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Subject – Science I
Std : 10th SSC

Model Answer
Set: IX

Q.1   A) Solve the following questions.

1)   EDUSATsatellite in the INSAT and GSAT series is used specially in the field of education.

2)   Al: Al_2O_3:: P: P_2O_5

The chemical formula of oxide of aluminum (Al) is Al_2O_3 while that of oxide that of oxide of phosphorus (P) is P_2O_5.

3)   Total internal reflection takes place at pointsB and C.

4)

	Group A		Group B
i	$2Mg_{(s)} + O_{2(g)} \xrightarrow{\Delta} 2MgO_{(s)}$	c	Combination reaction
ii	$CaCO_{3(s)} \xrightarrow{\Delta} CaO_{(s)} + CO_2\uparrow$	a	Decomposition reaction

5)   **Mass:** Mass is a scalar quantity while remaining are vector quantities.

B) Choose the correct alternative and rewrite the statement.

1)   c) Butane

2)   a) Doubling the number of turn in the loop

3)   c)amphoteric

4)   d) placed in the open in the winter

5)   b) $Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$

Q.2   Answer the following questions.(Any Five)

1)   i) The minerals from which metals can be profitably extracted are called ores.

ii) There are many minerals from which a metal can be extracted.

iii) However, only those minerals from which a metal can be extracted profitably are called ores.

E.g. In addition to bauxite, there are many minerals found in nature which contain aluminium. However, aluminium can be extracted profitably from bauxite. Hence, bauxite is an ore of aluminium.

2)   *Solution:*

Given: Initial velocity (u) = 0, acceleration due to gravity (g) = 10 m/s^2, time (t) = 1 s

To find: Height (s), speed (v)

Formulae: i. $s = ut + \dfrac{1}{2} gt^2$ ii. $v^2 = u^2 + 2 gs$

Calculation: From formula (i),

$$s = 0 \times 1 + \frac{1}{2} \times 10 \times 1^2 = 5 \text{ m}$$

3)

Element	Electronic configuration	Valence electrons	Valency
Beryllium (Be)	(a) 2,2	(c) 2	2
Oxygen (O)	(b) 2,6	6	(d) 2

4)   i) Whenever the number of magnetic lines of force passing through a coil changes, current is induced in the coil. This is known as Faraday's law of induction.

ii) The current produced in the coil is called the induced current.

iii) When a rectangular conductor loop is brought near a solenoid coil and if a current is switched on or off in the solenoid coil, current is induced in the loop.

iv) Also, when the current in the solenoid coil is increased or decreased, current is induced in the loop.

5)   i) When edible oil or ghee is left aside for a long period without use, it reacts with atmospheric

oxygen. Thus, it undergoes oxidation and becomes rancid. Such oil becomes unfit for consumption.

ii) If food is cooked in this oil, its taste changes.

iii) Storage of food in air tight containers slows down oxidation.

Hence, it is recommended to use air tight container for storing oil for long time.

6) i) Different colours travel with different speed in prism.

ii) Hence, refractive index of prism is different for different colours. It is maximum for violet light and minimum for red light.

iii) The angle of deviation of ray of light on passing through a prism depends on therefractive index of the material of the prism.

Hence, violet light is deviated the most and red light is deviated the least on passing through a prism.

7)

i. $Mg(OH)_{2(s)} + 2HCl_{(aq)} \longrightarrow 2H_2O_{(l)} + MgCl_{2(aq)}$
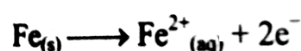
ii. $P_{4(s)} + 6Cl_{2(g)} \longrightarrow 4PCl_{3(l)}$
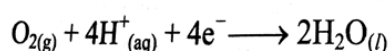
Q.3 Answer the following questions.(Any Five)

1) i) The given picture represents the electrochemical reaction which takes place during the corrosion of iron (rusting).

ii) Different regions on the surface of iron behave as anode and cathode.

iii) In the anode region, Fe is oxidized to Fe^{2+}

$$Fe_{(s)} \longrightarrow Fe^{2+}_{(aq)} + 2e^-$$

iv) In the cathode region, O_2 is reduced to form water.

$$O_{2(g)} + 4H^+_{(aq)} + 4e^- \longrightarrow 2H_2O_{(l)}$$

v) When Fe ions migrate from the anode region, they react with water and further get oxidized to Fe^{3+} ions.

vi. Fe 3+ ions form an insoluble hydrated oxide ($Fe_2O_3.H_2O$), which is deposited as reddish brown layer on the surface.It is called rust.

2) i) The rainbow appears in the sky after a rainfall.

ii) Water droplets present in the atmosphere act as small prism.

iii. When sunlight enters these water droplets, it gets refracted and dispersed.

iv)This dispersed light gets totally reflected inside the droplet and again is refracted while coming out of the droplet.
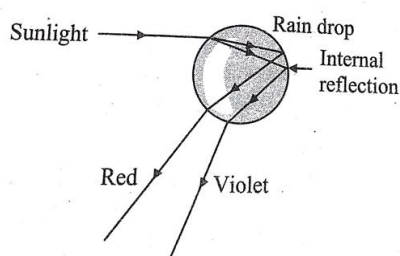
Formation of rainbow

v) As a combined effect of all these phenomena the seven coloured rainbow is observed

3) i) Many carbon compounds can be formed by replacing one or more hydrogen atoms in the hydrocarbon chain with elements such as oxygen, nitrogen, sulphur, halogens

ii) The atom of an element other than carbon and hydrogen which replaces one or more hydrogen atoms in the hydrocarbon chain is called a hetero atom.

iii) Hetero atoms often exist in the form of certain group of atoms.

iv) Carbon compound acquires specific chemical properties due to the presence of hetero atoms or the groups of atoms that include hetero atoms. E.g.

l . In CH_3CH_2OH, 'O' is a hetero atom.

2. In $CH_3CH_2NH_2$, 'N' is hetero atom.

3. In $CH_3CH_2OCH_2CH_3$, 'O' is a hetero atom.

4) The energy stored in an object because of its position or state is called potential energy. This energy is relative and increases as one goes to greater heights from the surface of the earth assuming value of potential energy on the ground as zero. When h is small compared to the radius R of the earth, we can assume g to be constant and potential energy can be calculated using formula mgh. But for large values of h, the value of g decreases with increase in h. For an objectat infinite distance from the earth, the value of g is zero and earth's gravitational force does not act on the object and value of potential energy is considered to be zero. Thus, for smaller distances, i.e. heights, the potential energy is negative.

5) i) The element in which both shells are completely filled with electrons is neon. It has electronic configuration (2, 8)

ii) The element which has same number of electrons in the first and second shell is beryllium. The first shell has 2 electrons, so the second shell should also have 2 electrons. So, the electronic configuration should be (2, 2). Hence, the element is beryllium with electronic configuration (2, 2).

iii. Electropositivity decreases from left to right within a period. Hence, lithium is the most electropositive element in period 2

6) Solution:

To convert water at 20 °C into ice at 0 °C heat energy (Q) needs to be taken off.

According to principle of heat exchange,

Q = Heat energy to be given off in cooling water from 20 °C to 0 °C (Q_1) + Heat energy to be given off to convert water at 0 °C into ice at 0 °C (Q_2)

But $Q_1 = m_{water} \, c_{water} \, \Delta T$

$\quad = 2 \times 10^3 \times 1 \times (20 - 0)$

$\qquad \qquad$ ....($\because$ mass of water = 2 kg = 2000 g)

$\quad = 40 \times 10^3$ cal

$Q_2 = m_{water} \, (L_{melt})_{ice}$

$\quad = 2 \times 10^3 \times 80$

$\quad = 160 \times 10^3$ cal

$\therefore \quad Q = Q_1 + Q_2$

$\quad = (40 + 160) \times 10^3$

$\quad = 200 \times 10^3$ cal

This heat energy is to be taken off using say 'm' mass of liquid ammonia.

$\therefore \quad Q = m \, (L_{vap})_{ammonia}$

$\therefore \quad 200 \times 10^3 = m \times 341$

$\therefore \quad m = \dfrac{200 \times 10^3}{341} = 586.5$ g

Ans: To convert 2 kg water at 20°C into ice at 0°C completely, 586.5 g of ammonia should be evaporated.

7) **Electric motor:** It is a device which converts electrical energy into mechanical energy.

Construction: Electric motor consist of parts :

i. Rectangular coil: A large number of turns of insulated copper wire wound on iron core in rectangular shape forms a coil ABCD as shown in figure below.

ii) Strong magnet: The coil placed in pieces (N and S) of a strong horse shoe magnet provides a strong magnetic field. The Sides AB and CD are perpendicular to the direction of magnetic field.

iii) Split ring: It consists of two halves of a metallic ring (R_1 and R_2). The ends of the coil are

connected to these rings. The outer conducting surfaces of spilt rings R_1 and R_2 are in contact with the two stationary carbon brushes. Spilt rings reverse the direction of current in the coil.

iv. Brushes: Two carbon brushes B_1 and B_2 are used to press the split rings.

v) Axle: The two halves of the rings have resistive coating in their inner surfaces and are tightly fitted on the axle

vi) Battery: The battery supplies the current to the coil.

Electric motor
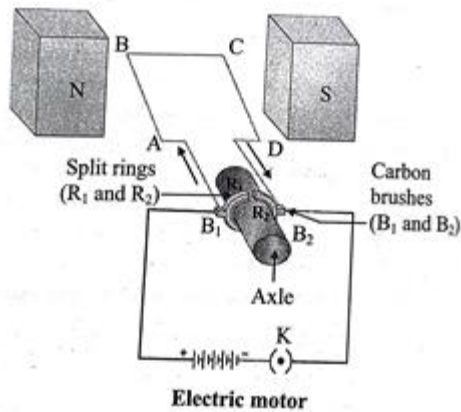
Working:

i) When the circuit is completed, the current passes through the brush B_1 from A to B in branch AB.

ii) As, the magnetic field acts from north pole to south pole, according to Fleming's left hand rule, the force experienced by arm AB is in the downward direction and arm CD is in the upward direction.

iii) Both these forces are equal in magnitude and opposite in direction and hence, the coil rotates in anticlockwise direction.

iv) After half rotation, the split rings R_2 and R_1 come in contact with brushes B_2 and B_1 respectively.

v) Again the current starts passing through the coil in opposite direction.

vi) The force acting on branch BA is upward and DC is downward, .this force again moves the coil in anticlockwise direction.

vii) This shows that the current in the loop ABCD is reversed after every half rotation, and the loop continues to rotate in same direction.

viii) Thus, the coil rotates with the help of electrical energy.

Q.4   Answer the following questions.(Any One)

1)   i)The defect shown in the diagram is farsightedness or hypermetropia.

ii) The defect is caused due to;

a. decrease 'in curvature of the cornea and the eye lens resulting in converging power of the lens becoming less.

b. decrease in distance between the lens and retina resulting in the flattening of the eye ball.

iii) The image will be formed behind the retina

iv) Hypermetropia can be corrected by using a convex lens of proper focal length

v) The focusing power of the convex lens is positive.

2)   i) The rate of a reaction depends on temperature. The rate of a reaction Increases with increase temperature. During winter the atmospheric temperature is low while during summer, the atmospheric temperature is high. Hence. during winter setting of milk into curd takes more time while in summer It takes less time.

ii) Cooking of a food is a chemical change and the rate of chemical reaction depends on temperature. The boiling point of oil is higher than that of water. Therefore, when Oil used for cooking vegetables, it provides higher temperature than water. Hence, vegetables cook quickly on oil rather than on water.

iii) Smaller the size of the reactant particles, higher is the rate of the reaction.

iv) Catalyst increases the rate of a chemical reaction.

v) More reactive metals react with faster rate than the less reactive metals. For example, Aluminium is more reactive than zinc. Hence, the rate of reaction of aluminium with dilute hydrochloric acid is faster than that of zinc.