MT

2017 ___ ___ 1100

MT - SCIENCE & TECHNOLOGY - I (72) - SEMI PRELIM - II : PAPER - 2

Time : 2 Hours **Model Answer Paper** **Max. Marks : 40**

A.1.	**(A) Fill in the blanks:**	
(1)	Elements showing properties of both metals and non-metals are called as **metalloids**.	**1**
(2)	If a P.D. of 12V is applied across a 3 Ω resistor then the current passing through it is **4A**.	**1**
(3)	The focal length of **convex** lens is positive.	**1**
A.1.	**(B) State whether the following statements are true or false and if false, write the correct statement:**	
(1)	False - Digestion of food is a decomposition reaction.	**1**
(2)	True	**1**
A.2.	**Rewrite the following statements by selecting the correct alternative:**	
(1)	When the crystals of ferrous sulphate are strongly heated, the residue obtained is **red in colour**.	**1**
(2)	(c) Displacement reaction	**1**
(3)	(b) $\frac{1}{v}+\frac{1}{u}=\frac{1}{f}$	**1**
(4)	(d) I → V graph is linear.	**1**
(5)	(a) current	**1**
A.3.	**Answer the following in short : (Any 5)**	
(1)	Cement with sand and gravel reacts with water to form concrete that imparts strength to the building. This is an exothermic reaction. $3CaO.Al_2O_{3(s)} + 6H_2O_{(l)} \rightarrow 3CaO.Al_2O_3.6H_2O_{(s)} + Heat$ (Tricalcium aluminate) (Concrete)	**2**

(2) (i) Atomic size is determined by atomic radius. **2**
(ii) Atomic radius is the distance between the centre of the atom and its outermost shell.
(iii) New shells are added to the atoms of the elements as we go down from top to bottom in a group, hence atomic radius increases.

(3) **2**

d-block elements	f-block elements
(i) They have last two shells incompletely filled.	(i) They have last three shells incompletely filled.
(ii) They are known as transition elements.	(ii) They are known as inner transition elements.
(iii) Elements placed in group 3 to 12 are called d-block elements.	(iii) Lanthanide and actinide series comprise of f-block elements.

(4) When copper is exposed to air, copper gets oxidized to form black coloured copper oxide. **2**

$2Cu_{(s)} + O_{2(g)} \rightarrow 2CuO_{(s)}$

Copper Oxygen Copper oxide

(5) (i) Fuse wire is made of an alloy like lead and tin having low melting point. **2**
(ii) If excess current passes through the fuse, the fuse wire melts.
(iii) As the fuse wire melts, the circuit breaks immediately. Fuse protects the electrical appliances by melting, at low temperature, thus limiting the current passing through device. Thus, fuses are made of materials having low melting point.

(6) **2**

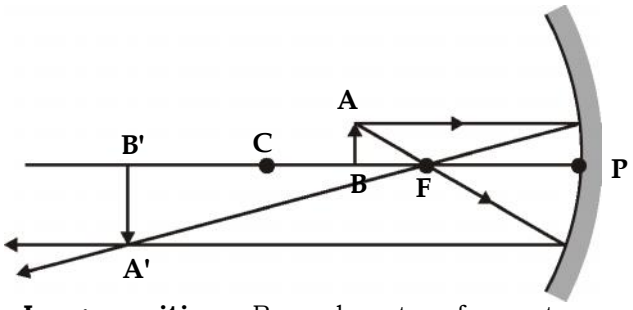


Image position : Beyond centre of curvature.
Nature : Real, inverted and magnified.

(7)	**Ohms' Law :** The electric current (I) flowing in a metallic conductor is directly proportional to the potential difference (V) across its terminals, provided physical conditions of the conductor such as length, area of cross section, temperature and material remain constant. $V \propto I$ or $R = \frac{V}{I}$	**2**
A.4.	**Answer the following in brief : (Any 5)**	
(1)	(i) Newlands' law was applicable to elements with low atomic masses only. He could arrange elements only upto calcium out of total 56 elements known. (ii) The law fails to explain similarities in properties of elements with higher atomic weights. After calcium, every eighth element did not possess properties similar to the first. (iii) Newlands thought only 56 elements existed, but later several elements were discovered. (iv) In order to fit the existing elements, Newlands adjusted two elements in the same position which differed in their properties. (v) This periodic table did not include inert gases as they were not discovered.	**3**
(2)	(i) The slow process of decay or destruction of metal due to effects of air, moisture, acids on it is called as corrosion. (ii) Gold is a yellow shining metal. Gold metal does not corrode because it is a highly unreactive metal that remains unaffected by air, water vapour, and other gases in the atmosphere. Gold does not tarnish and retains its lustre for years. Since gold does not corrode, gold ornaments look new after years.	**3**
(3)	(a) (i) Fats and edible oil when allowed to stand for a longer time in iron or tin container become rancid. (ii) The condition produced by oxidation of fats and oils in food marked by unpleasant smell and taste is called rancidity. When the oil is heated, it starts frothing and smells foul. (iii) If the food is cooked in rancid oil, it gives an unpleasant smell and taste, making it unfit for consumption. So, edible oil is not allowed to stand for a long time in an iron or tin container.	**2**

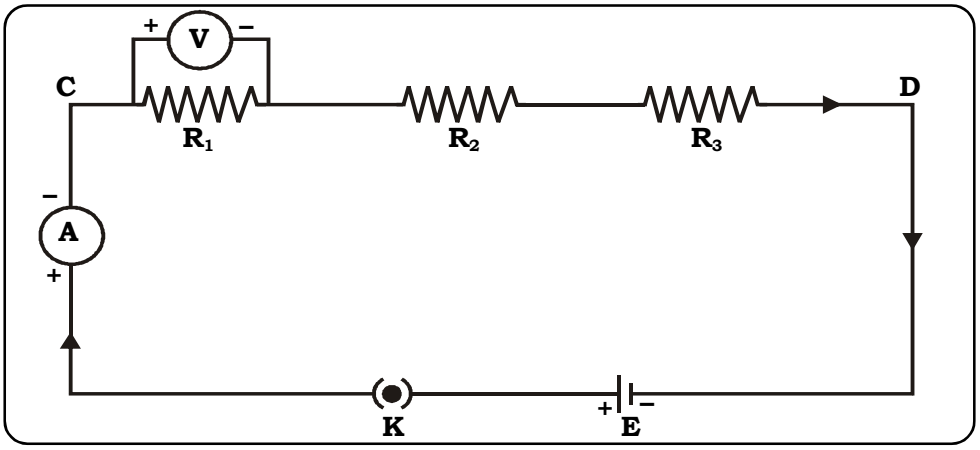
	(b) Oxidation reaction : The chemical reaction where reactants gain oxygen to form the corresponding oxide, or reactants lose hydrogen to form a product is called oxidation reaction.	1
(4)	(a) Resistance of a conductor depends on the length 'l' and area of cross section 'A' of the conductor $R \propto l$ and $R \propto \frac{1}{A}$ $\therefore R \propto \frac{l}{A}$ $\therefore R = \rho \frac{l}{A}$ (b) Where ° is called resistivity of the conductor. It is also called as specific resistance. If we put l = 1m and A = $1m^2$ then $\therefore R = \rho$ (c) Thus resistivity of a conductor is defined as the resistance of a conductor of unit length and unit area of cross-section. (d) The S.I. unit of resistivity is ohm-metre (Ω–m).	3
(5)	(a) The distance of principal focus and optical centre of the lens is the focal length. (b) Given : Image distance (v) = 5 cm Focal length (f) = 10 cm To find: Object distance (u) = ? Formula : $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$ Solution : $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$ $\therefore \frac{1}{u} = \frac{1}{f} - \frac{1}{u}$ $\therefore \frac{1}{u} = \frac{1}{10} - \frac{1}{5}$ $\therefore \frac{1}{u} = \frac{1-2}{10}$ $\therefore \frac{1}{u} = \frac{-1}{10}$ $\therefore u = -10cm.$ **The object is placed in front of the convex mirror at a distance of 10 cm.**	3

(6) (i) In torches : The source of light is placed at the focus. **3**
(ii) Projector lamps : The source of light is placed at the centre of curvature.
(iii) Flood lights : The source of light is placed just beyond the centre of curvature.

(7) 1. The eye defect is myopia. **3**
2. Two possible reasons of myopia are:
(a) As ciliary muscles do not relax sufficiently, converging power of eye lens becomes high.
(b) The distance between eye lens and retina increases as the eyeball is lengthened or lens is curved.
3. Concave lens of suitable focal length can correct this defect.

A.4. Answer the following : (any 1)

(1) (i) Let R_1, R_2 and R_3 be three resistances connected in series between C and D. **5**
(ii) Let R_S be the effective resistance in circuit and V_1, V_2 and V_3 be the potential difference across R_1, R_2 and R_3 respectively.



(iii) Let the potential difference across CD be V.
(iv) In series combination.
$V = V_1 + V_2 + V_3$ .... (i)
By using Ohm's law
$V = IR_S$
$\therefore V_1 = IR_1$, $V_2 = IR_2$ and $V_3 = IR_3$
Substituting these values in equation (i) we get

$IR_S = IR_1 + IR_2 + IR_3$

$\therefore R_S = R_1 + R_2 + R_3$

For 'n' number of resistors connected in series we get

$R_S = R_1 + R_2 + R_3 + R_4 + R_5 + R_6 + \ldots\ldots\ldots + R_n$

(2) (a) **Valency :** **5**

(i) In the modern periodic table, the elements are arranged in increasing order of atomic number (Z). Atomic number is related to the electronic configuration.

(ii) As the atomic number increases, the number of valence electrons increases. The first element has one electron in the outermost shell while the last element in a period has either completed duplet or completed octet. So, valency varies gradually across a period.

(iii) The group number indicates number of valence electrons. So, elements in a group have the same number of valence electrons. Therefore, down the group, valency remains the same.

(b) **Metallic character :** The tendency of an element to lose electrons and form positively charged ions (cations) is called metallic character.

Non-metallic character : The tendency of an element to gain electrons and form negatively charged ions (anions) is called non-metallic character.

As we go down a group, the atomic size increases. So, the nuclear attraction on the outermost electron decreases and electrons can be lost more easily. So, down the group, metallic character increases and non-metallic character decreases.

Across a period, the nuclear charge increases. Consequently, the attraction on the valence electrons increases and so more energy is required to lose the electron. So, across a period, metallic character decreases and non-metallic character increases.

(c) **Atomic size** is defined as the distance from the centre of the atom to the outermost shell of an atom. Across a period, the number of shells remain the same, but atomic number increases. The nuclear charge also increases due to increase in number of protons in the nucleus, the attraction to the outermost electron increases and pulls the electrons inwards. So, atomic size decreases across a period.

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Down the group, the number of shells increases. So, although the nuclear charge increases, the attraction to the outermost electron decreases. So, down the group, the atomic size increases.

GROUP

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