SCIENCE & TECHNOLOGY (PART 1)

SOLUTION : PRACTICE ACTIVITY SHEET 2

Q. 1. (A)

(i) (A)

(ii) (B)

(iii) (B)

(iv) (B)

(v) (D)

Q. 1. (B)

(i) Displacement reaction

(ii) Hygrometer

(iii) Electric current

(iv) False

(v) Clouds over India – Weather satellite

Q. 2. (A)

(i) (1) A given quantity of steam contains more heat than the same quantity of boiling water at the same temperature.

(2) When steam comes in contact with one's body, it releases extra heat of 540 calories per gram and causes a more serious burn than that caused by boiling water.

(ii) (1) The rays of light coming from the bottom of a pond bend away from the normal as they travel from water (denser medium) to air (rarer medium).

(2) Hence, they appear to come from a point above the actual point from which they come. Therefore, the bottom of the pond appears raised.

(iii) (1) Carbon has the property of catenation. Two or more carbon atoms can share some of their valence electrons to form (single, double and triple) bonds.

(2) The straight chains or branched chains or rings may have different shapes and sizes. This results in formation of many compounds. Hence, carbon atoms are capable of forming an unlimited number of compounds.

Q. 2. (B)

(i) (a) **Centripetal force :** In uniform circular motion of a body, the force acting on the body is directed towards the centre of circle, is called centripetal force.

(b) **Weight :** The weight of a body is defined as force with which the earth attracts it.

(ii) When sodium chloride solution is mixed with silver nitrate solution, white precipitate of silver chloride is formed.

$$\underset{\text{Sodium chloride}}{NaCl_{(aq)}} + \underset{\text{Silver nitrate}}{AgNO_{3(aq)}} \longrightarrow \underset{\text{Silver chloride}}{AgCl\downarrow} + \underset{\text{Sodium nitrate}}{NaNO_3}$$

(iii) $m = 30$ g, $L = 540$ cal/g, $Q = ?$

Amount of heat required, $Q = mL$

$= 30 \text{ g} \times 540 \text{ cal/g}$

$= 16200$ calories

Amount of heat required is 16200 calories.

(iv)

Electric motor	Electric generator
1. A battery is used in an electric motor to pass a current through the coil.	1. A battery is not used in an electric generator.
2. In this case, a current-carrying coil is set into rotation due to the magnetic field.	2. In this case, a potential difference and hence a current is produced when the coil is set into rotation in the magnetic field by an external agent.
3. Split rings are used in an electric motor.	3. Rings used in an AC generator are not split.
4. In this case, electric energy is converted into mechanical energy.	4. In this case, mechanical energy is converted into electric energy.

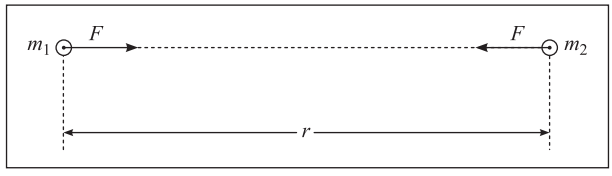
(v) $CH_4 \rightarrow \mathbf{C_2H_6} \rightarrow C_3H_8 \rightarrow \mathbf{C_4H_{10}} \rightarrow C_5H_{12}$

General formula of alkane : $\mathbf{C_nH_{2n+2}}$

Q. 3.

(i) 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 inversely proportional to the square of the distance between them.

Mathematical form : Consider two objects of masses m_1 and m_2. We assume that the objects are very small spheres of uniform density and the distance r between their centres is very large compared to the radii of the spheres (See fig.).



Gravitational force between two objects

The magnitude (F) of the gravitational force of attraction between the objects is directly proportional to m_1m_2 and inversely proportional to r^2.

$\therefore\ F \propto \frac{m_1m_2}{r^2} \qquad \therefore F = G\,\frac{m_1m_2}{r^2},$

where G is the constant of proportionality, called the universal gravitational constant.

(ii) (1) The category of the above reaction is decomposition reaction.

(2) When the evaporating dish containing lime stone powder is heated, carbon dioxide gas and calcium oxide are formed.

$$\underset{\text{Lime stone}}{CaCO_3} \longrightarrow \underset{\text{Calcium oxide}}{CaO} + CO_2\uparrow$$

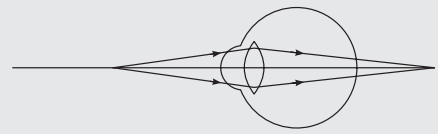
(3) In the above reaction, no change in colour is observed in the reactants and the products. This reaction falls in the category of chemical change.

(iii) (1) When electrons flow through a resistor (during flow of electric current) electrons possess kinetic energy.

(2) During the flow of electrons there is a decrease in the kinetic energy of the electrons due to collisions with atoms, ions and molecules.

(3) According to the law of conservation of energy, this decrease in the kinetic energy of the electrons gets converted into heat.

(iv)

Points		
(1) Name of the defect.	Myopia (nearsightedness)	Hypermetropia (farsightedness)
(2) Where will the image form?	In front of the retina instead of on the retina	Behind the retina instead of on the retina
(3) Which type of lens is used in the spectacle to remove the defect?	A concave lens of proper focal length	A convex lens of proper focal length

(v) **Corrosion :** The process in which a metal is destroyed gradually by the action of air, moisture or a chemical (like an acid) on its surface is called corrosion. OR

Corrosion is degradation of a material due to reaction with its environment.

The major problem of corrosion occurs with iron, as it is used as a structural material in construction, bridges, ship building.

Iron gets covered by reddish brown flakes when exposed to atmosphere. This is an example of corrosion.

Methods to prevent corrosion of metals :

(1) Corrosion of a metal can be prevented if the contact between metal and air is cut off. (2) Corrosion of a metal is prevented by coating with something which does not allow moisture and oxygen to react with it. (3) A layer of oil or paint or grease is applied on the surface of a metal to prevent corrosion. The rusting or corrosion of iron can be prevented by this method.

(vi) Noble gases do not take part in the chemical reactions. If we look into the electronic configuration of some metals and nonmetals, it will be seen that the driving force behind a reaction is to attain the electronic configuration of the nearest noble gas with complete octet. Metals do this by losing electrons while nonmetals do this by gaining electrons. The outermost shell of noble gases being complete, they are chemically inert.

(vii) (a) Carbon dioxide gas comes out as effervescence in the big test tube.

(b) The bubbles seen in the small test tube is due to CO_2, which is formed in the reaction of sodium carbonate and acetic acid.

(c) The lime water turns milky.

Reaction : $\underset{\text{Lime water}}{Ca(OH)_2} + CO_{2(g)} \longrightarrow \underset{\substack{\text{Calcium carbonate} \\ \text{(Milky)}}}{CaCO_3 \downarrow} + H_2O$

(viii) (a) Low Earth Orbit, height between 180 km and 2000 km above the earth's surface.

(b) Medium Earth Orbit, height 2000 km to 35780 km above the earth's surface.

(c) High Earth Orbit, height more than 35780 km from the earth's surface.

Q. 4.

(i) (a) The above elements belong to group 1.

(b) The above elements arranged vertically downward in an increasing order of atomic radii :

Li	Na	K	Rb	Cs
152	186	231	244	262

(c) This arrangement match with the pattern of the group 1 of the modern periodic table in an increasing order of atomic radii.

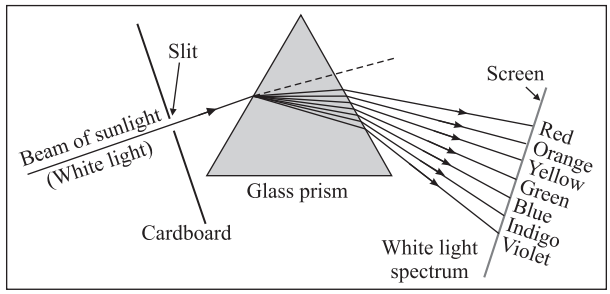
(d) The biggest atom : Cs

The smallest atom : Li

(e) While going down a group, atomic number increases, atomic radius increases. Therefore atomic size gradually increases.

(ii) Experiment :

(1) Procedure : Keep a glass prism on a table in a dark room. Hold a plane mirror outside the room so that it reflects a beam of sunlight into the room. Allow this beam to pass through a narrow slit made in a cardboard and then fall on the prism. Place a white screen on the other side of the prism as shown in the figure.



Dispersion of sunlight (white light) by a glass prism

(2) Observations :

(a) A pattern of various colours is observed on the screen. This pattern is called the spectrum.

(b) It is found that in dispersion, the ray corresponding to violet colour deviates the most.

(c) The ray corresponding to red colour deviates the least.

(d) The deviation of rays corresponding to other colours is intermediate.

(3) Conclusion : When sunlight (white light) is incident on a prism, dispersion of light takes place, forming a spectrum.
