac{1}{-15}$$
$$\frac{1}{u} = \frac{1}{-10} - \frac{1}{-15}$$
$$\frac{1}{u} = \frac{-1}{-10} + \frac{1}{-15}$$
$$\frac{1}{u} = \frac{-1}{10} + \frac{1}{15}$$
$$\frac{1}{u} = \frac{-3+2}{30} = \frac{-1}{30}$$
So u = -30 cm



Question 12: 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.

Answer- Focal length = f = +15 cm Object distance = u = -10 cm Image distance = v = ?

According to mirror formula $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

$$\frac{1}{v} + \frac{1}{-10} = \frac{1}{15}$$
$$\frac{1}{v} = \frac{1}{15} - \frac{1}{-10}$$
$$\frac{1}{v} = \frac{1}{15} + \frac{1}{10}$$
$$\frac{1}{v} = \frac{2+3}{30} = \frac{5}{30} = \frac{5}{30}$$
So $v = 6$ cm

Question 13: The magnification produced by a plane mirror is +1. What does this mean?

Answer- The magnification produced by a plane mirror is +1. It shows that the image formed by the plane mirror is of the same size as that of the object. The positive sign shows that the image formed is virtual and erect.

Question 14: 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.

Answer- Height of object = h = 5 cm Radius of curvature = R = +30 cm Focal length = f = $\frac{R}{2}$ = + $\frac{30}{2}$ = +15 cm Object distance = u = -20 cm Image distance = v = ? Height or size of image = h' = ? According to mirror formula $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$ $\frac{1}{v} + \frac{1}{-20} = \frac{1}{15}$ $\frac{1}{v} = \frac{1}{15} - \frac{1}{-20}$ $\frac{1}{v} = \frac{1}{15} + \frac{1}{20}$

 $\frac{1}{v} = \frac{4+3}{60} = \frac{7}{60}$ So, $v = \frac{+60}{7}$ cm

 $m = \frac{h'}{v} = -\frac{v}{v}$

Now,

$$\frac{h'}{5} = -\frac{60}{7x(-20)}$$
$$h' = \frac{15}{7} cm = 2.2 cm$$

Question 15: 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 focused image can be obtained? Find the size and the nature of the image.

Answer- Height of object = h = 7 cm

Focal length = f = -18 cm

Object distance = u = -27 cm

Image distance = v = ?

Height or size of image = h' = ?

According to mirror formula

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$
$$\frac{1}{v} + \frac{1}{-27} = \frac{1}{-18}$$
$$\frac{1}{v} = \frac{1}{-18} - \frac{1}{-27}$$
$$\frac{1}{v} = \frac{1}{-18} + \frac{1}{27}$$
$$\frac{1}{v} = \frac{-3+2}{v} = \frac{-1}{v}$$

$$\frac{-}{v} = \frac{-}{54} = \frac{-}{2}$$

v = -54 cm

54

V is negative so image will be formed real and inverted in front of mirror

Now

$$m = \frac{h'}{h} = -\frac{v}{u}$$
$$\frac{h'}{7} = -\frac{-54}{-27}$$
$$h' = -7x2 = -14 \text{ cm}$$

So

Question 16: Find the focal length of a lens of power -2.0 D. What type of lens is this?

Answer- Power of lens = P = -2 D

Focal length = f = ?

Now,

$$P = \frac{1}{f}$$

$$f = \frac{1}{P} = \frac{1}{-2} = -0.5 m$$

As focal length is negative, So lens is concave in nature.

Question 17: 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?

Answer- Power of lens = P = +1.5 D

Focal length = f = ?

Now,

$$P = \frac{1}{f}$$
$$f = \frac{1}{P} = \frac{1}{1.5} = \frac{10}{15} = 0.66 m$$

As focal length is positive, So lens is convex in nature.

Ray Diagrams-Mirrors

(1) Concave mirror- When object is at infinity



Position of Image- at Principle focus (F) **Size of image-** very small **Nature of image-** Real and inverted

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<u>CHAPTER 11 -HUMAN EYE AND COLOURFUL WORLD</u>

Question 1: What is meant by power of accommodation of the eye?

Answer- The ability of eye lens to adjust its focal length to see near and far objects, is known as power of accommodation of eye.

Question 2: 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?

Answer- Concave Lens.

Question 3: What is the far point and near point of the human eye with normal vision?

Answer- For normal eye far point is at infinity and near point is at 25 cm from eye.

Question 4: 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?

Answer- A student has difficulty in reading the blackboard while sitting in the last row. It shows that he is unable to see distant objects clearly. He is suffering from myopia. This defect can be corrected by using a concave lens.

EXERCISE QUESTION-ANSWERS

Question 1: The human eye can focus objects at different distances by adjusting the focal length of the eve lens. This is due to (b) Accommodation 🖌 (a) Presbyopia (c) Near-sightedness (d) Far-sightedness Question 2: The human eye forms the image of an object at its (a) Cornea (b) Iris (c) Pupil (d) Retina 🗸 **Question 3: The least distance of distinct vision for a young adult with normal vision is about** (a) 25 m (b) 2.5 cm(c) 25 cm ✓ (d) 2.5 m Question 4: The change in focal length of an eye lens is caused by the action of the (a) pupil (b) retina (c) ciliary muscles \checkmark (d) iris Question 5: 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? Answer-(i) For distant vision, Power of lens = P = -5.5 DFocal length $= f = \frac{1}{p} = \frac{1}{-5.5} = -\frac{10}{55} = -0.18 m$ (ii) For near vision Power of lens = P = +1.5 DPrepared by- Kirandeep Singh (GSSS Machhike MOGA) & Samandeep Kaur (GSSS Bilaspur MOGA) Page 27

Focal length =
$$f = \frac{1}{p} = \frac{1}{1.5} = \frac{10}{15} = +0.67 m$$

Question 6: 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?

Answer- Object distance (Far point for normal eye) $= u = -\infty$ (infinity) Image distance (Far point of defected eye) = v = -80 cm

Focal length = f = ?

According to lens formula $\frac{1}{n} - \frac{1}{n} = \frac{1}{f}$

$$\frac{1}{-80} - \frac{1}{-\infty} = \frac{1}{f}$$
$$\frac{1}{f} = \frac{1}{-80} - 0$$
$$\frac{1}{f} = \frac{1}{-80}$$

f = -80 cm = $-\frac{80}{100}$ = -0.8 m Now, Power of required lens = P = $\frac{1}{f(m)} = \frac{1}{-0.8} = -\frac{10}{8} = -1.25 D$

As Focal length of lens is negative, Hence lens is concave.

Question 7: 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.

Answer- Object distance (Near point for normal eye) = u = -25 cm

Image distance (Near point of defected eye) = v = -1 m = -100 cm

Focal length = f = ?

According to Lens formula $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

$$\frac{1}{-100} - \frac{1}{-25} = \frac{1}{f}$$
$$\frac{1}{f} = \frac{-1}{100} + \frac{1}{25} = \frac{-1+4}{100} = \frac{3}{100}$$
$$f = \frac{100}{3} = \frac{100}{3 \times 100} m = +\frac{1}{3} m$$

Now, Power of required lens $= P = \frac{1}{f(m)} = \frac{1}{\frac{1}{3}} = + 3D$

As Focal length of lens is positive, Hence lens is convex

Question 8- Why is a normal eye not able to see clearly the objects placed closer than 25 cm.

Answer- Because ciliary muscles of the eye are unable to contract beyond a certain limit. So we can not see clearly the objects placed closer than 25 cm.

Question 9: What happens to the image distance in the eye when we increase the distance of an object from the eye?

Answer- Image is always formed on retina even on increasing the distance of an object from eye. For this eye lens becomes thinner to increase its focal length.

Question 10: Why do stars twinkle?

Answer- Stars twinkle due to the atmospheric refraction of light. Stars are very far away from the earth. Hence, they are considered as point sources of light. When the light coming from stars enters the earth's atmosphere, it gets refracted .Because of the variation in the air density at different levels of the atmosphere, the light intensity entering in our eye changes regularly. Therefore, it appears as if the stars are twinkling at night.

Question 11: Explain why the planets do not twinkle?

Answer- Planets do not twinkle because they appear larger in size than the stars as they are relatively closer to earth. Planets can be considered as a collection of a large number of point-size sources of light. The different parts of these planets produce either brighter or dimmer effect in such a way that the average of brighter and dimmer effect is zero. Hence, the twinkling effects of the planets are nullified and they do not twinkle.

Question 12: Why does the Sun appear reddish early in the morning?

Answer- During sunrise, the light rays coming from the Sun have to travel a greater distance in the earth's atmosphere before reaching our eyes. In this journey, the shorter wavelengths of lights are scattered out and only

longer wavelengths (red, orange, yellow) are able to reach our eyes. Therefore, the Sun appears reddish early in the morning.

Question 13: Why does the sky appear dark instead of blue to an astronaut?

Answer- The sky appears dark instead of blue to an astronaut because there is no atmosphere in the outer space that can scatter the sunlight. As the sunlight is not scattered, no scattered light reach the eyes of the astronauts and the sky appears black to them.

Question 14: Draw a well labeled diagram of human eye.

Answer-

CHAPTER 15 -OUR ENVIRONMENT

Question 1: What are trophic levels? Give an example of a food chain and state the different trophic levels in it.

ANSWER: Each step or level of the food chain is known as a trophic level. Trophic levels can be broadly classified as Producers; Primary, Secondary and Tertiary Consumers. An example of a food chain:

Grass-----→ Deer------→ Lion

(Producer)

1st Trophic level

(Herbivore) 2nd trophic level (Carnivore) 3rd trophic level

Question 2: What is the role of decomposers in the ecosystem?

ANSWER -Decomposers break down the organic components of dead and decaying matter into simple inorganic substances. The organic matter like dead animal bodies are recycled in the ecosystem thereby cleaning the environment. And, the inorganic elements return back the minerals into the soil making the soil fertile.

Question 3: Why are some substances biodegradable and some non-biodegradable?

ANSWER- Substances that can be broken down by biological processes are said to be biodegradable. In our environment, many of the substances are broken easily by decomposers. Examples: Paper, vegetable peels etc. However, substances which cannot be broken down biologically but by physical means are known as non-biodegradable substances. Example: Plastic.

Question 4: Give any two ways in which biodegradable substances would affect the environment.

ANSWER- (1) These substances on degradation can produce foul smell which affects the population living nearby. They may also become a breeding place for insects.

(2). Many harmful greenhouse gases may evolve during degradation leading to global warming.

Question 5: Give any two ways in which non-biodegradable substances would affect the environment. ANSWER- (i) Substances like DDT, BHC enter in the food chain and cause biomagnification.

(ii) They cause pollution.

(iii) They also kill useful microorganisms.

Question 6: What is ozone and how does it affect any ecosystem?

ANSWER- Ozone (O₃) is a triatomic molecule of oxygen.

Ozone (O₃) thus forms a layer in the upper atmosphere. It shields the surface of the earth from ultra-violet

radiation (UV) coming from sun as these radiations are very harmful causing skin cancer and cataract in humans. It also cause harm to the crops.

Question 7: How can you help in reducing the problem of waste disposal? Give any two methods.

- ANSWER- (i) Throwing biodegradable and non-biodegradable waste into separate dustbins so that recycling can be done easily.
 - (ii) By putting the organic waste into compost pits dug in the ground and preparing compost. This compost helps in increasing the fertility of soil.
 - (iii) Practicing the 3 R's: Reduce, Reuse and Recycle.

EXERCISE QUESTION ANSWERS

Question 1: Which of the following groups contain only biodegradable items?

- (a) Grass, flowers and leather (\checkmark)
- (b) Grass, wood and plastic
- (c) Fruit-peels, cake and lime-juice (\checkmark)
- (d) Cake, wood and grass (\checkmark)

Question 2 - Which of the following constitute a food-chain?

- (a) Grass, wheat and mango
- (b) Grass, goat and human (\checkmark)
- (c) Goat, cow and elephant
- (d) Grass, fish and goat

Questiion 3- 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 (\checkmark)

Question 4- What will happen if we kill all the organisms in one trophic level?

ANSWER-If we kill all the organisms of one trophic level it will create an imbalance in the ecosystem.

For example, in a food chain:

If lions are removed from the above food chain, then population of deer will increase which will cause overgrazing. This will lead to deforestation. It may even lead to soil erosion causing further conversion of fertile land into barren desert.

Question 5: 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?

ANSWER- Yes, the impact of removing all the organisms in a trophic level will be different for different trophic levels.

No, the organisms of any trophic level cannot be removed without causing any damage to the ecosystem.

Consider the following example:

 $Grass \rightarrow Deer \rightarrow Lion$

1. If all the grass is removed, the deer will die out due to starvation which in turn will wipe out the lions.

2. If all the deer population is removed, the lions will die out due to starvation. The grasses will increase in number and turn the land into forests.

3. If all the lions are removed, the population of deer will keep on increasing which in turn will eat all the grass leaving the land barren.

Question 6- What is biological magnification? Will the levels of this magnification be different at different levels of the ecosystem?

ANSWER- Biological Magnification is the increase in concentration of harmful substances in the body of the living organism at each trophic level.

Yes, the levels of this magnification is different at different levels of the ecosystem. It is highest at the top most level of the food chain and lowest in first trophic level.

Question 7: What are the problems caused by the non-biodegradable wastes that we generate?

ANSWER- (i) Substances like DDT, BHC enter in the food chain and cause biomagnification.

(ii) They cause pollution.

(iii) They also kill useful microorganisms.

Question 8: If all the waste we generate is biodegradable, will this have no impact on the environment? ANSWER- If all the waste we generate is biodegradable, this will also have impact on the environment. These waste when not disposed properly releases foul smell which affects the population living nearby. These waste can also become breeding place for mosquitoes and other insects causing spread of diseases.

Question 9 Why is damage to the ozone layer a cause for concern? What steps are being taken to limit this damage?:

ANSWER- The ozone layer in the stratosphere absorbs the harmful UV rays and thus protect the living beings. If this ozone layer gets depleted, the UV rays may cause cancer in humans and other plants and animals. Thus, damage to the ozone layer is a cause for concern.

In order to limit this damage, the production of CFC's (Cholorofluoro carbons) were stopped in 1986.

Question 10- What is Green House Effect?

ANSWER- The greenhouse effect is a process in which greenhouse gases, like carbon dioxide in the Earth's atmosphere, cause thermal radiation emitted by the Earth's surface to be reflected back down, therefore causing the climate to warm

Question 11-What is Global Warming?

ANSWER-Global warming is a gradual increase in the earth's temperature generally due to the greenhouse effect caused by increased levels of carbon dioxide, CFCs, and other pollutants