

MT

2017 ____ 1100

MT - SCIENCE & TECHNOLOGY - I (72) - SEMI PRELIM - I : PAPER - 6

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

SECTION - A												
A.1. (A) Fill in the blanks :												
(1) Hydrogen ions which cannot exist alone combine with water to form hydronium ions.		1										
(2) Alnico is an alloy of aluminium, nickel, cobalt.		1										
(3) The band of seven colours formed when white light is passed through a prism is called spectrum .		1										
A.1. (B) True or False :		1										
(1) True		1										
(2) True												
A.2. Rewrite the following statements by selecting the correct alternative :												
(1) (a) a strong acid		1										
(2) (c) Sodium bicarbonate		1										
(3) (a) 50°		1										
(4) (a) $\epsilon_i > \epsilon_r$ but $\epsilon_i = \epsilon_e$		1										
(5) (a) current and number of turns per unit length		1										
A.3. Answer the following in short : (Any 5)												
(1)	<table border="1" style="width: 100%;"><thead><tr><th style="text-align: center;">Acid</th><th style="text-align: center;">Base</th></tr></thead><tbody><tr><td>(i) A substance which liberates H^+ ions when dissolved in water is an acid.</td><td>(i) A substance which liberates OH^- ions in water is called a base.</td></tr><tr><td>(ii) Blue litmus turns red in an acid.</td><td>(ii) Red litmus turns blue in a base.</td></tr><tr><td>(iii) The pH of an acid ranges from 0 to 7.</td><td>(iii) The pH of a base range from 7 to 14.</td></tr><tr><td>(iv) Acids are sour to taste.</td><td>(iv) Bases are bitter to taste.</td></tr></tbody></table>	Acid	Base	(i) A substance which liberates H^+ ions when dissolved in water is an acid.	(i) A substance which liberates OH^- ions in water is called a base.	(ii) Blue litmus turns red in an acid.	(ii) Red litmus turns blue in a base.	(iii) The pH of an acid ranges from 0 to 7.	(iii) The pH of a base range from 7 to 14.	(iv) Acids are sour to taste.	(iv) Bases are bitter to taste.	2
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(2)	(i) Red ants contain acidic sting known as formic acid. (ii) When red ants sting us, formic acid produced by them is transferred to us through the bite. (iii) Due to this formic acid, there is itching and irritation.	2				
(3)	When dry slaked lime reacts with chlorine gas, it gives bleaching powder. $\text{Ca(OH)}_{2(s)} + \text{Cl}_{2(g)} \rightarrow \text{CaOCl}_{2(aq)} + \text{H}_2\text{O}_{(l)}$ <p style="text-align: center;"> Calcium hydroxide Chlorine Bleaching powder Water </p>	2				
(4)	(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				
(5)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Direct current</th> <th style="text-align: center;">Alternating current</th> </tr> </thead> <tbody> <tr> <td style="vertical-align: top;"> (i) The magnitude and direction of current are constant. (ii) This type of current cannot be used for large scale use of electricity for house hold purpose. (iii) The frequency of direct current is zero. (iv) This current cannot be supplied over long distances through wires. </td> <td style="vertical-align: top;"> (i) The magnitude and direction of current reverse periodically. (ii) This type of current is used in electrical household appliances such as iron, heater etc. (iii) The frequency of AC current in India is 50 Hz. (iv) This current can be supplied over long distances through wires. </td> </tr> </tbody> </table>	Direct current	Alternating current	(i) The magnitude and direction of current are constant. (ii) This type of current cannot be used for large scale use of electricity for house hold purpose. (iii) The frequency of direct current is zero. (iv) This current cannot be supplied over long distances through wires.	(i) The magnitude and direction of current reverse periodically. (ii) This type of current is used in electrical household appliances such as iron, heater etc. (iii) The frequency of AC current in India is 50 Hz. (iv) This current can be supplied over long distances through wires.	2
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(6)	<p>Given : Velocity in first medium (V_1) = 2×10^8 m/s Velocity in second medium (V_2) = 1.25×10^8 m/s</p> <p>To find : Refractive index of second medium w.r.t. the first medium (${}_1\eta_2$)</p> <p>Formula : ${}_1\eta_2 = \frac{V_1}{V_2}$</p>	2				

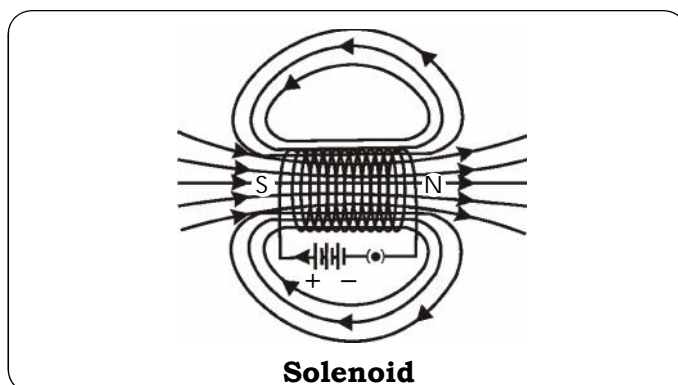
Solution : ${}_1\eta_2 = \frac{V_1}{V_2}$

$\therefore {}_1\eta_2 = \frac{2 \times 10^8}{1.25 \times 10^8}$

$\therefore {}_1\eta_2 = 1.6$

The refractive index of the second medium w.r.t. the first medium is 1.6.

(7)



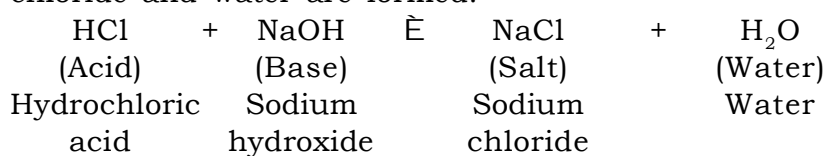
2

A.4. Answer the following in brief : (Any 5)

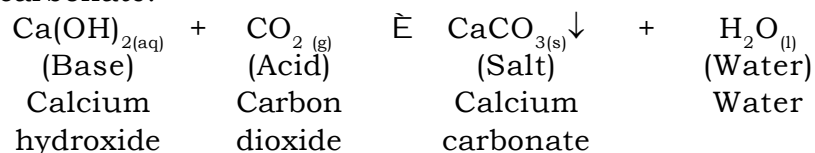
(1) (i) When a base reacts with acid, then a salt and water is formed. This is called as neutralization reaction.

(ii) E.g. :

(a) When hydrochloric acid reacts with sodium hydroxide, sodium chloride and water are formed.



(b) When carbon dioxide is passed through lime water, it turns milky due to the formation of white precipitate of calcium carbonate.



(c) Thus this is a neutralization reaction where base reacts with acidic non-metallic oxide (CO_2) to form salt and water.

3

(2)	<p>(i) The strength of an acid or base is measured on a scale of numbers called pH scale that has values from 0 to 14. pH scale helps in measuring hydrogen ion concentration in solutions. In pH, p stands for “potenz” (means “strength” in German). The scale reads from 0 (zero) (most acidic) to 14 (most basic). The value of pH indicates acidic or basic nature of a solution. The strength of base is represented by pOH.</p> <p>(ii) When the pH value is in between 0 to 7, the solution is acidic in nature.</p> <p>(iii) At value 7, the solution is neutral and between 7 to 14 the nature of the solution becomes alkaline/basic.</p> <p>(iv) The pH of a solution is inversely proportional to the concentration of hydrogen ions in it. i.e. a solution having a high concentration of hydrogen ions has a low pH value.</p> <table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 0 10px;">Acidic</td> <td style="text-align: center; padding: 0 10px;">Neutral</td> <td style="text-align: center; padding: 0 10px;">Basic</td> </tr> <tr> <td style="text-align: center; padding: 0 10px;">0</td> <td style="text-align: center; padding: 0 10px;">7</td> <td style="text-align: center; padding: 0 10px;">14</td> </tr> <tr> <td colspan="2" style="text-align: center; padding: 0 10px;">—————</td> <td></td> </tr> <tr> <td colspan="2" style="text-align: center; padding: 0 10px;">Most acidic</td> <td style="text-align: center; padding: 0 10px;">Most basic</td> </tr> </table>	Acidic	Neutral	Basic	0	7	14	—————			Most acidic		Most basic	3
Acidic	Neutral	Basic												
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(3)	<p>(i) It is used as a medicine(antacid). When it is taken, it undergoes hydrolysis to give sodium hydroxide in the stomach. Thus sodium hydroxide neutralizes the hydrochloric acid produced by gastric juice and gives relief to the patient from acidity.</p> $\text{NaHCO}_3 + \text{H}_2\text{O} \rightarrow \text{NaOH} + \text{H}_2\text{O} + \text{CO}_2\uparrow$ $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$ <p>(ii) It is used as a constituent in baking powder, used to prepare bread and cakes to make them lighter and spongy.</p> <p>(iii) It is used in fire extinguishers.</p> <p>(iv) It is used to prepare CO₂ gas.</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</p>	3												

	<p>the direction of the magnetic field at that point.</p> <p>(iii) Two magnetic lines of force can not intersect each other.</p> <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) (a) It works on the principle of force experinedc by a current carrying conductor .</p> <p>(b) X -Armature coil, Y- Split ring</p> <p>(c) Split ring OR commutator</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>A.5. Answer in detail: (Any 1)</p> <p>(1)</p> <div data-bbox="309 1196 992 1637" data-label="Diagram"> </div> <p>(i) In the atmosphere, there are different layers of air with different refractive indices which keep on changing as the physical conditions of air are not stationary.</p> <p>(ii) When we observe any object through this air, the light coming from them refract randomly due to which the apparent position of the object fluctuates.</p>	<p>3</p> <p>1½</p> <p>1½</p> <p>5</p>
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	<p>(iii) The large scale effect of this phenomenon is the twinkling of stars, advanced sunrise and delayed sunset.</p> <p>(iv) Due to change in the refractive index of atmosphere, the intensity of light that reaches our eyes from the stars varies and hence the stars appear twinkling at night.</p> <p>(v) Advanced sunrise occurs as a ray of light from the sun enters the earth's atmosphere, it follows a curved path due to refraction before reaching to the observer.</p> <p>(vi) It appears to the observer as if the rays are coming from the position where the sun is seen by the observer. Hence the sun is seen earlier before it reaches the horizon.</p>	
(2)	<p>(a) $\text{Al}_2(\text{CO}_3)_3 + 6\text{HCl} \rightarrow 2\text{AlCl}_3 + 3\text{H}_2\text{O} + 3\text{CO}_2 \uparrow$ 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.</p> <p>(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. $\text{CuO} + 2\text{HCl} \rightarrow \text{CuCl}_2 + \text{H}_2\text{O}$</p> <p>(c) The acids which produce less number of H^+ ions in aqueous solution are termed as weak acids.</p>	<p>2</p> <p>2</p> <p>1</p>
