

MARCH-2015 : PAPER SOLUTION

PART-B : MARCH 2015

Time : 2 Hours]

011 (E) March 2015

[Maximum Marks : 50

Instructions : As per Question Paper-I

SECTION-A

Answer questions from 1 to 5, using maximum 30 words. Each question carries 2 marks.

1. Give four examples of uses of nanostructure in History.

Ans. Uses of Nano-structure in History

- Nanoparticles were used by artisans in the 9th century for generating a glittering effect on the surface of pots.
- A hair dye formula used 2000 years ago by Greeks and Romans works by causing tiny nanoparticles. Ancient Egyptians were using nano-lead compound for eye-make up.
- The Damascus steel with carbon nanotubes on the surface was found in the sword of Tipu Sultan.
- "Bhasmas" ayurvedic medicines are metallic mineral preparations of biologically produced nanoparticles.
- Michael Faraday gave first scientific description about how materials show drastically different and unique properties at the nano-scale.

OR

1. 'Carbon forms backbone of biology of life on earth'. Justify.

Ans. Carbon forms backbone of biology of life on earth :

- Carbon atom can bond with many different types of atoms including other carbon atoms by forming covalent bonds at a time. This helps to form long chains of atoms. This characteristic results in varieties of carbon allotropes; namely diamond, graphite, graphene, amorphous and glassy carbon and fullerenes, all showing different properties.
- Carbon atom bonds as strongly to other carbon atoms, and also by sharing different number of electrons. In fact, this strong cohesion is responsible for most stable bio-chemical compounds necessary for life. This is the reason why carbon is considered as a basis for the chemistry of life.

2. Write Faradays laws of electrolysis.

Ans. Michael Faraday (1791-1867), studied it in detail and gave rules to calculate how much metal is deposited on the electrode in the process of electrolysis.

Faraday's First Law :

- The mass of the substance (metal) deposited at cathode on passing the electric current through electrolytic solution is proportional to charge passed through it. $m \propto Q$

Faraday's Second Law :

- For a given amount of charge passed, the masses of different elements deposited on cathode is proportional to their chemical equivalent (e). Chemical equivalent of any atom is the ratio of atomic mass and its valency. $\left(\frac{m_1}{m_2} = \frac{e_1}{e_2} \right)$

3. Write the physical properties of ethene gas.

2

Ans. Physical properties of ethene gas :

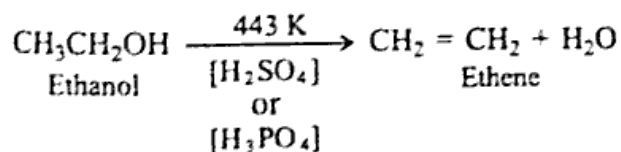
1. Ethene gas is insoluble in water.
2. Ethene is colourless and odourless gas.
3. Ethene is lighter than water.
4. When burnt in presence of air, it burns with sooty flame, i.e., it is a combustible substance.
5. The soot produced is called carbon black.

OR

3. Explain the preparation of ethene gas by dehydration, giving chemical equation.

Ans. Preparation of Ethene gas by dehydration :

- Ethene is formed by heating ethanol with con. H_2SO_4 or H_3PO_4 at 443 K temperature.
- During this reaction a molecule of water is removed and so this reaction is known as dehydration of alcohol.



4. What is lymph? Explain its constitution.

2

Ans. **Lymph** : The fluid, that diffuses from the blood, flowing through the blood capillaries, into the intercellular spaces between the tissue cells is called lymph.

- Lymph is a colourless liquid connective tissue.
- **Constitution** : Lymph contains all the constituents of blood except the red blood corpuscles, very few types of white blood corpuscles and all the constituents of blood plasma having relatively less proteins.

5. Describe the types of biodegradable waste giving examples.

2

Ans. Wastes are unwanted, unusable items, remains on household garbage. Wastes are generated in our homes on daily basis.

- The waste materials which are broken down by biological processes are called biodegradable, for example vegetables and fruits while glass, plastics and polythene which are not broken down by biological processes are said to be non-biodegradable.

SECTION-B

- Answer questions from 6 to 10 in maximum 30 words. Each question carries 2 marks.

- An imaginary sphere covering the sky with the earth at its centre is known as the celestial sphere.
- The ecliptic of the celestial sphere is divided into 27 equal parts; which are known as Nakshatra.
- Their angular region is $360^\circ \div 27 = 13^\circ 20'$ (Read as thirteen degree twenty minutes)
- Our moon undergoes $13^\circ 20'$ angular displacement every day along the ecliptic.
- Thus, moon remains in one Nakshatra for a day, while the sun remains in one Nakshatra for $365 \div 27 = 13.5$ days.
- Nakshatra are given names on the basis of imaginary figures formed by joining stars or by luminous stars belonging to the Nakshatra.
- Pushya, Swati, Ardra etc. are some of the well known Nakshatras.
- In India, they have religious importance too.

7. What is reflection? Give two examples.

Ans. Reflection of Light :

- When a ray of light incidents on an opaque object it comes back in the same direction. This phenomenon is called reflection of light.

There are two types of reflection :

- (1) Regular reflection
- (2) Irregular reflection

(1) Regular Reflection :

- When a parallel beam of light falls on a smooth or highly polished surface then reflected beam is also parallel and directed in a fixed direction. Such reflection is called regular reflection.

- Eg. : reflection of light by mirror.

(2) Irregular Reflection :

- When a parallel beam of light falls on a rough surface, then reflected light is not parallel but spreads over a wide area. Such a reflection is known as irregular reflection

- Eg. : Reflection of light from book, chair, table, etc.

8. How many times more acidic will be the aqueous solution having 2pH compared to that having 4pH.

Ans. For solution having 4pH,

$$\text{pH} = -\log_{10} [\text{H}_3\text{O}^+]$$

$$\therefore 4 = -\log_{10} [\text{H}_3\text{O}^+]$$

$$\therefore \log_{10} [\text{H}_3\text{O}^+] = -4$$

$$\therefore [\text{H}_3\text{O}^+] = 10^{-4} \text{ M}$$

Similarly, $[\text{H}_3\text{O}^+]$ for solution having 2pH = 10^{-2} M

Now, $\frac{[\text{H}_3\text{O}^+]}{[\text{H}_3\text{O}^+]}$ in aqueous solution having 2pH
in aqueous solution having 4pH

$$= \frac{10^{-2} \text{ M}}{10^{-4} \text{ M}} = 10^2 = 100$$

→ Thus, the concentration of $[\text{H}_3\text{O}^+]$ in 2pH concentrated solution will be 100 times more than that of 4pH, i.e., it will be 100 times more acidic.

9. Write any two points of difference between, Homologous organs and Analogous organs.

2

Homologous organs	Analogous organs
1. The internal structure and fundamental origin of these organs are mostly similar.	The fundamental structure and origin of these organs are totally dissimilar.
2. Functionally these organs may be similar or dissimilar.	Functionally these organs are always similar.
3. The presence of these organs indicates common ancestors.	The presence of these organs does not indicate common ancestors.
4. The forelimbs of frog, lizard, bird and man are homologous organs.	The wings of butterfly, wings of birds and those of bat are analogous organs.

OR

9. What is heredity? Explain.

Ans. **Heredity** : Heredity means continuity of features from one generation to another. "The transmission of characters from parents to the offspring" or the tendency of every individual to resemble their parents.

- **Appropriate examples** : Eggs laid by a sparrow hatch into a sparrows only. A dog gives birth to pups only.
- Hereditary information is present in the fertilized egg or zygote.
- The zygote develops into an organism of a particular type only.
- Heredity is one of the important aspects of science, which is studied under Genetics.

10. Write the importance of forests.

2

Ans. **Importance of Forests** :

- Forests are most valuable resources. Food, fodder, fibres, timber, fuel wood, medicines, gum, resins, bamboo from forests.
- Bamboos obtained from forests are mostly use to make slats for huts and baskets for storing things.
- Forests provide habitat to numerous plants and animals.
- Forests play a very important role in maintenance of environment. They play an important role in the maintenance of seasonal cycles, biochemical cycles, regularity of rainfall and conservation of soil.
- Forests reduce impact of heavy rains and strong winds. They control erosion of soil and leaching.

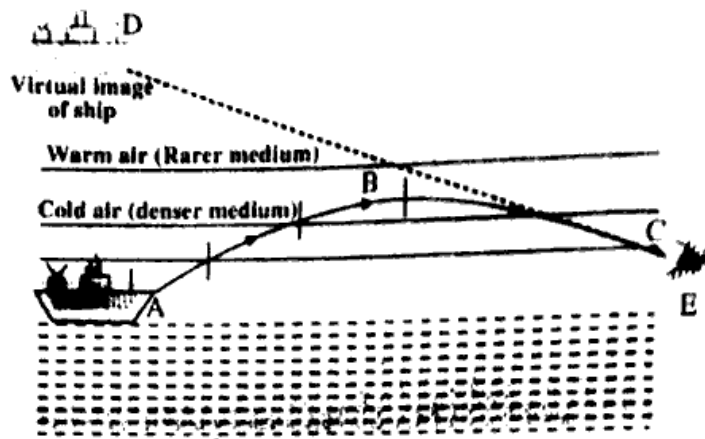
SECTION-C

- Answer questions from 11 to 15 in the limit of maximum 50 words. Each question carries 3 marks.

11. What is Looming? How is it formed? Explain with figure.

Ans. Looming :

→ Looming is a mirage observed above horizon in atmosphere.



Looming caused by total interval reflection

- Looming is such a kind of mirage observed in very cold regions in which the virtual and erect image of distant object appears to be hanging midway in the atmosphere.
- It is produced by the total internal reflection of light (in downward direction) caused by atmospheric refraction.
- The looming produces virtual and erect image of an object above horizon where the warmer (optically rarer) air remains above the colder (optically denser) air in the atmosphere.

12. Explain the construction and working of electric bell with figure.

Ans. Electric Bell :

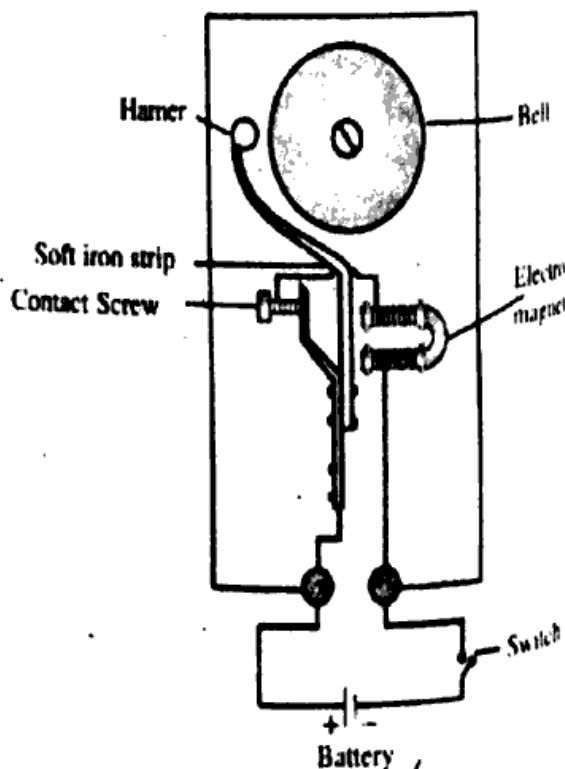
Principle : The electric bell works on the principle of an electromagnet.

Construction :

- Electric bell is made up of a electro-magnet, bell (metallic cup), a soft iron strip and a contact screw. Bell is a cup shaped device made up of a metal. A soft iron strip works as a small hammer. The construction of an electric bell is shown in the following figure.

Working :

- When the circuit is switched on, an electric current returns in the battery after passing through an electromagnet, a soft iron strip and a contact screw.
- While passing a current through an electromagnet acts as a magnet and attracts an iron strip.



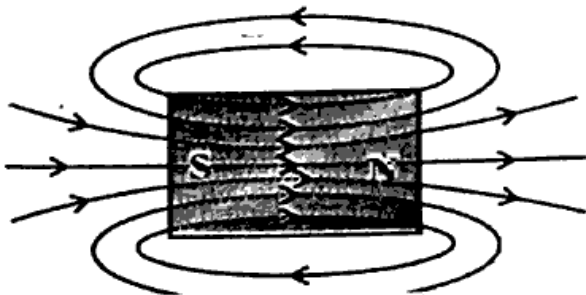
- As iron strip (hammer) being elastic, it strikes with the bell. Simultaneously its contact with a contact screw is broken and current flows through electro-magnet stops. The iron strip comes in contact with the screw by obtaining an original position and again the electric current passes through an electromagnet.
- This phenomenon occurs many times in a second and a hammer strikes many times with the bell, as a result the bell rings. The bell rings till the circuit is switched off.
- Uses : Electric bell is used in school, home, telephone, security system, fire alarm etc.

OR

12. Explain the characteristics of magnetic field lines with figure.

Ans..Characteristics of the magnetic field lines :

- (1) The magnetic field lines of a magnet starts from the north pole (N) and reach to the south pole (S) and these lines are in the direction from south pole (S) to the north pole (N) inside the magnet. Thus, they form close loops.
- (2) The region in which the field lines are at close distance to each other has a strong magnetic field and if the field lines are at far distance from each other the region has a weak magnetic field. Near the poles of a magnetic the field lines are at close distance from each other so there is a strong.
- (3) The magnetic field is a vector quantity. So it has a magnitude and a direction both. The tangent drawn at any point of a magnetic field line (that means the direction of magnetic needle at that point) shows the direction of magnetic field at that point.
- (4) Magnetic field lines do not intersect each other.



13. Write the uses of dihydrogen gas.

3

Ans. Uses of dihydrogen gas :

- Hydrogen gas is used in welding (hydrogen welding) and in oxyhydrogen flame for cutting metal.
- It is used as a reactant for the manufacture of NH_3 by Haber's process.
- It is used in the manufacture of methanol and HCl .
- Liquid hydrogen is used as a fuel in space rocket and in fuel cell.
- In preparation of vegetable ghee from vegetable oil in presence of nickel catalyst.
- Hydrogen can be absorbed on the surface of certain solid metals and is released whenever required.

14. Explain the modern method of industrial production of acetic acid. Also write any two properties and uses.

3

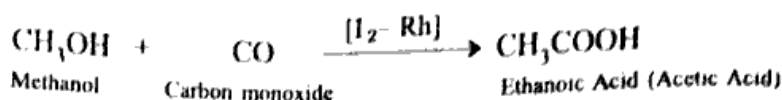
Ans. Acetic Acid (CH_3COOH) :

- The common name of ethanoic acid is acetic acid. Its formula is CH_3COOH .

Modern Method of Industrial Production of Acetic Acid :

- In modern method of industrial production of Acetic Acid, is done by the reaction

of methanol and carbon monoxide in the presence of a catalyst Iodine Rhodium
[I₂-Rh].



Properties of ethanoic acid (Acetic Acid) are as follows :

1. Acetic acid is a colourless liquid with a peculiar smell.
2. Its boiling point is 391 K.
3. It is miscible with water.
4. 4% to 6% aqueous solution of acetic acid is called vinegar.

The uses of Acetic Acid are as follows :

1. Acetic acid is used as vinegar in pickles.
2. It is used as a preservative as well as to impart sour taste to the food.
3. As a reagent and solvent in the laboratory.
4. To prepare white lead.

OR

14. What is soap? Explain the preparation of soap giving chemical equation.

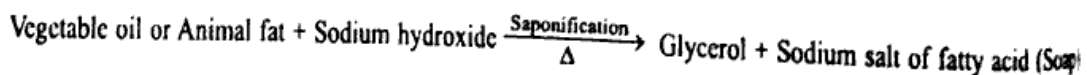
Ans. Soap : Soap is a sodium or potassium salt of fatty acid like stearic acid or palmitic acid.

Preparation of Soap :

→ Vegetable oil (mustard seed oil; groundnut oil) or animal fat (mutton tallow) is heated with the aqueous sodium hydroxide (NaOH) to form sodium salt of fatty acid (Soap) and glycerol.

Chemical equation :

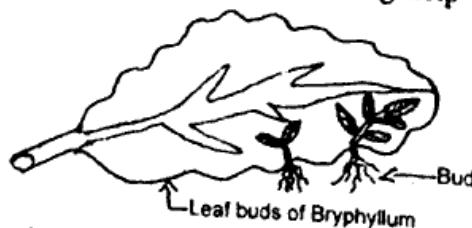
→ The reaction to prepare soap is known as saponification.



15. What is vegetative propagation? Explain Vegetative propagation in Bryophyllum with figure.

Ans. Vegetative Propagation :

→ Vegetative propagation is an asexual method of reproduction, which occurs only in plants. In vegetative propagation, new plants are obtained from the plant parts like roots, stem and leaves of old plants, without taking help of any reproductive organs.



→ Vegetative propagation involves the development and growth of dormant state of buds present in old part of the plant. When suitable moisture and temperature are provided to dormant state of bud then these buds grow to form new plants.

SECTION-D

Answer questions 16 to 18 in detail, to the point, in at least 100 words. Each question carries 5 marks. 15

16. Explain refraction of light and lateral shift using a rectangular glass slab with figure. 5

Ans. Refraction of Light Through Rectangular Glass Slab :

→ A line drawn on a piece of paper appears to be raised or shifted up when a glass slab is placed on it.

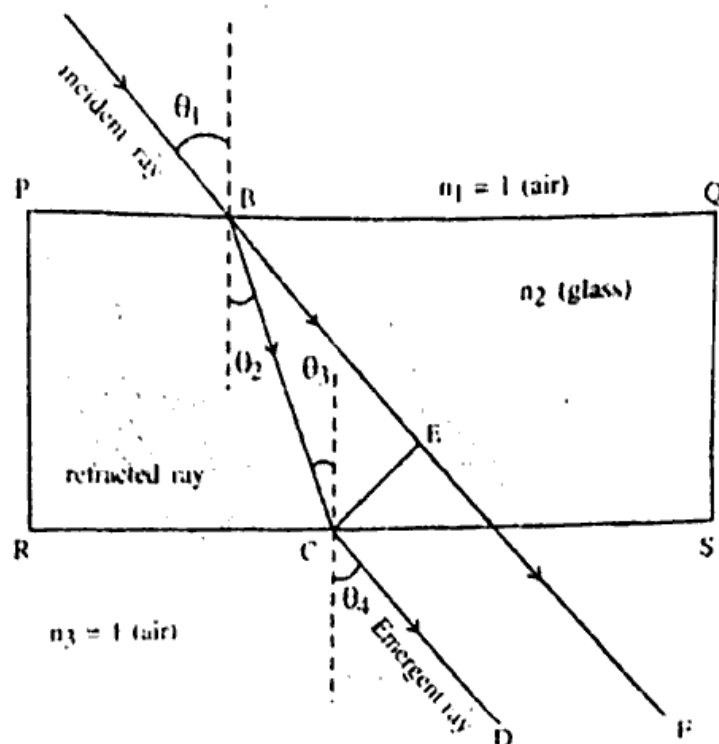
→ Similarly any thing lying on the bottom of a swimming pool appears to be raised.

→ These facts result due to the phenomenon of refraction of light.

→ As shown in Figure.

→ A light ray AB is incident at angle θ_1 at point B on the surface PQ of a glass slab.

→ After the refraction from point B, a refracted ray BC is incident at point C on surface RS at an angle θ_3 and emerges as a ray CD from the glass slab.



Refraction of light through rectangular glass slab

→ Let us determine the direction of an emergent ray using the laws of refraction.

→ Here, $n = 1$, for the medium of an air at the surface PQ.

→ Therefore, from Snell's Laws $n_1 \sin \theta_1 = n_2 \sin \theta_2$

$$\therefore \sin \theta_1 = n_2 \sin \theta_2 \quad (\because n_1 = 1) \quad \dots(1)$$

→ Similarly for the surface RS parallel to PQ,

$$n_2 \sin \theta_3 = n_3 \sin \theta_4$$

$$n_2 \sin \theta_3 = \sin \theta_4, \quad (n_3 = 1 \text{ for an air})$$

$$\therefore n_2 \sin \theta_2 = \sin \theta_4; \quad (\theta_2 = \theta_3 \text{ as they are alternate angles}) \quad \dots(2)$$

→ From equation comparison (1) and (2)

$$\sin \theta_1 = \sin \theta_4$$

$$\therefore \theta_1 = \theta_4$$

$$\dots(3)$$

\therefore Angle of incidence = Angle of emergence

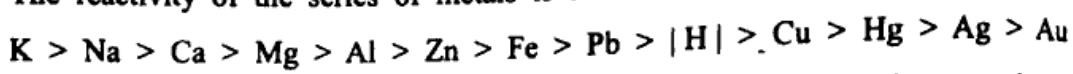
→ It is clear from Figure and equation (3) that the emergent ray CD travels in the same direction as an incident ray AB, but it is displaced by a perpendicular distance CE.

→ Thus, when a ray of light is refracted from two parallel refracting surfaces, the emergent ray is displaced from the direction of incident ray. This kind of displacement is called lateral shift.

- Here, the emergent ray is linearly displaced by perpendicular distance CE due to refraction.
- **Lateral Shift** : When ray of light is refracted from two refracting surfaces, emergent ray is (linearly) displaced from the direction of incident ray. This kind of displacement of light is called the lateral shift.
- The lateral shift in the diagram is equal to CE.
- The amount of lateral shift depends upon perpendicular distance between two parallel refracting surfaces as well as upon the angle of incidence and refractive index of medium.

17. Describe reactivity series of metals. Also describe an experiment to decide the order of reactivity of Fe, Cu and Ag. 5

Ans. The reactivity of the series of metals is as follows :



To determine the order of activity of Fe, Cu and Ag metals following experiment is carried out :

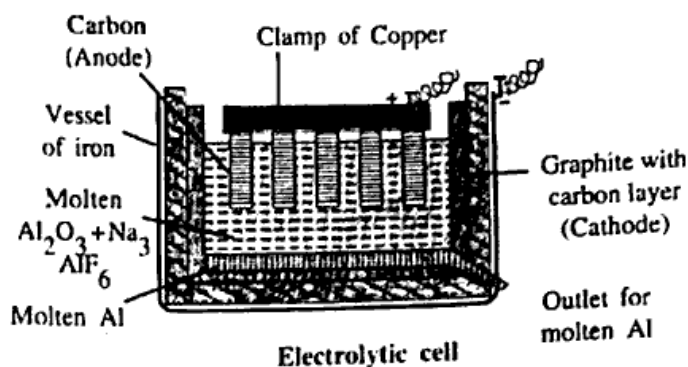
- First of all take test tubes and number them as 1 and 2 respectively.
- In test tube 1 and 2 take 0.1 gram copper sulphate ($CuSO_4 \cdot 5H_2O$) and 0.1 gram silver nitrate ($AgNO_3$).
- Add 10 ml of distilled water to each test tube and dissolve the substance in it.
- With this keep ready a piece of iron nail or screw and piece of copper wire.
- Now add iron nail or screw in test tube 1 and piece of copper wire or thin strip in test tube 2.
- Place both the test tubes in order and observe the solutions and metal in each test tube.
- In about 5 minutes, it will be observed that the metal from the solution being deposited on the metal added.
- After half an hour when observation of both the test tubes is carried out, it will be observed that in test tube 1, the nail or screw will appear brown coloured due to deposition of copper on it. In test tube 2, silver as shining white colour deposited on the wire or strip of copper.
- By keeping the test tubes for more than half an hour, more amount of metals will be found deposited.
- The colour of the solutions in both the test tubes will be light blue from dark blue colour and light blue colour from colourless respectively.
- Thus, it can be concluded at the end of the activity that Fe is more active metal than Cu because Cu from solution of $CuSO_4$ is displaced by metal Fe,
i.e. $Fe > Cu$
- Cu is more active metal than Ag because Ag is displaced from solution of $AgNO_3$ by Cu metal, i.e., $Cu > Ag$
- Thus, the order of activity of all the three metals will be $Fe > Cu > Ag$.

OR

17. Explain Hall - Heroult method of obtaining pure aluminium from alumina with fig..

Ans. To obtain aluminium from alumina by electrochemical reduction :

→ The method to obtain aluminium from alumina by electrochemical method was invented by American chemist Charles Martin Hall and French scientist Paul Heroult in 1886. Hence, this method is also known as Hall-Heroult method.



→ Electric current cannot pass through solid form of alumina.

Also, melting point of alumina is very high 2348 K. Electrolysis at such a high temperature is very expensive. Hence, cryolite (Na_3AlF_6) is added so that electrolysis can be carried out easily.

→ This mixture works as better electric conductor than melted alumina. The melting point can be brought still lower by addition of feldspar (CaF_2).

→ As shown in Fig., the mixture of alumina, cryolite and feldspar is electrolysed in a vessel of iron having inner surface layered with carbon.

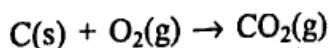
→ In this cell, the rods of carbon are joined by copper clamp as anode and carbon layered graphite is taken as cathode.

→ On passing the electric current molten aluminium is deposited on cathode and dioxygen gas is produced at the anode. The molten aluminium collected at the bottom of the cell is taken out.

→ Cathode : $2\text{Al}^{3+}(\text{l}) + 6\text{e}^- \rightarrow 2\text{Al}(\text{l})$

→ Anode : $6\text{O}^{2-}(\text{l}) \rightarrow 3\text{O}_2(\text{g}) + 12\text{e}^-$

→ The dioxygen gas produced at the anode reacts with rod of carbon and forms carbon dioxide. As a result anode is corroded. Hence, they are frequently replaced.



18. What is respiration ? Explain the types of respiration.

5

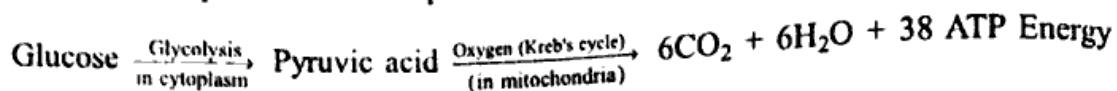
→ The process of releasing energy from food is called respiration. The process of respiration involves intake of oxygenated air into the cell (inspiration), using it for releasing energy by burning of food, and then removal of the carbon dioxide and water from the body. During the process of respiration energy is released inside the cells. So it is known as cellular respiration. Respiration is essential for life, because it releases energy to carry out different life processes.

Types of respiration :

→ Respiration is of two types : (i) aerobic and (ii) anaerobic.

(i) **Aerobic respiration :** The respiration which takes place in the presence of oxygen is called aerobic respiration. Aerobic respiration takes place in the cell, so it is also called cellular respiration. During this food (Glucose) is broken down into carbon dioxide and water in the presence of oxygen. The energy released in the process is stored in ATP.

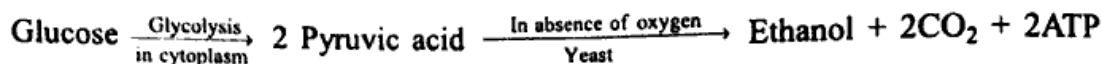
- The overall equation can be represented as follow as :



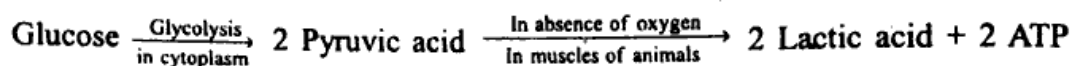
(ii) Anaerobic respiration :

- The respiration which takes place without oxygen is called anaerobic respiration. It is seen in microorganisms like bacteria, yeast, fungi, and parasites and muscle cells. In anaerobic respiration, the microorganisms break down glucose into ethanol and carbon dioxide and release energy. CO_2 and Ethanol are formed as end products in plants, while lactic acid is an end product in muscles of animals. The equations are as follows:

In Yeast :



In Animal muscles :



OR

18. Answer as directed.

(a) What is the role of hydrochloric acid in our stomach?

Role of hydrochloric acid in our stomach :

- The hydrochloric acid makes the acidic medium in stomach.
- In acidic medium, the enzyme pepsin digests protein, present in the food, and converts into small molecules.
- It also kills bacteria which enter the stomach with food.
- Thus digestion of protein begins in the stomach.

(b) What is the function of enzymes in the human digestive system?

Functions of enzymes in the human digestive system :

- The enzyme called amylase secreted by salivary gland digests the starch of food into maltose.
- Thus, the digestion of starch begins from mouth.
- The bile salts break the fats present in the food into small globules, making it easy for the enzyme to act and digest them.
- The pancreas secretes pancreatic juice which contains enzyme like amylase, trypsin and lipase.
- The enzyme amylase digests starch, the trypsin digests proteins and lipase digests fats.
- The glands of the wall of small intestine secrete intestinal juice.
- The intestinal juice contains various enzymes which complete the digestion of carbohydrates into glucose, proteins into amino acids and fats into fatty acids glycerol.
- Thus, above are the functions of various enzymes in the human digestive system.

□ □ □