**TickMark.Ai**
Mumbai

**Class:** EM - CLASS 10 **Subject:** Science and Technology - Part 1 **Time:**2 hrs
**Date:** 08-03-2025 **Paper:** March 2024 (Solution) **Marks:**40

**Q1(A))**
**(1)** Joule
**(2)** Tinning
**(3)** -COOH
**(4)** Refraction of light
**(5)** Convex

**(B))**
**(1)** $CaCO_3$
**(2)** 1) - c
**(3)** The hydrocarbon from the given electron-dot structure is ethane.
**(4)** Helium
**(5)** Calorimeter is used to measure specific heat of an object.

**Q2(A))**
**(1)** i. Silver articles turn blackish after some time of exposure to air. This is because silver undergoes corrosion when exposed to air containing hydrogen sulphide.
ii. Silver reacts with hydrogen sulphide in air to form a layer of silver sulphide (Ag2S), which gives silver articles a blackish appearance.
**(2)** i. An electric bulb is an important application of heating effect of electric current.
ii. Tungsten has a very high melting point ($3380^0$c) due to which it can withstand the extreme heat and does not melt.
iii. This tungsten filament gets heated on passage of electric current and emits light.
iv. The other properties of tungsten which makes it suitable for making filaments of electric bulb are its high flexibility, highest tensile strength and low rate of evaporation at high temperature.
v. Hence, tungsten metal is used to make a solenoid type coil in an electric bulb.
**(3)** i. When limestone is heated, calcium oxide and carbon dioxide gas are formed.
ii. When carbon dioxide gas is passed through freshly prepared lime water, the solution turns milky due to the formation of calcium carbonate which is insoluble in water.

**(B))**
**(1)** i. The Vehicle with the help of which the satellites are placed in their proper orbits are called as satellite launch vehicle.
ii. PSLV (Polar Satellite Launch Vehicle designed by ISRO is the Indian satellite launch vehicle. There is a place at the top of the fourth stage, to keep the polar satellite to be launched.
**(2)** The figure given is of a DC generator.
Use of D.C. generator:
i. DC generator is used to convert mechanical energy into electrical energy in the form of direct current.
ii. DC generator is used in stable current generator, booster and arc lamps for lighting.
iii. DC generators are also used to reimburse the voltage drop within feeders.
**(3)** i. Debereiner's law of triads: In the year 1817 a German scientist Dobereiner suggested that properties of elements are related to their atomic masses. He made groups of three elements each, having similar chemical properties and called them triads.

ii. He arranged the three elements in a triad in an increasing order of atomic mass and showed that the atomic mass of the middle element was approximately equal to the mean of the atomic masses of the other two elements.

iii. For Example: Lithium (Li), Sodium (Na), and Potassium (K) are having similar chemical properties and they are arranged in increasing order of their molecular mass, which are 6.9, 23.0 and 39.1 gm/mol respectively. Thus, as per law of triads the actual molecular mass of Sodium (Na) should be equivalent to the mean of molecular mass of Lithium (Li) and Potassium (K).

$$\text{Molecular mass of Sodium (Na)} \frac{\text{Molecular mass of Lithium (Li)} + \text{Molecular mass of Potassium (K)}}{2}$$

$$\text{Molecular mass of Sodium (Na)} = \frac{\text{Molecular mass of Lithium (Li)} + \text{Molecular mass of Potassium (K)}}{2}$$

$$\text{Atomic mass of sodium (Na)} = \frac{6.9 + 39.1}{2} = 23$$

**(4)** i. The motion of any object under the influence of the force of gravity alone is called as free fall. Free fall is possible only in the absence of air or vacuum.

ii. When a ball and a feather is thrown from a height, feather falls on the ground first. But in a vacuum both ball and feather will reach the ground together.

**(5)** Given: focal length = 20 cm

To find:

Power

Formula : P = 1/f

Calculation: 1 m = 100 cm

Focal length = 0.2 m

P = 1/0.2

P = 5D

Thus, the power of convex lens is +5D.

**Q3)**

**(1)** (a) According to Newton's universal law of gravitation every object in the universe attracts every other object with a definite force. This force is directly proportional to the product of the masses of the two objects and is inversely proportional to the square of the distance between them.

$F \propto m_1 m_2$ .....(i)

$F \propto \frac{1}{d^2}$ ..... (ii)

by (i) and (ii)

$F \propto \frac{m_1 m_2}{d^2}$

$F = \frac{G m_1 m_2}{d^2}$

Where, G = universal gravitational constant.

(b) If the distance between the two bodies is tripled, the gravitational force will decrease by factor of 9.

(c) If the mass of one of the object is doubled then the gravitational force will also be doubled. Because, mass is directly proportional to the grávitational force.

**(2)** (a) Factors affecting the rate of chemical reaction are:

Nature of reactant. Size of the particles of reactants. Concentration of the reactants. Temperature of the reaction. Catalyst.

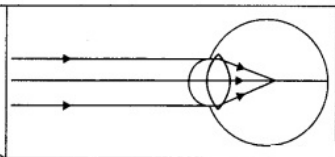
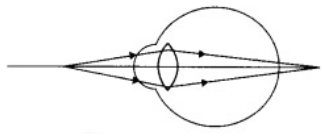
(b) Catalyst: "The substance in whose presence the rate of a chemical reaction increases, without causing any chemical change to it, is called a catalyst." On heating potassium chlorate (KClO3) decomposes slowly.

$$2KClO_3 \xrightarrow{\Delta} 2KCl + 3O_2 .....$$

The rate of the above neither increases by reducing the particle size nor by increasing the reaction temperature. However, KClO3 decomposes rapidly in presence of manganese dioxide (MnO2) to liberate O2

gas. No chemical change takes place in $MnO_2$ in this reaction.

**(3)**

| Figure → / Points ↓ |  |  |
|---|---|---|
| (a) Name the defect | Nearsightedness/myopia | Farsightedness/Hypermetropia |
| (b) Position of the image | In the front of the retina | Behind the retina |
| (c) Lens used to correct the defect | Concave lens is used to correct the defect | Convex lens is used to correct the defect |

**(4)** Given: Height of the satellite above the earth's surface = 35780 km Tangential velocity of the satellite = 3.08 km/sec.

Suppose the satellite takes T seconds to complete one revolution around the earth. The distance travelled during this one revolution is equal to the circumference of the circular orbit.

If r is the radius of the orbit, the satellite will travel a distance of 2πr during one revolution. Thus, the time required for one revolution can be obtained as follows:

$$v = \frac{\text{Distance}}{\text{Time}} = \frac{\text{Circumference}}{\text{Time}}$$

$$v = \frac{2\pi x}{T} \quad [\because x = (r + h)]$$

$$T = \frac{2\pi(r+h)}{v}$$

$$= \frac{2\times3.14\times(6400+35780)}{3.08}$$

= 86003.38 sec.

= 23.89 hours

= 23 hours 54 minutes

Thus, satellite takes 23 hours and 54 minutes to complete one revolution around the earth.

**(5)** i. The attractive forces between the positively and negatively charged ions are strong. Therefore, ionic compounds exist in solid state and are hard.

ii. The ionic compounds are brittle and can be broken into pieces by applying pressure.

iii.The intermolecular force of attraction is high in ionic compounds and large energy is required to overcome it. Therefore, the melting and boiling points of ionic compounds are high.

iv.Ionic compounds are soluble in water and insoluble in solvents like kerosene and petrol.

v. The ionic compounds cannot conduct electricity in solid state. However, in the fused /molten state they can conduct electricity, as in this state the ions are mobile. Due to the electrical conductivity in fused and dissolved state the ionic compounds are called electrolytes

**(6)** (a) The graph represents latent heat of phase transformation.

(b) Line AB represents the conversion of ice into water at constant temperature.

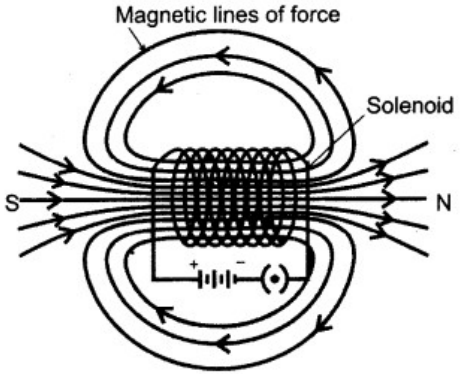
(c) Line BC represents rise in temperature of water from 0°C to 100°C

**(7)** i. When a copper wire with a resistive coating is wound in a chain of loops, it is called solenoid.

ii. Whenever an electric current passes through a solenoid, magnetic lines of force are produced in pattern.

iii. The properties of the magnetic field of a solenoid are very similar to magnetic field produced by a bar magnet.

iv. One of the open ends of a solenoid acts as a magnetic north pole and the other as the magnetic south pole.




**(8)** four, p-block, d-block, metals, f-block

**Q4)**

**(1)** (a) Acetic acid (CH3COOH) and sodium carbonate ($Na_2CO_3$) are the reactants in given reaction.

(b) Carbon dioxide ($CO_2$) comes out as effervescence in the bigger test tube.

(c) Carbon dioxide gas is passed through lime water, it turns lime water milky or cloudy due to formation of calcium carbonate.

(d) Sodium bicarbonate is used instead of sodium carbonate to get same products.

(e) Acetic acid is used as vinegar and is helpful in cooking. It is used to produce dyes, perfumes, esters, etc.

**(2)** (a) The process shown in figure is Dispersion of light

(b) Violet colour deviates the most

(c) Red colour deviates the least

(d) Rainbow is the phenomenon in the nature which is based on above process.

(e) The band of coloured components of a light beam is called as spectrum.

**All the Best**