

MT

2017 ____ 1100

MT - SCIENCE & TECHNOLOGY - I (72) - SEMI PRELIM - II : PAPER - 5

Time : 2 Hours

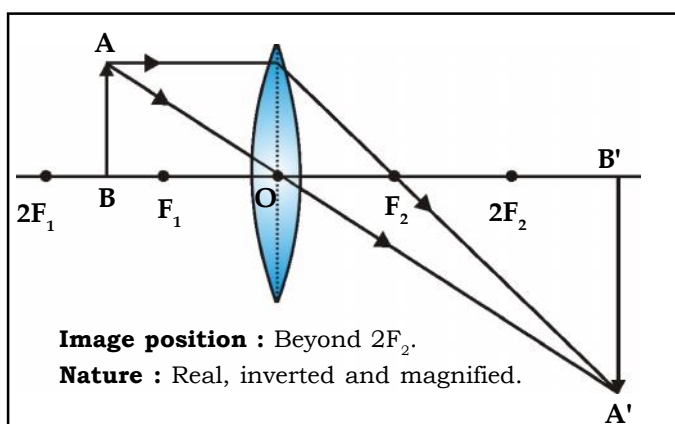
Model Answer Paper

Max. Marks : 40

| | | |
|-------------|---|---|
| A.1. | (A) Fill in the blanks: | |
| (1) | The law used by Newlands to arrange elements is called Newlands Law of octaves. | 1 |
| (2) | The power of a convex lens of focal length 25 cm is 4 dioptre. | 1 |
| (3) | To increase the effective resistance in a circuit the resistors are connected in series. | 1 |
| A.1. | (B) State whether the following statements are true or false and if false, write the correct statement: | |
| (1) | False - Decomposition of compost is an exothermic reaction. | 1 |
| (2) | False - The SI unit of charge is coulomb. | 1 |
| A.2. | Rewrite the following statements by selecting the correct alternative: | |
| (1) | (b) Oxidation reaction | 1 |
| (2) | (c) Displacement reaction | 1 |
| (3) | (b) $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$ | 1 |
| (4) | (d) $I \rightarrow V$ graph is linear. | 1 |
| (5) | (a) current | 1 |
| A.3. | Answer the following in short : (Any 5) | |
| (1) | When barium sulphate reacts with carbon, barium sulphate gets reduced to barium sulphide and carbon gets oxidized to carbon monoxide. | 2 |
| | $\text{BaSO}_{4(\text{aq})} + 4\text{C}_{(\text{s})} \rightarrow \text{BaS}\downarrow + 4\text{CO}_{(\text{g})}$ <p>Barium sulphate Carbon Barium sulphide Carbon monoxide</p> | |

| (2) | <p>(i) In the Modern Periodic Table, elements having same number of valence electrons are present in the same group.</p> <p>(ii) Inert gases have eight electrons in their outermost orbit (except He) because of which they do not take part in any chemical reaction.</p> <p>(iii) they do not give, take or share electrons with any other elements i.e. they have zero valency. Hence they are placed in zero group.</p> | 2 | | | | |
|--|--|----------------------|------------------------------|--|---|---|
| (3) | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: center;">Alkali metals</th> <th style="width: 50%; text-align: center;">Alkaline earth metals</th> </tr> </thead> <tbody> <tr> <td style="vertical-align: top;"> <p>(i) In the Modern Periodic Table, IA group elements are alkali metals.</p> <p>(ii) Atoms of these elements have one electron in the valence shell.</p> <p>(iii) They are monovalent.</p> <p>(iv) Their oxides and hydroxides dissolve readily in water.</p> </td> <td style="vertical-align: top;"> <p>(i) In the Modern Periodic Table, IIA group elements are alkaline earth metals.</p> <p>(ii) Atoms of these elements have two electrons in their valence shell.</p> <p>(iii) They are divalent.</p> <p>(iv) Their oxides and hydroxides dissolve slightly in water.</p> </td> </tr> </tbody> </table> | Alkali metals | Alkaline earth metals | <p>(i) In the Modern Periodic Table, IA group elements are alkali metals.</p> <p>(ii) Atoms of these elements have one electron in the valence shell.</p> <p>(iii) They are monovalent.</p> <p>(iv) Their oxides and hydroxides dissolve readily in water.</p> | <p>(i) In the Modern Periodic Table, IIA group elements are alkaline earth metals.</p> <p>(ii) Atoms of these elements have two electrons in their valence shell.</p> <p>(iii) They are divalent.</p> <p>(iv) Their oxides and hydroxides dissolve slightly in water.</p> | 2 |
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| (4) | <p>When silver bromide is exposed to light, yellow colour of silver bromide changes to grey colour. Silver bromide is decomposed to form grey silver metal and bromine gas is liberated.</p> <p>This reaction is used in black and white photography during the process of developing.</p> $2\text{AgBr}_{(s)} \xrightarrow{\text{Sunlight}} 2\text{Ag}_{(s)} + \text{Br}_{2(g)}$ <p style="text-align: center;">Silver bromide Silver metal Bromine gas</p> | 2 | | | | |
| (5) | <p>(i) A magnifying glass works on the principle of simple microscope.</p> <p>(ii) When an object is placed within the focal length of a convex lens we get a virtual, erect and magnified image on the same side of the lens.</p> <p>(iii) This principle is used by the watch repairer to see the small parts more clearly. Hence, watchmakers use a magnifying glass while repairing wristwatches.</p> | 2 | | | | |

(6)



2

(7)

- (i) An iris in human eye controls and regulates the amount of light entering the eye by contracting and dialating the pupil.
- (ii) Ciliary muscles adjust the focal length of eye lens by contracting and relaxing.

2

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

(1)

- (i) Mendeleev was the first who successfully classified all known elements.
- (ii) Mendeleev kept some blank places in his periodic table. These vacant spaces were for elements that were yet to be discovered. He also predicted properties of these elements even before they were discovered. Later the properties were found to be correct.
- (iii) In the periodic table, some gaps were left by Mendeleev for unknown elements that could be found in the future. Three such unknown elements were named as Eka-Boron, Eka-Aluminium and Eka-Silicon. Even the properties of these unknown elements were predicted and these were found to be accurate.

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| Predicted element | Actual element discovered after |
|-------------------|---------------------------------|
| Eka-boron | Scandium |
| Eka-Aluminium | Gallium |
| Eka-Silicon | Germanium |

- (iv) When noble gases were discovered later, they were placed in Mendeleev's Periodic Table without disturbing the positions of other elements.

| | | |
|-----|---|---|
| (2) | <p>(i) Substance 'A' is Plaster of Paris (POP). Its molecular formula is $(\text{CaSO}_4)_2 \cdot \text{H}_2\text{O}$</p> <p>(ii) $(\text{CaSO}_4)_2 \cdot \text{H}_2\text{O} + 3\text{H}_2\text{O} \rightarrow 2(\text{CaSO}_4 \cdot 2\text{H}_2\text{O}) + \text{Heat}$ (A) (B) Plaster of Paris Gypsum</p> <p>(iii) Substance B is gypsum and it is used as a raw material in manufacturing of cement.</p> | 3 |
| (3) | <p>(a) (i) Grills of doors and windows are made of iron. (ii) To protect them from rusting, a coating of paint is applied. By doing this, air and moisture cannot come in contact with the iron and hence rusting doesn't take place. So, grills of doors and windows are always painted before they are used.</p> | 2 |
| | <p>(b) Rancidity : Rancidity is the oxidation of oils and fats resulting in change in taste and giving foul smell.</p> | 1 |
| (4) | <ol style="list-style-type: none"> In torches : The source of light is placed at the focus to obtain a parallel beam of light. Projector lamps : The object is placed at the centre of curvature to obtain an image of the same size. Flood lights : The source of light is placed just beyond the centre of curvature so as to get intense beam of light. | 3 |
| (5) | <p>(a) Resistivity : It is defined as the resistance of a conductor of unit length and unit area of cross section.</p> <p>(b) (i) Resistivity of the wire is dependent upon the material of the wire, hence, resistivity of both the wires is same. (ii) Resistance is the property which opposes the flow of current and it depends on length of wire and cross sectional area of the wire. (iii) It is directly proportional to the length and inversely proportional to area. (iv) Since cross section of wires are not the same, the resistance of both the wires cannot be same. Therefore, the wires have different resistances.</p> | 3 |
| (6) | <p>(a) Centre of curvature of a lens : It is the centre of the imaginary sphere, which forms the given lens. Each lens has two centres of curvature C_1 and C_2 respectively.</p> <p>(b) Principal axis of a lens : It is an imaginary straight line passing through the two centres of curvatures of lens.</p> | 3 |

(c) Optical centre of a lens : The central point of lens on the principal axis is its optical centre. When a ray of light passes through the optical centre of a lens, it passes without undergoing any deviation.

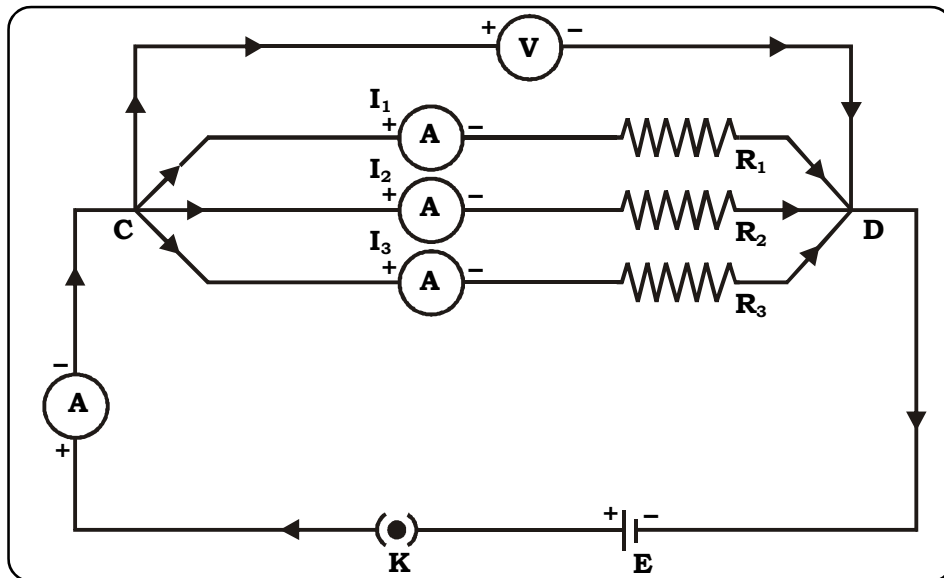
(7) Draw the symbols of any three of the following :

(a) Galvanometer $\text{---} \text{+} \text{G} \text{---}$ (b) Tap key open $\text{---} \text{---} \text{---}$

(c) Wire crossing $\text{---} \text{---}$ (d) Plug key closed $\text{---} \text{---}$

A.5. Answer in detail: (Any 1)

(1)



1. Let R_1 , R_2 and R_3 be the three resistances connected in parallel combination between points C and D and let R_p be their effective resistance.

2. Let I_1 , I_2 and I_3 be the currents flowing through resistances R_1 , R_2 and R_3 respectively.

Let I be the current flowing through the circuit and V be the potential difference of the cell.

3. For parallel combination of resistances,

$$I = I_1 + I_2 + I_3 \quad \dots\dots (i)$$

According to Ohm's law,

$$I = \frac{V}{R_p}$$

Therefore,

$$I_1 = \frac{V}{R_1}, \quad I_2 = \frac{V}{R_2}, \quad I_3 = \frac{V}{R_3}.$$

4. Substituting the values of I , I_1 , I_2 and I_3 in equation (i) we get

$$\frac{V}{R_p} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$$

$$V \left(\frac{1}{R_p} \right) = V \left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \right)$$

$$\therefore \frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

For 'n' number of resistances

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots + \frac{1}{R_n}$$

(2) Based on electronic configuration, the modern periodic table is divided into four blocks namely, s-block, p-block, d-block, f-block.

5

| | s - block | p - block | d - block | f - block |
|--|--|--|--|--|
| No. of shells incomplete/ valence electrons | Outermost shell incomplete (1 or 2 valence electrons). | Outermost shell incomplete except zero group elements that have completely filled shells (3 to 8 valence electrons). | Last two shells incomplete. | Last three shells incomplete. |
| Position | IA, IIA and hydrogen. | III A to VII A and zero group. | Group IIIB to IIB along with group VIII. | Lanthanides and actinides placed separately at the bottom of the periodic table. |
| Includes | All metals except hydrogen. | Metals, non-metals, metalloids, zero group elements. | Metals. | Metals. |
| Types of elements | Normal elements. | Normal and inert elements. | Transition elements. | Inner-transition elements. |

| | s - block | p - block | d - block | f - block |
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