

MT

2018 ____ 1100

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

Time : 2 Hours

(Model Answer Paper)

Max. Marks : 40

A.1.	(A) Solve the following questions :	
(1)	The force acting on a current carrying conductor is maximum when the direction of current is perpendicular to the direction of magnetic field.	1
(2)	Sodium chloride : It is an ionic compound others are covalent compounds.	1
(3)	True	1
(4)	False - Generally most of the carbon compounds are found to be bad conductor of electricity.	1
(5)	Thermometer - All others are based on magnetic effect of electric current.	1
A.1.	(B) Choose the correct alternative and rewrite the sentences :	
(1)	Cinnabar is an ore of Mercury .	1
(2)	If temperature of water increases from 1°C to 3°C, the density of water increases .	1
(3)	International Space Station is a Low Earth Orbit (LEO) satellite.	1
(4)	CO₂ + H₂O are the products obtained on complete combustion of hydrocarbons.	1
(5)	If the potential difference across a wire is 2 V and the current through the wire is 1 A, the electric power is 2 W .	1
A.2.	Solve the following questions : (Any 5)	
(1)	(i) Copper on exposure to moist air combines with carbon dioxide and a green coloured copper carbonate salt is formed, tarnishing the copper. (ii) Lime juice and tamarind contain citric acid and tartaric acid respectively.	2

- (iii) These acids react with copper carbonate forming water - soluble salts, which get washed off easily.
- (iv) Due to this, the tarnished copper becomes clean and regains its lustre.
- (v) Hence, lemon or tamarind is used for cleaning copper vessels turned greenish.

(2) **AC generator and DC generator :**

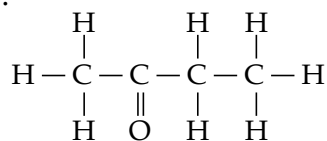
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AC generator	DC generator
(i) AC generator converts mechanical energy into electrical energy in the form of alternating current.	(i) DC generator converts mechanical energy into electrical energy in the form of direct current.
(ii) In this, brass slip rings are used.	(ii) In this, brass split rings are used.

(3) **Butanone: Molecular formula C₄H₈O**

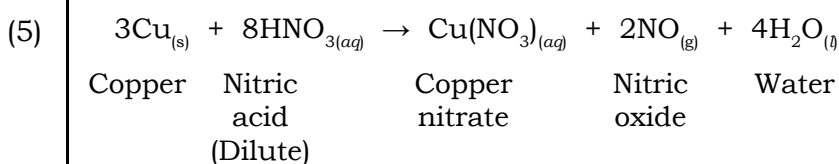
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Structural formula :



- (4) **Relative humidity :** The ratio of the mass of water vapour in given volume of air at given temperature to the mass of water vapour required to saturate the same volume of air at the same temperature is called relative humidity.

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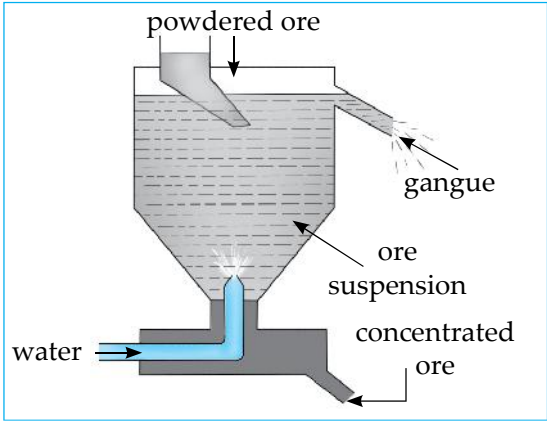
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(6) **Alkenes and Alkynes :**

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Alkenes	Alkynes
(i) The hydrocarbons which contains carbon to carbon double bonds (C=C) are called alkenes.	(i) The hydrocarbons which contain carbon to carbon triple bonds (C≡C) are called alkynes.
(ii) Their general formula is C _n H _{2n} .	(ii) Their general formula is C _n H _{2n-2} .

(7)	Geo-stationary satellites have orbits parallel to the equator and hence the observation of polar region is not properly carried out. For this purpose, elliptical medium earth orbits passing over polar region is used.	2
A.3. Solve the following questions : (Any 5)		
(1)	(a) AB (b) BC (c) The heat energy absorbed at constant temperature during transformation of liquid into gas is called Latent heat of vapourization.	3
(2)	(a) Dew point : The temperature at which the air becomes saturated with water vapour is called dew point. (b) (i) We can determine whether air is saturated with vapour or not on the basis of relative humidity. (ii) Relative humidity is the ratio of actual mass of vapour content in air for given volume and temperature to that required to make air saturated with vapour at that temperature. (iii) If relative humidity is 100%, the air is saturated with vapour. This is called dew point. (iv) If its value is less than 100%, then air is unsaturated.	3
(3)	(a) The commercial unit for measuring Electrical Energy is Kilowatt hour (kWh).	3
(b)	<p>Given: I = 3A P = 100 W</p> <p>To find: R = ?</p> <p>Formulae: P = I²R</p> <p>Solution: P = I²R 100 = (3)² × R 9R = 100 100 R = $\frac{\quad}{9}$ R = 11.11Ω R ≈ 11Ω</p> <p>The value of the resistance is 11Ω.</p>	

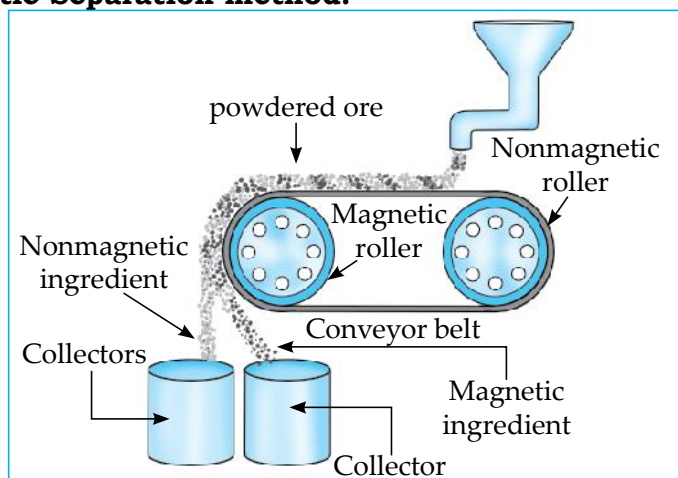
(4)	<p>(a) $\text{CH}_3\text{-CH}=\text{CH}-\text{CH}_3 + \text{Br}_2 \rightarrow \text{CH}_3\text{-CHBr}-\text{CHBr}-\text{CH}_3$ Addition reaction</p> <p>(b) Ethanol gets oxidised by alkaline potassium permanganate to form ethanoic acid. Potassium permanganate is an oxidizing agent which is the source of oxygen. Addition of oxygen is oxidation.</p>	<p>1</p> <p>2</p>
	$\text{CH}_2-\text{CH}_2-\text{OH} \xrightarrow[\text{acidic KMnO}_4]{(\text{O})} \text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH}$ <p style="text-align: center;">ethanoic acid</p>	
(5)	<p>(i) When the current is downwards, the force experienced by the conductor will be outwards.</p> <p>(ii) If the conductor experiences a force inwards the direction of current would be upwards.</p> <p>(iii) Fleming's Left Hand Rule.</p>	<p>3</p>
(6)	<p>(a) Hydraulic separation method :</p>  <p>The diagram shows a hydraulic separation process. Powdered ore is poured into a tank. Water is added from the bottom. The mixture forms an ore suspension. Gangaue is separated from the suspension. Concentrated ore is collected at the bottom.</p>	<p>2</p>
	<p>(b) Electroplating : The process where a less reactive metal is coated on a more reactive metal using electrolysis is called electroplating.</p>	<p>1</p>
(7)	<p>The number of the known carbon compounds is as large as about 10 million and the range of their molecular masses is as large as 10^1-10^{12}. The giant carbon molecules formed from hundreds or thousands of atoms are called macromolecules.</p> <p>(i) Natural macromolecules: The natural macromolecule namely polysaccharides, proteins and nucleic acids are the supporting pillars of the living world. We get food, clothing and shelter from polysaccharides; namely starch and cellulose. Proteins constitute a large part of the bodies of animals and also are responsible for their movement and various physiological processes. Nucleic acid control the heredity at molecular level. Rubber is another type of natural macromolecule.</p>	<p>3</p>

- (ii) Man-made macromolecule: Today manmade macromolecule are in use in every walk of life. Manmade fibres which have strength along the length similar to natural fibres cotton, wool and silk; elastomers which have the elastic property of rubber, plastics from which innumerable types of articles sheet, pipes are made. All these are examples of manmade macromolecules.

A.4. Solve the following questions : (Any 1)

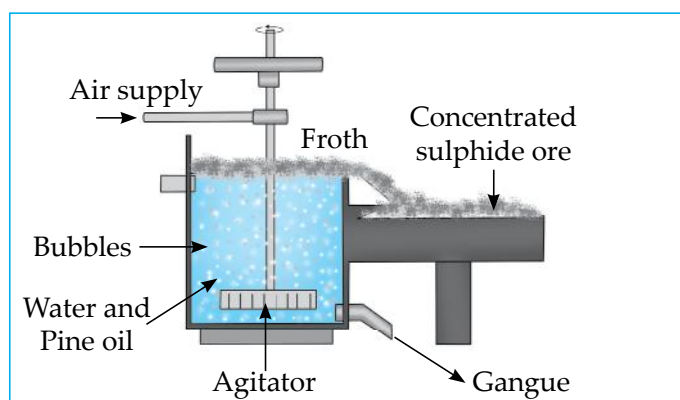
- (1) (i) **Magnetic Separation method:**
- (a) This method requires an electromagnetic machine.
- (b) The main parts of this machine are two types of iron rollers and the conveyor belt moving continuously around them.
- (c) One of the rollers is nonmagnetic while the other is electromagnetic.
- (d) The conveyor belt moving around the rollers is (non magnetic) made up of leather or brass.
- (e) The powdered ore is poured on the conveyor belt near the nonmagnetic roller.
- (f) Two collector vessels are placed below the magnetic roller.
- (g) The particles of the nonmagnetic part in the ore are not attracted towards the magnetic roller.
- (h) Therefore, they are carried further along the belt and fall in the collector vessel placed away from the magnetic roller.
- (i) At the same time, the particles of the magnetic ingredients of the ore stick to the magnetic roller and therefore fall in the collector vessel near the magnetic roller.
- (j) In this way the magnetic and nonmagnetic ingredients in the ore can be separated depending on their magnetic nature. For example, cassiterite is a tin ore.
- (k) It contains mainly the nonmagnetic ingredient stannic oxide (SnO_2) and the magnetic ingredient ferrous tungstate (FeWO_4).
- (l) These are separated by the electromagnetic method.

Magnetic Separation method:



(ii) Froth floatation method:

- (a) The froth floatation method is based on the two opposite properties, hydrophilic and hydrophobic, of the particles.
- (b) Here the particles of the metal sulphides, due to their hydrophobic property, get wetted mainly with oil, while due to the hydrophilic property the gangue particles get wetted with water.
- (c) By using these properties certain ores are concentrated by froth floatation method.
- (d) In this method, the finely ground ore is put into a big tank containing ample amount of water.
- (e) Certain vegetable oil such as pine oil, eucalyptus oil, is added in the water for the formation of froth.
- (f) Pressurised air is blown through the water.
- (g) There is an agitator rotating around its axis in the centre of the floatation tank. The agitator is used as per the requirement. Bubbles are formed due to the blown air.
- (h) Due to agitation, a foam is formed from oil, water and air bubbles together, due to the agitating. This foam rises to the surface of water and floats. That is why this method is called froth floatation process.
- (i) Particles of certain sulphide ore float with the foam on water as they preferentially get wetted by the oil. For example, this method is used for the concentration of zinc blende (ZnS) and copper pyrite ($CuFeS_2$).

Froth floatation method:

- (2) (i) Heat gets transferred from hot object to the cold object. Hence, temperature of hot object decreases, while that of cold object increases.
- (ii) Principle of heat exchange.
- (iii) The principle of Heat exchange states that, if heat is exchanged

between a hot and cold object, then Heat energy lost by hot object is equal to Heat energy gained by the cold object.

- (iv) Using this principle, the specific heat capacity of a substance can be measured.
- (v) Heat exchange stops when temperature of two bodies becomes equal.

