

MT

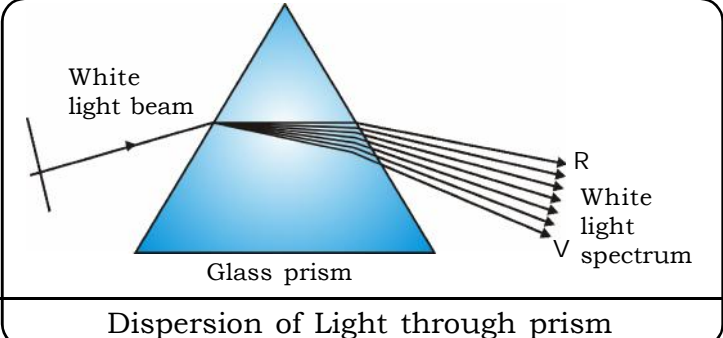
2017 ____ 1100

MT - SCIENCE & TECHNOLOGY - I (72) - SEMI PRELIM - I : PAPER - 3

Time : 2 Hours Semi Prelim - I : Model Answer Paper Max. Marks : 40

SECTION - A												
A.1. (A) Fill in the blanks :												
(1) 10% NaCl is known as brine .		1										
(2) Very fine particles mainly scatter blue light.		1										
(3) The phenomenon of change in the direction of light when it passes from one transparent medium to another is called refraction.		1										
A.1. (B) True or False :												
(1) False : Salts of strong acid and weak base are acidic in nature.		1										
(2) True		1										
A.2. Rewrite the following statements by selecting the correct alternative:												
(1) (d) Lichen		1										
(2) (b) Ferrous chloride		1										
(3) (c) passes without bending		1										
(4) (a) 50°		1										
(5) (a) increases		1										
A.3. Answer the following in short : (Any 5)												
(1)	<table border="1" style="width: 100%;"><thead><tr><th style="text-align: center;">Washing soda</th><th style="text-align: center;">Baking soda</th></tr></thead><tbody><tr><td>(i) It is sodium carbonate.</td><td>(i) It is sodium bicarbonate or sodium hydrogen carbonate.</td></tr><tr><td>(ii) It's molecular formula is $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$</td><td>(ii) It's molecular formula is NaHCO_3.</td></tr><tr><td>(iii) It is a crystalline substance.</td><td>(iii) It is an amorphous powder.</td></tr><tr><td>(iv) It is used in manufacturing soaps and detergent.</td><td>(iv) It is used in bakery for making cakes and bread lighter and spongy.</td></tr></tbody></table>	Washing soda	Baking soda	(i) It is sodium carbonate.	(i) It is sodium bicarbonate or sodium hydrogen carbonate.	(ii) It's molecular formula is $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$	(ii) It's molecular formula is NaHCO_3 .	(iii) It is a crystalline substance.	(iii) It is an amorphous powder.	(iv) It is used in manufacturing soaps and detergent.	(iv) It is used in bakery for making cakes and bread lighter and spongy.	2
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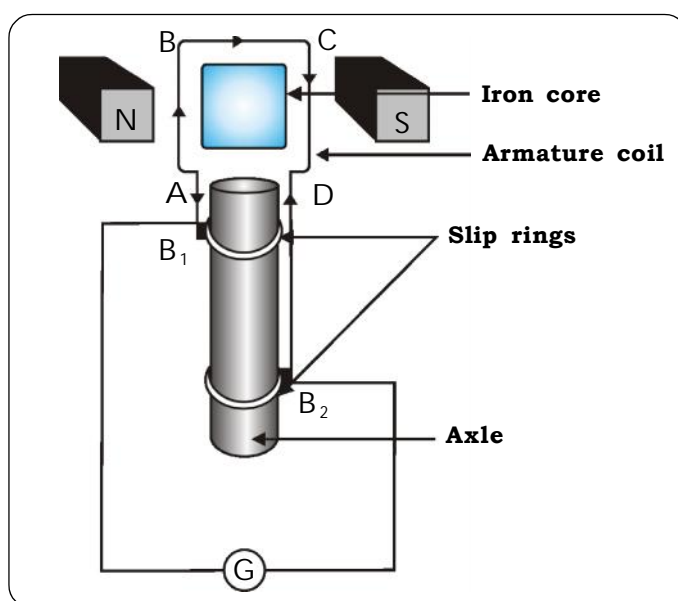
(2)	(i) Baking soda is chemically known as sodium bicarbonate. (ii) On heating, sodium bicarbonate decomposes to form sodium carbonate, water and carbon dioxide (CO ₂). (iii) The carbon dioxide produced is released due to which the cake becomes soft and spongy. (iv) Hence, baking soda is used to make cake spongy and soft.	2
(3)	When aluminium reacts rapidly with dilute hydrochloric acid, it gives aluminium chloride and hydrogen gas. $2\text{Al}_{(s)} + 6\text{HCl}_{(aq)} \rightarrow 2\text{AlCl}_{3(aq)} + 3\text{H}_{2(g)}$ <div style="display: flex; justify-content: space-around; text-align: center;"> <div>Aluminium</div> <div>Hydrochloric acid</div> <div>Aluminium chloride</div> <div>Hydrogen</div> </div>	2
(4)	(i) The blue colour of the sky is due to scattering of light by the atmosphere. (ii) At higher altitudes, there is no atmosphere, hence, the scattering of light does not take place at all. Hence, in space the sky appears dark instead of blue.	2
(5)	(i) A magnetic crane consist of a magnetic disc to which all scrap and loose iron material get attracted. (ii) Magnetism is induced in the disc, as it is not feasible to create a permanent magnet of such a big size and store such a big magnet. (iii) Hence magnetic crane is used to load and transport scrap iron.	2
(6)	<p>Given : Velocity of light in air (V_a) = 3 × 10⁸ m/s Velocity of light in medium (V_m) = 1.5 × 10⁸ m/s</p> <p>To find : Refractive index of medium w.r.t. air (_aη_m) = ?</p> <p>Formula : $\frac{V_a}{V_m} = {}_a\eta_m$</p> <p>Solution : $\frac{V_a}{V_m} = {}_a\eta_m$</p> <p>∴ ${}_a\eta_m = \frac{3 \times 10^8}{1.5 \times 10^8}$</p> <p>∴ ${}_a\eta_m = 2$</p> <p>The refractive index of medium w.r.t. air is 2.</p>	2

(7)	 <p style="text-align: center;">Dispersion of Light through prism</p>	2
<p>A.4. Answer the following in brief : (Any 5)</p>	<p>(1) (i) It is defined as fixed number of water molecules present in crystal structure. It is responsible for crystalline structure (shape) and colour in certain compounds.</p> <p>(ii) The salts that contain water of crystallization is called as hydrated salt.</p> <p>Eg. : $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$: Copper sulphate pentahydrate, it contains 5 molecules of water of crystallization.</p> <p>$\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$: Sodium carbonate decahydrate, it contains 10 molecules of water of crystallization.</p> <p>$\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$: Ferrous sulphate heptahydrate, it contains 7 molecules of water of crystallization.</p> <p>$\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$: Zinc sulphate heptahydrate, it contains 7 molecules of water of crystallization.</p>	3
<p>(2)</p>	<p>(i) The acidic and basic nature of the compounds can also be indicated by some natural as well as synthetic substances. They are known as 'indicators'. Thus an indicator tells us if the given substance is an acid or base by changing its colour. The three common indicators are: Litmus, methyl orange, phenolphthalein.</p> <p>Natural indicators : The most common indicators used for testing acids and bases in the laboratory is litmus that is a natural indicator. Litmus paper is obtained from a plant called as lichens. Other examples are beetroot, turmeric, rose petals etc.</p> <p>Synthetic indicator : The indicator that is artificially prepared is called as synthetic indicator. E.g. : phenolphthalein, eosin, methyl orange are synthetic indicators.</p> <p>Universal indicator :</p> <p>(i) It is a mixture of many different indicators which give different colours at different pH values. Just like litmus, universal</p>	3

	<p>indicator can be used in the form of solution or in the form of pH paper.</p> <p>(ii) When an acid or base solution is added to the universal indicator, the indicator produces a new colour. The colour produced by universal indicator is used to find the pH value of acid or base by matching the colour with colours on pH colour chart which determines the strength of acid and bases.</p> <p>Olfactory indicator : The term olfactory means relating to sense of smell. Those substances whose smell changes in acidic or basic solution are called as olfactory indicators. It works on the principle that when a base is added to it, its characteristic smell cannot be detected. Onion and vanilla extract are olfactory indicators.</p> <p>E.g. : Onion has a characteristic smell. When a basic solution like sodium hydroxide solution is added to a cloth strip treated with onions, then the onion smell cannot be detected. An acidic solution like hydrochloric acid, does not destroy the smell of onions. This is used as a test for acids and bases.</p>	
(3)	<p>Electrolysis of NaCl in solution and in fused state yield different products.</p> <p>(i) When electricity is passed through solution of sodium chloride, which is termed as brine (10% NaCl), it decomposes to form sodium hydroxide, an important basic compound.</p> $2\text{NaCl}_{(aq)} + 2\text{H}_2\text{O}_{(l)} \rightarrow 2\text{NaOH}_{(aq)} + \text{Cl}_{2(g)} + \text{H}_{2(g)}$ <p>Cl_2 is liberated at anode and $\text{H}_{2(g)}$ at cathode respectively.</p> <p>(ii) Salt when heated at high temperature, the molten state is termed as fused state. NaCl is able to conduct electricity even in fused state. During electrolysis $\text{Cl}_{2(g)}$ is liberated at anode and sodium is deposited at cathode.</p>	3
(4)	<p>(i) The phenomenon of splitting of light into its component colours is called as dispersion.</p> <p>(ii) The band of coloured components of light beam is called spectrum. The colours in the order from bottom to top are violet, indigo, blue, green, yellow, orange, red (VIBGYOR).</p>	3
(5)	<p>(i) Magnetic lines of force are closed continuous curves, which start from north pole and end at the south pole.</p> <p>(ii) The tangent at any point in the magnetic lines of force gives the direction of the magnetic field at that point.</p> <p>(iii) Two magnetic lines of force cannot intersect each other.</p>	3

	<p>(iv) Magnetic lines of force are crowded where the magnetic field is strong and far from each other where the field is weak.</p> <p>(6) (i) A rainbow appears in the sky during a rain shower.</p> <div data-bbox="379 504 1061 884" style="text-align: center;"> </div> <p>(ii) The water droplets act as small prisms. When sunlight enters the water droplets present in the atmosphere, they refract and disperse the incident sunlight.</p> <p>(iii) Then they reflect it internally inside the droplet and finally again refract it. As a collective effect of all these phenomenon, the seven coloured rainbow is observed.</p> <p>(7) (a) When light travels from one transparent medium to another transparent medium obliquely, the direction of propagation of light in the second medium changes. This phenomenon is called refraction of light.</p> <p>(b) The light rays reflected from the coin, come obliquely. These rays bend away from the normal at the point of incidence (ie. the surface of water) and reach our eyes. These refracted rays appear to come from a point above the actual point and hence the coin appears to be raised up. Therefore the coin appears to float when the jar is tilted suitably and viewed at a suitable angle.</p>	<p>3</p> <p>1½</p> <p>1½</p>
<p>A.5. Answer in detail: (Any 1) (1)</p>	<p>Working :</p> <p>(a) When the armature coil ABCD rotates in the magnetic field provided by the strong magnets, it cuts the magnetic lines of forces.</p> <p>(b) Thus the changing magnetic field produces induced current in the coil. The direction of induced current is determined by the Fleming's right hand rule.</p>	<p>5</p>

- (c) The current flows out through the brush B1 in one direction in the first half of the revolution and through the brush B2 in the next half revolution in the reverse direction. This process is repeated.
- (d) Therefore, the induced current produced is of alternating nature. Such a current is called as alternating current.



- (2) (a) $\text{Al}_2(\text{CO}_3)_3 + 6\text{HCl} \rightarrow 2\text{AlCl}_3 + 3\text{H}_2\text{O} + 3\text{CO}_2 \uparrow$ **2**
 During this reaction carbon dioxide gas is released, this gas when passed through decanted solution of chalk with H_2O it turns milky due to formation of calcium carbonate.
- (b) When dil. HCl is added to red oxide i.e. (primer used before paint). We observe that the colour of the solution becomes blue. This is due to the formation of copper chloride. **2**
 $\text{CuO} + 2\text{HCl} \rightarrow \text{CuCl}_2 + \text{H}_2\text{O}$
- (c) The acids which produce more number of H^+ ions in aqueous solution are termed as strong acids. **1**

