# TERM-1 SAMPLE PAPER SOLVED

# SCIENCE

Time Allowed: 90 Minutes

Maximum Marks: 40

General Instructions: Same instructions as given in the Sample Paper 1.

# **SECTION - A**

(Section A consists of 24 questions. Attempt <u>any 20</u> questions from this section. The first attempted 20 questions would be evaluated.)

 When a lead salt X is heated in a test tube, brown fumes of a gas Y are emitted, along with lead oxide and oxygen gas.



Identify the lead salt X and brown gas Y and select the row containing the correct substances and the type of reaction involved:

	Х	Y	Reaction type
(a)	Lead Nitrate	Nitrogen dioxide	Displacement Reaction
(b)	Lead Nitrate	Nitrogen dioxide	Decomposition Reaction
(c)	Lead Carbonate	Carbon dioxide	Displacement Reaction
(d)	Lead Carbonate	Carbon dioxide	Decomposition Reaction

Which salt has pH more than 7 in solution form:

(a) Na <sub>2</sub> CO <sub>3</sub>	(c) NaCl
(b) CaCO <sub>3</sub>	(d) CaCl <sub>2</sub>

- Arrange the metals Ca, Al, Mg and Zn in decreasing order of their reactivities:
  - (a) Mg > Ca > Al > Zn
  - (b) Ca > Mg > Al > Zn
  - (c) Mg > Ca > Zn > Al
  - (d) Ca > Mg > Zn > Al
- 4. Which of the following chemical equations are balanced?

(a) 
$$AlCl_{3(aq)} + 3NH_4OH_{(aq)} \longrightarrow Al(OH)_{3(s)}$$

- $\begin{array}{r} + 3\mathrm{NH}_4\mathrm{Cl}_{(aq)} \\ \text{(b) } 2\mathrm{AlCl}_{3(aq)} + \mathrm{NH}_4\mathrm{OH}_{(aq)} \longrightarrow 2\mathrm{Al}(\mathrm{OH})_{3(s)} \\ + \mathrm{NH}_4\mathrm{Cl}_{(aq)} \end{array}$
- (c)  $AlCl_{3(aq)} + 2NH_4OH_{(aq)} \longrightarrow Al(OH)_{3(s)} + 2NH_4Cl_{(aq)}$
- (d)  $3AlCl_{3(aq)} + 2NH_4OH_{(aq)} \longrightarrow 3Al(OH)_{3(s)}$

+ 2NH<sub>4</sub>Cl<sub>(aq)</sub>

 HCl is a stronger acid than acetic acid because:

(a) HCl turns litmus solution red.

- (b) HCl is corrosive in nature, but acetic acid not.
- (c) HCl dissociates completely, but acetic acid do not.
- (d) HCl and acetic acid are equally stronger.

6. In the reaction between MnO<sub>2</sub> and HCl, the processes X and Y have been marked as shown in the figure below.

$$MnO_2 + 4HCl \longrightarrow MnCl_2 + Cl_2 + 2H_2O$$

Identify the processes X and Y and the substances oxidized and reduced from the table below:

	x	Y	Substance oxidized	Substance reduced
(a)	Oxidation	Reduction	HCl	Cl <sub>2</sub>
(b)	Oxidation	Reduction	HCL	MnO <sub>2</sub>
(c)	Reduction	Oxidation	Mn	H <sub>2</sub> O
(d)	Reduction	Oxidation	HCL	MnO <sub>2</sub>

- Respiration is considered as an exothermic process because.
  - (I) During respiration, digested food is broken down and ATP is released.
  - (II) During respiration, body temperature is increased.

Select the correct option.

- (a) Statement (I) is correct
- (b) Statement (II) is correct
- (c) Both (l) and (ll) are correct
- (d) Both (l) and (ll) are incorrect
- 8. An aqueous solution 'A' turns phenolphthalein solution pink. On addition of an aqueous solution 'B' to 'A', the pink colour disappears. The following statement is true for solution 'A' and 'B'.
  - (a) A is strongly basic and B is a weak base.
  - (b) A is strongly acidic and B is a weak acid.
  - (c) A has pH greater than 7 and B has pH less than 7.
  - (d) A has pH less than 7 and B has pH greater than 7.
- The increase in pH value from 7 to 14 indicates:
  - (a) Increase in concentration of OH<sup>-</sup> ions
  - (b) Increase in concentration of H<sup>+</sup> ions
  - (c) Decrease in concentration of OH<sup>-</sup> ions
  - (d) No change in concentration of OH<sup>-</sup> ions
- **10.** What is the difference between the following two types of reactions ?
  - (I)  $AgNO_3 + HCl \rightarrow AgCl + HNO_3$
  - (II) Mg + 2HCl  $\rightarrow$  MgCl<sub>2</sub> + H<sub>2</sub>
  - (a) Reaction I is double displacement reaction.
    - Reaction II is single displacement reaction.

- (b) Reaction I is single displacement reaction Reaction II is precipitation reaction.
- (c) Both reactions are double displacement reaction.
- (d) Both reactions are single displacement reaction.
- **11.** The graph below shows the variation of rate of photosynthesis with light intensity for different levels of carbon dioxide.



After analyzing the graph a student writes the following statements.

- (I) The rate of photosynthesis increases linearly with light intensity.
- (II) The rate of photosynthesis first increases linearly with increase in light intensity and then becomes a constant.
- (III) For a given light intensity, the rate of photosynthesis will be more if carbon dioxide concentration is less.
- (IV)For a given light intensity, the rate of photosynthesis does not depend upon the carbon dioxide concentration. Choose from the following which of the following would be the correct statement(s).
- (a) Only I (b) Only II
- (c) Both I and III (d) Both II and IV
- **12.** What protects the inner lining of stomach from hydrochloric acid?
  - (a) Muscle
  - (b) Mucus
  - (c) Basement membrane
  - (d) Alkaline solution
- **13.** What will happen to a plant if its xylem is removed?
  - (a) No conduction of water and minerals
  - (b) No conduction of organic material
  - (c) Death of plant would occur
  - (d) Both (a) and (c)
- **14.** What are the end products of anaerobic respiration in yeast?
  - (a) CO<sub>2</sub> and water
  - (b) Alcohol and CO<sub>2</sub>
  - (c) Alcohol and Water
  - (d) Oxygen and Water

- **15.** Which is the correct sequence of air passage during inhalation?
  - (a) Nostrils  $\longrightarrow$  Larynx  $\longrightarrow$  Pharynx  $\longrightarrow$  Trachea  $\longrightarrow$  Lungs
  - (b) Nasal passage  $\longrightarrow$  Trachea  $\longrightarrow$  Pharynx  $\longrightarrow$  Larynx  $\longrightarrow$  Alveoli
  - (c) Larynx  $\longrightarrow$  Nostrils  $\longrightarrow$  Pharynx  $\longrightarrow$  Lungs
  - (d) Nostrils → Pharynx → Larynx → Trachea → Alveoli
- 16. A student performed an activity to understand the role of saliva in digestion. He took two test tubes labelled I and II having starch solution and starch solution with saliva respectively. He then added few drops of iodine to the test tubes.



Select the row containing correct observation from the table below :

Option	Test Tube I	Test Tube II	
(a)	No change in colour	Colour changes to blue black	
(b)	Colour changes to blue black	No change in colour	
(c)	Colour changes to blue black	Colour changes to blue black	
(d)	No change in colour	Colour changes to blue black	

- Magnification produced by a rear view mirror fitted in vehicles:
  - (a) is less than one
  - (b) is more than one
  - (c) is equal to one
  - (d) can be more than or less than one depending upon the position of the object in front of it.
- **18.** The figure shows a ray of light as it travels from medium A to medium B. The refractive

index of the medium B relative to medium A is:



**19.** Study the table below and select the row that has the incorrect information.

S. No.	Type of Mirror	Position of object	Magnification
(a)	Concave	Beyond C	Less than -1
(b)	Concave	At C	Equal to -1
(c)	Concave	Between C and F	Greater than -1
(d)	Convex	Between Infinity and P	Greater than +1

 Study the graph drawn below between the sine of angle of incidence and sine of angle of refraction and choose the correct statement(s):



- (I) The graph proves Snell's law of refraction.
- (II) The ratio of sine of angle of refraction to the sine of angle of incidence is known as the refractive index of second medium with respect to the first.
- (III) The refractive index of the second medium with respect to the first is less than 1.

- (IV)The value of the refractive index for a given pair of media depends upon the speed of light in the two media.
- (a) Only I (b) Both I and IV
- (c) Both II and IV (d) Both II and III
- **21.** Dispersion of white light by a prism is shown in the diagram below. What should be position of second prism in order to recombine the spectra and yield white light?



- 22. A student writes a few statements after studying the object distances and image distances of spherical mirrors and lenses.
  - I. A concave mirror gives real, inverted and

same size image if the object is placed at C *i.e.* centre of curvature.

- A convex mirror forms a virtual and magnified image of the object for all positions of the object.
- III. A convex lens forms a real and highly enlarged image if object is placed at Focus.
- IV. A concave lens forms a real and diminished image if object is placed between infinity and optical centre O of the lens.

Choose the correct statement(s) from the following:

- (a) I and III (b) II and IV
- (c) II and III (d) I, III and IV
- 23. An object is placed at a distance of 10 cm in front of a plane mirror, then the distance of image from mirror is:
  - (a) 5 cm (b) 10 cm
  - (c) 20 cm (d) 0
- 24. At noon the sun appears white as (a) Red light is least scattered
  - (b) Red light is scattered the most
  - (c) Blue colour is scattered the most
  - (d) Blue colour is scattered the least

# **SECTION - B**

(Section B consists of 24 questions (Q. No. 25 to 48). Attempt <u>any 20</u> questions from this section. The first attempted 20 questions would be evaluated.)

**25.** Match the reaction given in column I with the type of reaction in column II.

Column I	Column II	
(I) $CaCO_{3(s)} \rightarrow CaO_{(s)} + CO_{2(g)}$	(a)Combination Reaction	
(II) $BaCl_{2(aq)} + CuSO_{4(aq)}$ $\rightarrow BaSO_{4(s)} + CuCl_{2(aq)}$	(b)Displacement Reaction	
(III) $H_{2(g)} + Cl_{2(g)} \longrightarrow$ $2HCl_{(g)}$	(c) Decomposition Reaction	
(IV) $CuCl_{2(aq)} + Pb_{(s)} \rightarrow PbCl_{2(aq)} + Cu_{(s)}$	(d)Double Displacement Reaction	
(a) (l) – (b); (ll) – (d); (lll) – (a); (lV) – (c) (b) (l) – (d); (ll) – (c); (lll) – (b); (lV) – (a) (c) (l) – (c); (ll) – (a); (lll) – (b); (lV) – (d) (b) (l) – (c); (ll) – (c) (ll) – (b); (lV) – (d)		
(a) (l) – (c); (ll) – (d); (ll)	– (a); (IV) – (b)	

- **26.** Plaster of Paris is hardened by:
  - (a) Combining with water
  - (b) Due to formation of gypsum

- (c) Due to formation of slaked lime
- (d) Both (a) and (b)
- **27.** Oxides of which of the following metals are amphoteric oxides?
  - (I) Fe (II) Al
  - (III) Zn (IV) Mn
  - (a) Both (l) and (ll)
  - (b) Both (II) and (III)
  - (c) Both (l) and (IV)
  - (d) Both (II) and (IV)
- **28.** Common salt conducts electricity in molten state, because :
  - (a) Na<sup>+</sup> and Cl<sup>-</sup> free to move in molten state but not in solid state
  - (b) Na<sup>+</sup> and Cl<sup>-</sup> free to move in solid state but not in molten state
  - (c) Na<sup>+</sup> and Cl<sup>−</sup> free to move in gaseous state but not in solid state
  - (d) Na<sup>+</sup> and Cl<sup>-</sup> needs force to move in gaseous state
- 29. The pH of the gastric juices released during digestion is:

- (a) equal to 0
- (b) equal to 7
- (c) less than 7
- (d) more than 7
- **30.** Baking powder is a mixture of:
  - (a) sodium carbonate and ethanoic acid
  - (b) sodium hydrogen cabonate and ethanoic acid
  - (c) sodium carbonate and tartaric acid
  - (d) sodium hydrogen carbonate and tartaric acid

Question No. 31 to 34 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

**Options:** 

- (a) Both A and R are true, and R is the correct explanation of A.
- (b) Both A and R are true, but R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.
- **31.** Assertion (A): Hydrogen chloride gas does not change the colour of dry blue litmus paper.
  - Reason (R): Hydrogen chloride gas dissolves in the water present in wet litmus paper to form H<sup>+</sup> ions.
- 32. Assertion (A): When zinc is added to an aqueous solution of iron (II) sulphate, no change is observed.
  - Reason (R): Zinc is more reactive than iron.
- 33. Assertion (A): Human heart does not allow mixing of oxygen rich blood with carbon dioxide rich blood.
  - Reason (R): Human heart has four chambers.
- **34.** Assertion (A): The stars twinkle while the planets do not.
  - Reason (R): The stars are much bigger in size than the planets.
- **35.** A metal M does not liberate hydrogen from acids but reacts with oxygen to give a black colour product. The metal M is
  - (a) zinc (b) iron
  - (c) copper (d) aluminium

- **36.** The part of alimentary canal that receives bile from the liver is:
  - (a) Oesophagus
  - (b) Stomach
  - (c) Small intestine
  - (d) Large intestine
- 37. The rate of breathing in aquatic organisms is much faster than terrestrial organisms as:
  - (a) Amount of dissolved oxygen is quite low as compared to amount of oxygen in air.
  - (b) Amount of dissolved carbon dioxide is quite low as compared to amount of carbon dioxide in air.
  - (c) Fishes have gills
  - (d) Heart of fishes have only two chambers.
- **38.** Which of the following statements are incorrect?
  - (I) Ventricles have thicker muscular walls than atria.
  - (II) Ventricles pump blood into various organs
  - (III) Valves in heart ensure that blood does not flow backwards when atria or ventricle relax.
  - (IV) Deoxygenated blood is transferred to lungs by left ventricle.
  - (a) Both (l) and (ll)
  - (b) Both (II) and (III)
  - (c) Both (II) and (IV)
  - (d) Both (III) and (IV)
- **39.** What will be the nature of the image for an object placed at infinity?
  - (a) real and erect
  - (b) real and inverted
  - (c) virtual and erect
  - (d) virtual and inverted
- **40.** Select the correct statement:
  - (a) The focal length of a convex lens having power + 2D is + 50 cm.
  - (b) The focal length of a convex lens having power 2D is + 50 cm.
  - (c) The focal length of a concave lens having power + 2D is + 50 cm.
  - (d) The focal length of a concave lens having power 2D is + 50 cm.
- **41.** The figure given below shows the human excretory system with labels (I) to (IV). Identify the correct label with its functions



- (a) (I) Kidneys: Elimination of unabsorbed food and other wastes
- (b) (II) Urinary bladder: Stores urine temporarily
- (c) (III)Urethra: Urine is passed out through it
- (d) (IV) Ureter: Transfers liquid waste from the kidneys into the urinary bladder.
- **42.** Heart of which of the following organisms have four chambers?
  - (a) Giraffe (b) Fishes
  - (c) Frog (d) Lizards
- **43.** Study the figure below and answer the question that follows



The position and nature of image formed will be:

	Position of image	Nature of image
(a)	Between C and F	Real, inverted, diminished
(b)	Between C and F	Real, inverted, magnified
(c)	Between P and F	Real, inverted, diminished
(d)	Between P and F	Real, inverted, magnified

- **44.** Linear magnification produced by a convex mirror is always positive. This is because:
  - (a) image formed by a convex mirror is always smaller in size than the object

- (b) convex mirror is small mirror
- (c) image formed by a convex mirror is always virtual and erect
- (d) image formed by convex mirror is real
- **45.** Ritik held a convex lens in his hand and directed it towards the Sun. He focussed the light from the Sun on a sheet of paper to obtain a sharp bright image of the Sun. He hold the paper and the lens in the same position for a while. After a while, he observed that paper begins to burn producing smoke and caught fire after a while. He wrote the following possible explanation for the case.



- (I) image is formed at focus
- (II) sun was too bright and temperature was high
- (III) The parallel rays of light converged to a point by the lens
- (IV)The concentration of the sunlight at apoint generated heat.
- (V) The parallel rays of light diverged to a point by the lens.

Select the correct statements w.r.t. to correct explanation.

- (a) Statement (I), (II), (III)
- (b) Statement (I), (II), (III), (IV)
- (c) Statement (I), (III), (IV)
- (d) Statement (I), (IV)
- **46.** What is the formula for magnification obtained with a lens?
  - (a) Ratio of height of image to height of object.
  - (b) Double the focal length.
  - (c) Inverse of the radius of curvature.
  - (d) Inverse of the object distance.
- **47.** An object 4 cm in height, is placed at 15 cm in front of a concave mirror of focal length 10 cm. The distance from the mirror where a screen should be placed to obtain a sharp image of the object is:
  - (a) 15 cm behind the mirror
  - (b) 15 cm in front of the mirror
  - (c) 30 cm behind the mirror
  - (d) 30 cm in front of the mirror
- **48.** The metals which react with steam but not with hot water is:
  - (a) Al, Zn, Fe(b) Pb and Cu(c) Ag and Au(d) K, Na, Mg

# SECTION - C

(Section C consists of three Cases followed by questions. There are a total of 12 questions in this section. Attempt <u>any 10</u> questions from this section. The first attempted 10 questions would be evaluated.)

#### Q. 49 to 52 are based on case-1:

**Case 1:** In the given set up 10 mL of blue coloured coppers sulphate is taken in test tubes A and B. Iron nails are dipped in test tube B for about 20 minutes. The solution in test tube turns green. Observe the given figure and answer the question that follow.



- **49.** The changes observed in the colour of iron and copper sulphate solution after the reaction shown above are:
  - (a) colour of iron nail fades and copper sulphate becomes brown
  - (b) iron becomes brownish and blue colour of copper sulphate fades
  - (c) iron is unaffected but blue colours of copper sulphate fades
  - (d) both (a) and (c)
- **50.** The chemical reaction in the above reactions is.
  - (a)  $FesO_4 + Cu \rightarrow CuSO_4 + Fe$
  - (b) Fe + CuSO<sub>4</sub>  $\rightarrow$  FeSO<sub>4</sub> + Cu
  - (c) Fe + CuSO<sub>4</sub>  $\rightarrow$  Fe + CuO<sub>4</sub> + SO<sub>2</sub>
  - (d) Fe + CuSO<sub>4</sub>  $\rightarrow$  Cu + FeSO<sub>2</sub> + O<sub>2</sub>
- **51.** Which of the following is more reactive than Cu?

(a) Iron (b)	Silver
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(c) Mercury	(d) Platinum
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- **52.** The type of reaction involved in the above activity is:
  - (a) displacement
  - (b) double displacement
  - (c) combustion
  - (d) combination

#### Q. 53 to 56 are based on case-2:

**Case 2:** Energy is needed to maintain a state of order in our body. Some organisms use simple

food material obtained from inorganic source and other organisms utilise complex substances. These substances have to be broken down into simpler ones before they can be used for the upkeep and growth of the body.

**53.** An experiment was conducted to study a factor necessary for photosynthesis.



The test performed on the leaf and the solution used for the test are respectively.

- (a) starch test and potassium iodide
- (b) chlorophyll test and ethyl alcohol
- (c) photosynthesis test and potassium iodide
- (d) starch test and ethyl alcohol
- **54.** Which of the following statement(s) is (are) true about stomata?
  - (I) These are the tiny pores present on the surface of the leaves.
  - (II) Through these, massive amounts of gaseous exchange take place.
  - (III) Plants open these pores when carbon dioxide is not required.
  - (IV)Guard cells operate the opening and closing of these pores.
  - (a) (I) and (II) only
  - (b) (I) and (III) only
  - (c) (I), (II) and (III) only
  - (d) (I), (II) and (IV) only
- **55.** Study the table below and select the row that has the incorrect information.

Organism	Type of thyrotrophic nutrition
(a) Amoeba	Holozoic
(b) Mushroom	Saprophytic
(c) Lice	Parasitic
(d) Lion	Parasitic

**56.** Below given diagram represent the cross section of a leaf.



Identify "P" and choose the correct combination of plots provided in the following table.

	Р	Description	Function
(a)	Chlorophyll	A green coloured pigment	Esential for photosyn- thesis
(b)	Chloroplast	A cell organelle	Conduct photosyn- thesis
(c)	Vascular bundle	Vascular tissue	Transporta- tion in plans
(d)	Chloroplast	A green coloured pigment	Essential for photosyn- thesis

#### Q. 57 to 60 are based on case-3:

**Case 3:** The absolute refractive index of a medium. This ability of medium to refract light is also expressed in terms of its optical density. We have been using rarer medium and 'denser medium' which actually means optically rarer medium and optically denser medium. In comparing two media the one with larger refractive index is optically denser and vice versa.

Material medium	<b>Refractive index</b>	Material medium	<b>Refractive index</b>
Air	1.003	Canada Balsam	1.53
Ice	1.31		
Water	1.33	Rock salt	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	1.77
Crown glass	1.52	Diamond	2.42

- **57.** In which of the following medium's does the light travel slowest?
  - (a) Air (b) Water
  - (c) Alcohol (d) Canada Balsam
- **58.** You are given Dense flint glass, diamond and ice. In which of these does the light travel:
  - (a) Ice
  - (b) Dense flint glass
  - (c) Diamond
  - (d) Equal in ice and diamond

- **59.** Name the medium having highest optical density in the following:
  - (a) Benzene (b) Carbon disulphide
  - (c) Water (d) Alcohol
- **60.** Find the medium with lowest optical density in the following:
  - (a) Air
- (b) Fused Quartz (d) Ruby

(c) Sapphire



# SAMPLE PAPER - 7

# **SECTION - A**

**1.** (b)  $X \rightarrow$  Lead Nitrate,  $Y \rightarrow$  Nitrogen dioxide Reaction type  $\rightarrow$  Decomposition Reaction **Explanation:** When lead nitrate is heated, it undergoes decomposition reaction to form

lead oxide, along with the evolution of gases nitrogen dioxide and oxygen.

Equation for the reaction taking place is:  $2Pb(NO_3)_{2(s)} \rightarrow 2PbO_{(s)} + 4NO_{2(q)} + O_{2(q)}$ 

**2.** (a) Na<sub>2</sub>CO<sub>3</sub>

**Explanation:** Sodium carbonate (Na<sub>2</sub>CO<sub>3</sub>) solution has pH more than 7 as on dissolving in water, it gives weak acid, H<sub>2</sub>CO<sub>3</sub> and strong base, NaOH.

**3.** (b) Ca > Mg > Al > Zn

**Explanation:** Metals have been arranged based on their relative reactivities in a series.

**4.** (a) 
$$AlCl_{3(aq)} + 3NH_4OH_{(aq)} \rightarrow Al(OH)_{3(s)} + 3NH_4Cl_{(aq)}$$

**Explanation:** The chemical equations are balanced to satisfy the law of conservation of mass in chemical reactions. This can be verified by noting the number of atoms of each element on the reactant side as well as product side.

Element	Number of atoms in reactant side	Number of atoms in product side
Al	1	1
Cl	3	3
Ν	3	3
Н	15	15
0	3	3

**5.** (c) HCl dissociates completely, but acetic acid do not.

**Explanation:** HCl is stronger acid than acetic acid because it ionises completely in aqueous solution while acetic acid is only partially ionised in aqueous solution.

**6.** (d)  $X \rightarrow$  Reduction,  $Y \rightarrow$  Oxidation,

Substance oxidized  $\rightarrow$  HCl,

Substance reduced  $\rightarrow$  MnO<sub>2</sub>

**Explanation:** The process X is Reduction and Y is Oxidation as  $MnO_2$  loses Oxygen atom to form  $MnCl_2$  whereas HCl is getting oxidized to  $H_2O$  by addition of Oxygen atom.

7. (a) Statement (I) is correct

**Explanation:** The respiration included breaking down of digested food using oxygen. Since the respiration process produces a lot of energy in form of ATP, it is exothermic process in nature.

# Selated Theory

 Glucose, formed during the digestion process, come in contact with oxygen present in our body cells to for  $CO_2$  and  $H_2O$  along with certain amount of energy. This is called respiration process.

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

8. (c) A has pH greater than 7 and B has pH less than 7.

**Explanation:** Acids have pH less than 7 and alkalis have pH more than 7.

 Phenolphthalein is an organic dye and in neutral or acidic solution, it is colourless while in the basic solution, the colour of phenolphthalein changes to pink. So the aqueous solution

'A' which turns phenolphthalein pink is basic or alkaline and has pH greater than 7.

- (2) On addition of an aqueous solution of 'B' to 'A', the pink colour disappears, it means neutralisation reaction has taken place. Hence, aqueous solution of B is acidic in nature and has pH less than 7.
- (a) Increase in concentration of OH<sup>-</sup> ions
   Explanation: Increase in the value of pH from 7 to 14 indicates that the alkaline nature is increasing due to increase in concentration of hydroxyl or OH<sup>-</sup> ions.

# Related Theory

Strong bases such as sodium hydroxide (NaOH) have pH value equal to 14 as they have maximum concentration of  $OH^-$  ions.

- (a) Reaction I is double displacement reaction Reaction II is single displacement reaction
   Explanation: The first reaction is a double displacement reaction whereas second reaction is a single displacement reaction.
- **11.** (b) Only II

**Explanation:** The rate of photosynthesis first increases linearly with increase in light intensity and then becomes aconstant. Moreover, it also depends upon the carbon dioxide concentration in the atmosphere. More the concentration of carbon dioxide, faster will be the rate of photosynthesis for a given intensity of light.

**12.** (b) Mucus

**Explanation:** The inner lining of stomach is protected from hydrochloric acid by mucus.

# **13.** (d) Both (a) and (c)

**Explanation:** The xylem tissue transports water and minerals from the soil to the leaves of a plant for photosynthesis. If xylem is removed, upward movement of water will

stop leading to wilting of leaves and ultimately causes death of a plant.

- (b) Alcohol and CO<sub>2</sub>
   Explanation: The end product is obtained by anaerobic respiration of yeast are ethyl alcohol and carbon dioxide.
- **15.** (d) Nostrils  $\longrightarrow$  Pharynx  $\longrightarrow$  Larynx  $\longrightarrow$ Trachea  $\longrightarrow$  Alveoli
- **16.** (a) Test tube  $I \rightarrow No$  change in colour Test tube  $I \rightarrow Colour$  changes to blue black

**Explanation:** We will observe a colour change in test tube B, showing presence of starch. Where as test tube A will show no colour change as due to addition of saliva, starch is converted into sugar by the enzyme salivary amylase.

**17.** (a) is less than one

**Explanation:** Convex mirror is used as a rear view mirror in vehicles. It forms virtual, erect and diminished images of the objects.

As magnification is defined as the ratio of the height of the image to the height of the object, hence, magnification produced by a rear view mirror, fitted in vehicles is less than one.

**18.** (a) 
$$\frac{\sqrt{3}}{\sqrt{2}}$$

**Explanation:** Here, angle of incidence,  $i = 60^{\circ}$ Angle of refraction,  $r = 45^{\circ}$ 

Refractive index of the medium B relative to medium A,

$$n_{BA} = \frac{\sin i}{\sin r} = \frac{\sin 60^{\circ}}{\sin 45^{\circ}}$$
$$= \frac{\left(\frac{\sqrt{3}}{2}\right)}{\left(\frac{1}{\sqrt{2}}\right)} = \frac{\sqrt{3}}{\sqrt{2}}$$

19. (d) The image formed by a convex mirror is diminished, virtual and erect when object is placed between infinity and pole P of the mirror. Magnification is less than +1.

**Explanation :** As image formed by a concave mirror is diminished, real and inverted when object is placed beyond C, magnification is less than -1.

As image formed by a concave mirror is of same size as object, real and inverted when

object is placed at C, magnification is equal to -1.

As image formed by a concave mirror is enlarged, real and inverted when object is placed between C and F, magnification is greater than -1.

As per the sign convention, Minus sign indicates that the image is inverted.

#### **20.** (b) Both I and IV

**Explanation:** Snell's law states that the ratio of sine of angle of incidence *i* to the sine of angle

of refraction r is constant. We can write  $\frac{\sin r}{\sin r}$ 

=  $n_{21}$ , where  $n_{21}$  is a constant and is called the refractive index of medium 2 with respect to medium 1.

As the refractive index is the ratio of sin *i* to sin *r*, we observe that it is greater than 1.

Also, The value of the refractive index for a given pair of media depends upon the speed of light in the two media as it is given by the ratio of speed of light in the first medium to the speed of light in the second medium.

**Explanation:** To recombine the spectra, the second prism is kept inverted to the first prism.

**22.** (a) I and III

**Explanation:** The image formed by the concave mirror is inverted and of the same size if the object is placed at the centre of curvature. A convex lens forms a real and highly enlarged image if object is placed at Focus.

A convex mirror forms a virtual and diminished image of the object for all positions of the object.

A concave lens forms a virtual and diminished image if object is placed between infinity and optical centre O of the lens.

**23.** (b) 10 cm

**Explanation:** The distance of image is equal to the distance of object in plane mirror.

**24.** (d) Blue colour is scattered the least

**Explanation:** Sun appears white at noon as only a little of the blue and violet lights are scattered.

**25.** (c) (l) – (c); (ll) – (d); (lll) – (a); (lV) – (b)

**Explanation:** Equation (I) is a decomposition reaction as a single reactant is forming two products.

Equation (II) is a double displacement reaction as the two reactants exchange their ions.

Equation (III) is a combination reaction as the two reactants combine to form a single product.

Equation (IV) is a displacement reaction as a more reactive metal, Pb, displaces a less reactive metal, Cu, from its salt solution.

**26.** (*d*) Both (*a*) and (*b*)

**Explanation:** Plaster of Paris is hardened by combining with water. On mixing with water it changes to gypsum giving a hard solid mass.

$$CaCO_2 \frac{1}{2} H_2O + 1\frac{1}{2} H_2O \longrightarrow CaSO_4.2H_2O$$

27. (b) Both (II) and (III)

**Explanation:** The metal oxides show both acidic and basic nature are known as amphoteric oxides. For ex, aluminium oxide and zinc oxide are amphoteric oxides.

The reaction of aluminium oxide with acids and bases is given below:

 $Al_2O_3 + 6HCl \longrightarrow 2AlCl_3 + 3H_2O$  $Al_2O_3 + 2NaOH \longrightarrow 2NaAlO_2 + H_2O$ 

28. (a) Na<sup>+</sup> and Cl<sup>-</sup> are free to move in molten state but not in solid state.

**Explanation:** In molten state, free electrons are present which conducts electricity.

Gastric juices released during digestion is slightly acidic. Therefore, its pH is less than 7.

**29.** (c) Less than 7.

**Explanation:** Gastric juices released during digestion is slightly acidic. Therefore, its pH is less than 7

- **30.** (d) sodium hydrogen carbonate and tartaric acid
- **31.** (a) Both A and R true, and R is correct explanation of A.

**Explanation:** Dry HCl gas does not free contain H<sup>+</sup> ions. It is only in the aqueous solution that an acid dissociate to give ions.

# Caution

Consider the gas to be dry in nature, i.e., free from any moisture. **32.** (d) A is false, but R is true.

**Explanation:** Zinc is more reactive than iron and displaces iron from iron (II) sulphate solution.

**33.** (a) Both A and R true, and R is correct explanation of A.

**Explanation:** There is no mixing of deoxygenated and oxygenated blood in human heart due to the presence of inter-atrial and inter-ventricular septum. These septa completely divide the atria and ventricles into right and left to avoid mixing of blood.

**34.** (b) Both A and R are true, but R is not the correct explanation of the A.

**Explanation:** Stars are very far away as compared to the planets so they appear smaller than the planets. Ray of light from the stars which is considered as a point source due to its distance gets refracted by different layers of the atmosphere which causes the twinkling.

**35.** (c) copper

**Explanation:** M is copper. It reacts with oxygen to form black coloured compound. CuO.

2Cu <sub>(s)</sub>	+ O <sub>2(g)</sub>	$\rightarrow$	2CuO
Copper	Oxygen		Copper oxide

**36.** (c) Small intestine

**Explanation:** The small intestine receives bile from the liver. This bile is later stored within the gall bladder which executes two different functions - making food alkaline and breaking down fat.

**37.** (a) Amount of dissolved oxygen is quite low as compared to amount of oxygen in air.

**Explanation:** As the amount of dissolved oxygen is quite low as compared to amount of oxygen in air, the rate of breathing in aquatic organisms is much faster than terrestrial organisms. Fishes have gills where the dissolved oxygen is taken up by the blood.

# **38.** (d) Both (III) and (IV)

**Explanation:** Valves in heart ensure that blood does not flow backwards when atria or ventricle contract. Deoxygenated blood is transferred to lungs for oxygenation by right ventricle.

## **39.** (b) real and inverted

**Explanation:** When the object is at infinity, nature of the image will be real and inverted.

**40.** (a) The focal length of a convex lens having power + 2D is + 50 cm.

**Explanation:** Power of a lens is the reciprocal of its focal length in m.

Here,  $\mathsf{P}$  = + 2D .

As power is positive, it is a convex lens.

$$P = \frac{1}{f(inm)} \Rightarrow +2 = \frac{1}{f}$$
$$\Rightarrow \qquad f = +\frac{1}{2}m = +50 \text{ cm}$$

- **41.** (b) (II) Urinary bladder: Stores urine temporarily **Explanation:** The kidneys filter the wastes, including urea, salt and excess water, which are flushed out of the body as urine. Part (III) is ureter which transfers liquid waste from the kidneys into the urinary bladder. Part (IV) is the urethra which provides a passage of passing out urine from the body.
- **42.** (a) Giraffe

**Explanation:** Mammals and birds have four chambers in their heart as they have high energy needs to maintain their body temperature. Fishes have two chambers whereas reptiles and amphibians have three chambers. As Giraffe is a mammal, it has four chambered heart.

**43.** (a) Position of image : Between C and F, nature of image : Real, inverted, diminished

**Explanation:** The ray diagram showing formation of image is given below:



**44.** (c) image formed by a convex mirror is always virtual and erect

**49.** (b) iron becomes brownish and blue colour of copper sulphets fades.

**Explanation:** Iron nail becomes brownish in color due to deposition of copper and the blue colour of copper sulphate solution fades as it change to green of ferrous sulphate. **Explanation:** Magnification of a convex mirror is always positive, but that of a concave mirror may be both positive or negative.

#### 45. (c) Statement I, III, IV

**Explanation:** The light from the Sun constitutes parallel rays of light. These rays were converged by the lens at the sharp bright spot formed on the paper. The bright spot obtained on the paper is a real image of the Sun. The concentration of the sunlight at a point generated heat. This caused the paper to burn.

**46.** (a) Ratio of height of image to height of object

Explanation: 
$$m = \frac{\text{Height of image}}{\text{Height of object}}$$
  
 $= \frac{h'}{h}$   
or  $m = \frac{h'}{h} = \frac{v}{\mu}$ 

**47.** (d) 30 cm in front of the mirror

**Explanation:** Let  $h_1$ =height of object = 4 cm and let  $h_2$  = height of image Object distance = u = -15 cm Focal length = f = -10 cm Let v = image distance According to mirror formula,

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

$$\frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{1}{-10} - \frac{1}{-15}$$

$$= \frac{-3+2}{30} = -\frac{1}{30}$$

The screen should be placed 30 cm in front of the mirror to get a sharp image of the object.

### **48.** (a) Al, Zn, Fe

**Explanation:** Aluminium, zinc and iron do not react with cold or hot water but they react with steam to form metal oxide and hydrogen gas.

# SECTION - C

- **50.** (b)  $CuSO_4 + Fe \rightarrow FeSO_4 + Cu$  **Explanation:**  $CuSO_4 + Fe \rightarrow FeSO_4 + Cu$ Copper Iron Ferrous Copper sulphate Sulphate
- **51.** (a) Iron

**Explanation:** Iron is more reactive than copper as copper is displaced by iron to form ferrous sulphate.

**52.** (a) displacement

**Explanation:** Iron displace copper from  $CuSO_4$  to form FeSO<sub>4</sub>. As the equation indicates, it is evident than Fe is more reactive than Cu.

**53.** (a) starch test and potassium iodide

**Explanation:** The given diagram indicates that starch test is performed on the leaf and potassium iodidie is used for the test.

**54.** (d) I, II and IV only

**Explanation:** Since large amounts of water can also be lost through the stomata, the plant close these pores when it does not need carbon dioxide for photosynthesis.

**55.** (d) Lion, Parasitic

**Explanation:** Lion show holozoic type of nutrition. In such type of nutrition, the digestion of food follows after the ingestion of food. Parasitic nutrition is a mode of heterotrophic nutrition where an organism lives on the body

surface on inside the body of another type of organism.

**56.** (b) Chloroplast, A cell organelle, conduct photosynthesis

**Explanation:** In the given diagram "P" represents the chloroplast, *i.e.*, the cell organelles that contain chlorophyll.

- 57. (d) Canada balsamExplanation: Light travels slowest in the medium with highest refractive index.
- **58.** (a) Ice

**Explanation:** Light travels fastest in the medium with lowest refractive index.

59. (b) Carbon disulphide

**Explanation:** Higher the optical density, higher the refractive index of the medium.

**60.** (a) Air

**Explanation:** Lower the optical density, lower the refractive index of the medium.

