MT

2017 ___ ___ 1100

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

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

A.1.	**(A) Fill in the blanks:**	
(1)	The element eka-Aluminium is called as **gallium**.	**1**
(2)	A ray of light parallel to principal axis after reflection from concave mirror passes through **focus**.	**1**
(3)	The S.I. Unit of resistivity is **ohm-metre**.	**1**
A.1.	**(B) State whether the following statements are true or false and if false, write the correct statement:**	
(1)	False - The given reaction is a redox reaction.	**1**
(2)	False - Resistivity of pure metals is less than alloys.	**1**
A.2.	**Rewrite the following statements by selecting the correct alternative:**	
(1)	(b) Cu	**1**
(2)	(b) $H_2 + Cl_2 \rightarrow 2HCl$	**1**
(3)	(a) always like a concave lens	**1**
(4)	(b) decreases	**1**
(5)	(a) series	**1**
A.3.	**Answer the following in short : (Any 5)**	
(1)	When sodium metal reacts with ethyl alcohol it gives sodium ethoxide and hydrogen gas is liberated. The hydrogen atom of the hydroxyl (OH)group is replaced by a sodium atom, forming sodium ethoxide. $2C_2H_5OH_{(l)} + 2Na_{(s)} \rightleftharpoons 2C_2H_5ONa_{(l)} + H_2\uparrow$ Ethyl alcohol Sodium Sodium ethoxide Hydrogen	**2**

(2) (i) Tendency to lose electrons is the characteristic of metals. **2**
(ii) Atomic radius decreases as we move from left to right in a period.
(iii) This is because the electrons are added to the same outermost shell because of which the electrons added experience greater pull from the nucleus.
(iv) Therefore, the electrons are not easily released. Thus, metallic character i.e. tendency to lose electrons decreases from left to right in a period.

(3)

s-block elements	p-block elements
(i) Elements in group 1 and 2 are called s-block elements including hydrogen.	(i) Elements in group 13 to 17 and zero group are called p-block elements.
(ii) They contain 1 or 2 electrons in the outermost shell.	(ii) They contain 3 to 8 electrons in the outermost shell.
(iv) They are all metals (except hydrogen).	(iii) They are metals, non-metals and metalloids.

2

(4) When calcium oxide reacts vigorously with water, it forms calcium hydroxide (slaked lime). Since a large amount of energy is released, it is an exothermic reaction. **2**

$$CaO_{(s)} + H_2O_{(l)} \rightarrow Ca(OH)_2 + \text{Heat}$$

Calcium oxide + Water → Calcium hydroxide + Heat

(5)

Voltmeter	Ammeter
(i) It is an instrument to measure the potential difference between the two terminals of a cell.	(i) It is an instrument to measure the electric current flowing through the circuit.
(ii) It is connected in parallel with the cell.	(ii) It is connected in series with the cell.
(iii) It has a very high resistance.	(iii) It has a very low resistance.

2

(6)

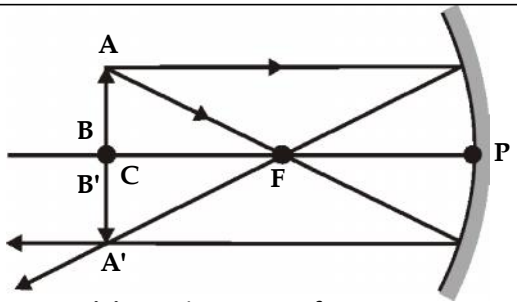


Image position : At centre of curvature.
Nature : Real, inverted and same size.

2

(7)	Joule's Law : The quantity of heat (H) generated in a conductor of resistance (R) when a current (I) flows through it for some time (t) is directly proportional to: (i) The square of the current (ii) The resistance of the conductor, and (iii) The time for which the current flows. $\therefore H = \frac{I^2Rt}{4.18}$ cal	**2**
A.4.	**Answer the following in brief : (Any 5)**	
(1)	(i) Dobereiner arranged chemically similar elements in the increasing order of their atomic masses in a group of three which is known as "Dobereiner's Triads". In a Triad atomic mass of middle element is approximately equal to the mean of atomic masses of other two elements in that Triad. Eg.: Lithium (Li), Sodium (Na), Potassium (K) form a triad as they show similar chemical properties. The atomic weights are 6.9, 23, 39 respectively. (ii) According to Dobereiner's law of Triads, $\frac{6.9+39}{2} = \frac{45.9}{9}$ = 22.95~23 = 23 Atomic weight of sodium. Thus, the atomic weight of sodium (23) is the average of the atomic weights of lithium (6.9) and potassium (39).	**3**
(2)	(i) The reaction between acid and base to form salt and water is called as neutralization reaction. Acid + Base → Salt + Water (ii) When an acid is treated with base, the base neutralizes the acid and destroys its acidity. Since an acid and base neutralize each other's effect, it is called as neutralization reaction. (iii) Eg.: When hydrochloric acid reacts with sodium hydroxide, then a neutralization reaction takes place to give salt and water. $NaOH_{(aq)} + HCl_{(aq)} \rightarrow NaCl_{(aq)} + H_2O_{(l)}$	**3**
(3)	(a) (i) Potassium ferrocyanide, is a yellow coloured compound. (ii) If this compound gets exposed to sunlight, then it will undergo oxidation reaction. (iii) In this reaction potassium ferrocyanide gets converted into potassium ferricyanide. (iv) So to prevent this oxidation reaction, potassium ferrocyanids is stored in dark coloured bottles and kept away from sunlight.	**2**
	(b) A reaction where heat is evolved is called exothermic reaction.	**1**

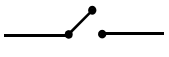
(4) The rules are as follows : **3**

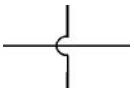
1. If the incident ray is parallel to the principal axis, then the reflected ray passes through focus.
2. If the incident ray is passing through the focus, then the reflected ray is parallel to the principal axis.
3. If the incident ray passes through the centre of curvature, the reflected ray traces the same path.

(5) (a) The eye defect is Myopia or short sightedness. **1**
(b) The eyeball is lengthened or lens is curved. **1**
(c) He will use concave lens of suitable focal length (-2.5D). **1**

(6) Draw the symbols of any three of the following : **3**

(a) Galvanometer 

(b) Tap key open 

(c) Wire crossing 

(d) Plug key closed

(7) **3**

Given : $R_1 = 3\ \Omega$
$R_2 = 2\ \Omega$
$R_3 = 5\ \Omega$
P.D. (V) = 4 V

To find : (1) Total resistance (R)
(2) Current (I)

Formula : (1) $R_S = R_1 + R_2$

(2) $\frac{1}{R_P} = \frac{1}{R_S} + \frac{1}{R_3}$

(3) $V = IR$

Solution : $R_S = R_1 + R_2$

$\therefore R_S = 3 + 2$

$\therefore R_S = 5\ \Omega$

$\frac{1}{R_P} = \frac{1}{R_S} + \frac{1}{R_3}$

$\therefore \frac{1}{R_P} = \frac{1}{5} + \frac{1}{5}$

$\therefore \frac{1}{R_P} = \frac{2}{5}$

$\therefore R_P = \frac{5}{2}$

$\therefore R_P = 2.5\ \Omega$

$V = IR$

$\therefore I = \frac{V}{R}$

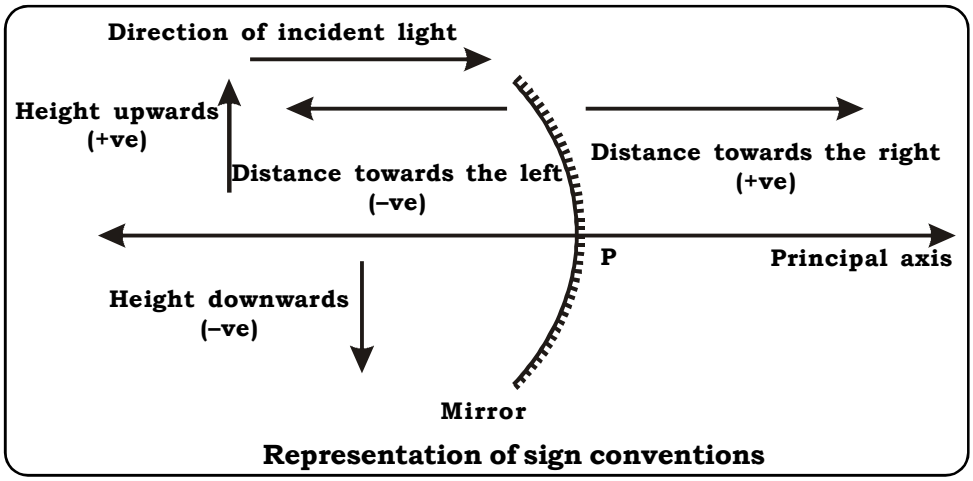
$\therefore I = \frac{4}{2.5}$

$y \quad I = 1.6\ A$

The total resistance is 2.5 t and current is 1.6 A.

A.5. **Anwser in detail: (Any 1)**

(1)



Representation of sign conventions

5

According to the new cartesian sign convention, the pole (P) of the mirror is taken as origin. The principal axis is taken as X-axis of the co-ordinate system. The sign conventions are as follows:

1. The object is always placed on the left of the mirror.
2. All distances parallel to principal axis are measured from the pole of the mirror.
3. All the distances measured to the right of the origin are taken as positive, while distances measured to the left of the origin are taken as negative.
4. Distances measured perpendicular to and above the principal axis are taken as positive.
5. Distances measured perpendicular to and below the principal axis are taken as negative.
6. Focal length of convex mirror is positive while that of concave mirror is negative.

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

(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.

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(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.

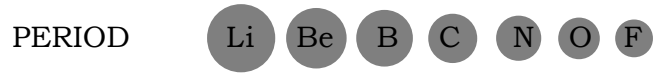
(b) **Metallic character :** The tendency of an element to lose electrons and form positively charged ions (cations) is called metallic character.

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

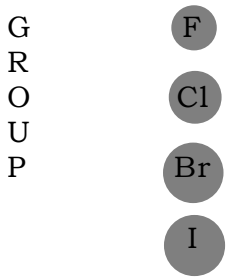
As we go down a group, the atomic size increases. So, the nuclear attraction on the outermost electron decreases and electrons can be lost more easily. So, down the group, metallic character increases and non-metallic character decreases.

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.



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.



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