

MARCH-2016 : PAPER SOLUTION

PART-B : MARCH-2016

Time : 2 Hours]

011 (E) March 2016

[Maximum Marks : 50

Instructions : 1. Write in a clear hand writing.

2. There are four Sections in Part - B of the question paper and total 1 to 18 questions are there.

3. All the questions are compulsory. Internal options are given.

4. The numbers at right side represent the marks of the questions.

5. Start new Section on new page.

6. Maintain sequence.

7. Draw neat labelled diagram as per instructions.

SECTION-A

- Questions from 1 to 5 are short answer type questions.
Each question carries 2 marks.

1. How nano-technology can be useful in energy sector? Explain. 2

Ans. Energy resources :

- Due to tunable electrical and optical properties, specially designed nano - materials can interchange electricity and light with minimum energy loss.
- They are more efficient than any of the conventional devices.
- Carbonic solar cells and hydrogen fuel cells will be shortly commercialized.
- Automobile engineering will improve to design lighter, stronger and fuel efficient vehicles.
- A paper thin sheet of cellulose infused with carbon nano - tubes act as highly efficient battery.

OR

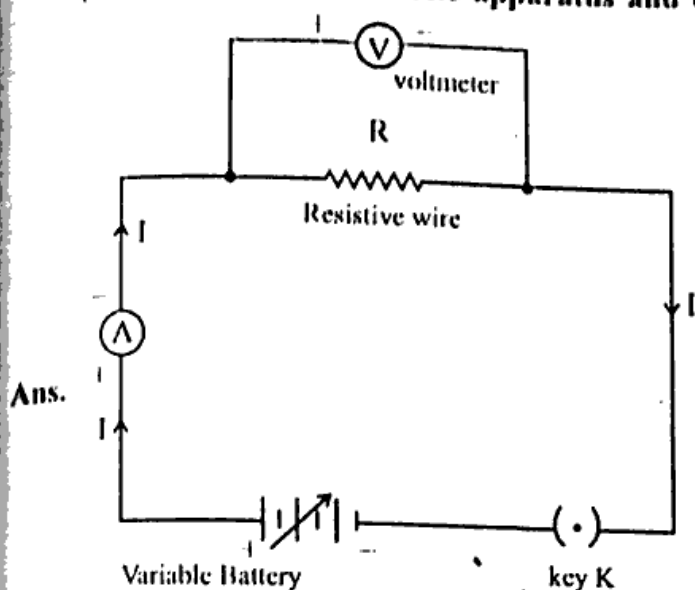
1. "Nano-technology is considered as an invention of modern science, its use has been identified from long past". Give four examples proving above statement.

Ans. Nano-technology :

- Nanoparticles were used by artisans as far back as 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 nanoparticles on the surface was found on the surface of the sword of Tipu Sultan.
- 'Bhasmas' an ayurvedic medicines - are actually metallic mineral preparations of biologically produced nanoparticles.
- And history is long - it is Michael Faraday (1857) who gave first scientific description about how materials show drastically different and unique properties at the nano-scale.

2. Draw a labelled diagram of the experiment explaining Ohm's law.
(Blind candidate can write apparatus and experiments method in short)

2

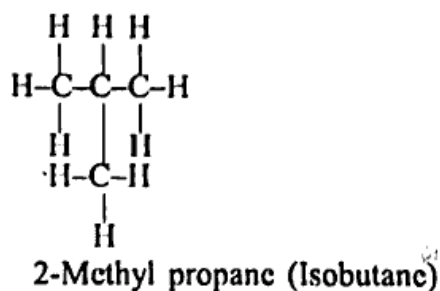
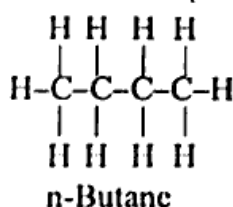


3. What is isomer? Write the isomer of butane with structural formula.

2

Ans. Because of this catenation property of carbon, compounds having different structural formula and compounds having different physical properties are observed. Such organic compounds having molecular formula same but different structural formula are called isomers. This type of phenomenon is called isomerism, viz.

→ Butane (C_4H_{10}) has two isomers



OR

3. Write the industrial name and two uses of ethyne.

Ans. → The industrial name of ethyne is acetylene.

- Ethyne is industrially very important.
- The substances like ethanol, acetic acid, vinyl polymer and plastic like substance can be prepared from it.
- Ethyne is used in oxyacetylene flame used for welding of metals.
- On kite flying day, acetylene gas is filled in rubber balloons and are flown high in sky.

4. Write four points of difference between Arteries and Veins.

Ans.

Arteries	Veins
1. The blood vessel that carries blood from the heart to different organs is called an arteries.	1. The blood vessel that carries blood from any organ towards the heart is called a veins.
2. In arteries, the blood flows under higher pressure.	2. In veins, the blood flows under somewhat low pressure.
3. The wall of the arteries is relatively thick and elastic.	3. The wall of the vein is relatively thin and less elastic.
4. The arteries divides into several arterioles and numerous fine blood capillaries in the organs and tissues.	4. In the organs and tissues, the veins are formed by the union of numerous blood capillaries and several venules.
5. Arteries carry oxygenated (O_2) blood (exception-Pulmonary artery).	5. Veins carry deoxygenated (O_2) blood (exception-Pulmonary veins).

5. Explain the types waste based on its nature and degradation.

Ans.

→ Unwanted, unusable items, remains or household garbage are called waste. These wastes are classified in to two major forms :

(1) **Solid wastes** : Kitchen wastes such as vegetables and fruits, peels, scales, bones, etc. Besides it metal wastes, glasses, plastics and polythenes are included in solid wastes.

(2) **Liquid wastes** : The liquid forms are easy to handle and manage as compared to those of solid forms.

→ Wastes are classified into two types on the basis of degradation.

(1) **Biodegradable wastes** : The waste materials which are broken down by biological processes are called biodegradable wastes.
e.g. Vegetables, fruits, etc.

(2) **Non-biodegradable wastes** : The waste materials which are not broken down by biological processes are called non-biodegradable wastes.
e.g. Glass, plastics, polythenes, etc.

SECTION-B

Questions from 6 to 10 are short answer type. Each question carries 2 marks.

6. What is solar system ? Write the name of planets of solar system in sequence.

Ans. **Solar system** : The system comprises of the sun, planets which are revolving around the sun, asteroid satellites which are revolving around the planets, meteors, asteroids and comets is called solar system.

→ There are nine planets in our solar system. There are about 102 satellites which are revolving around the planets and more than 1 lakh asteroids.

→ The centripetal force, required to keep them in respective orbits, is provided by the gravitational force between the sun and the planets.

→ **Name of the planets of solar system :**

(i) Mercury, (ii) Venus, (iii) Earth, (iv) Mars, (v) Jupiter, (vi) Saturn, (vii) Uranus, (viii) Neptune and Pluto.

→ Pluto is recognised as dwarf planet.

7. Write the definition of acid and base based on Arrhenius principle also write the limitations of this principle. 2

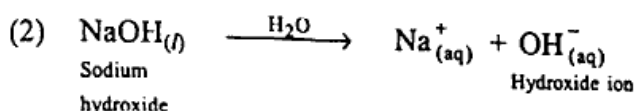
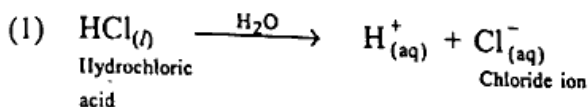
Ans. The definite concept about an acid and a base was given, in 1884, by Swedish scientist Svante Arrhenius.

→ According to him the definition of an acid and a base is as follows :

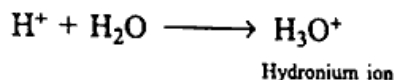
1. **Arrhenius acid** : Acid is a substance containing hydrogen which produces hydrogen ion (H^+) in its aqueous solution.
2. **Arrhenius base** : Base is a substance containing hydroxide which produces hydroxide ion (OH^-) in its aqueous solution.

→ On basis of this theory it can be said that acid ionises in water and produces H^+ and base ionises in water and produces OH^- ion.

→ **Examples :**



→ **Limitations :** (1) It is applicable only to aqueous solutions. (2) Ammonia (NH_3) does not contain hydroxide ion even though its aqueous solution acts as base; couldn't be explained. (3) H^+ is proton and is highly unstable because it is hydrogen atom without electron. Its independent existence is not there, as it combines immediately with solvent. i.e.,



8. Write the properties of hormone. 2

Ans. Hormones demonstrate the following main properties :

- (i) Each hormone is produced by a specific kind of cells.
- (ii) Hormones are not effective at their site of synthesis.
- (iii) Hormones are poured directly into blood. They are transported through blood to a specific organ and influence specific processes occurring there. This influence may be stimulatory or inhibitory. Thus, hormones are "regulator chemicals".
- (iv) Hormones are used up in producing their regulatory effect.
- (v) Chemically hormones are peptides and steroids. Some are biogenic amines.

9. Explain the acquired trait with examples. 2

Ans. **Acquired trait :**

- Acquired trait means a Trait of an organism that is not inherited but developed in response to the environment.
- For example reduction in weight due to starvation.
- The reduced weight due to starvation would not change the DNA of germ cells.
- Thus reduced weight is not a trait that can be inherited by the future generation of starving organisms.
- Another examples of acquired trait are cut tail of mouse or a man who knows how to swim, or speak German or roller skate, or may have scar on the face due to accident.

- The reason for this because only those traits inherited to their progeny where change has occurred in the genes in gametes of organisms during the process of reproduction.
- Thus the changes in the non-reproductive body cells of an organism cannot be transmitted to its progeny.
- A trait of organisms which is caused by a change in its DNA is known as inherited trait.
- For example, there is a population of red beetles which live in bushes with green leaves. Suppose a color variation arises during reproduction in the gene of reproductive cells, one green color beetle arises instead of red color. Here the green color of this beetle is an inherited trait which can be transmitted to the next generations. This is the essence of the idea of evolution.

OR

9. In which way analogous organs gives evidence for evolution?

Ans. The organs which have different basic design but have similar appearance and carry out similar functions but are fundamentally different in their basic structure and origin are called analogous organs.

- For example, the wings of birds and the wings of insects are structurally altogether different. The origin of the wings of birds and those of insects are also totally different. The wings of insects are originated from the ectoderm, while those of the birds are modified forelimbs of the avian animals.
- The presence of analogous organs in different animals provides evidences that these animals are not evolved and originated from a common ancestral stock, but to survive in the environment they have become stronger by adopting to similar functional organs.

10. Explain the usefulness of dam constructed on the river.

Ans. Usefulness of dams are as follows :

- (1) Water from a dam is used for irrigation in fields through a network of canals. Dams ensure round the year water supply to the crop fields.
- (2) Water from a dam is supplied to the people in towns and cities through pipelines after suitable treatment.
- (3) The falling water from the dams is used for generating electricity.
- (4) To stop the useless flow of rain water to sea and control the hazardous effects of floods.

SECTION-C

Questions from 11 to 15 are short answer type. Each question carries 3 marks.

11. Explain total internal reflection using diagram.

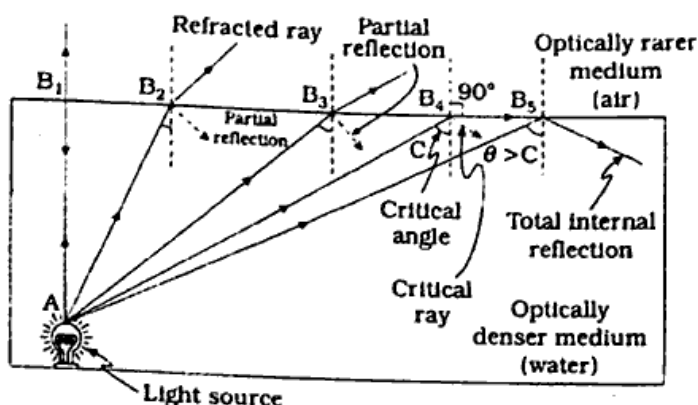
(Blind student should not have to draw diagram)

Ans.

- (1) When an oblique ray of light travels from optically denser medium to optically rarer medium it bends away from the normal at the surface separating the two media.
- According to Snell's law, the angle of refraction increases with the increase in the angle of incidence.
- As shown in the fig., the rays AB_2 and AB_3 originating from the point A of the source

undergoes partial reflection and partial refraction at points B_2 and B_3 respectively.

The refracted ray for the incident ray AB_4 travels along the surface separating the two different media. In other words, we can say that the angle of refraction becomes equal to 90° .



- When a light ray travels from optically denser medium to optically rarer medium, the angle of incidence for which the angle of refraction is 90° is known as critical angle.
- (2) When the ray for which, angle of incidence exceeds the critical angle, that ray is totally reflected in the same medium. (In the fig., the ray AB_5 is totally reflected).
- This phenomenon is known as total internal reflection. In this situation, the surface separating the two media behaves like an ideal 'mirror'.

Illustrations : (1) The sparkling of diamond is due to total internal reflection.

(2) The total optical fibers used in telecommunication also work on this principle.

12. What precautions should be taken during the use of electricity?
(Write any six points)

3

Ans. Use of Electricity :

- Switch off all switches including main switch whenever there is a sparking or fire.
- All connections must be tight.
- Wires must be covered with proper insulation and of proper thickness.
- All joints must be covered with insulating tape.
- Defective switches should be immediately replaced.
- Fuses should be used in the circuit of proper rating.
- The earth wire must be connected to the body of electric appliances.
- Always put dry rubber shoes while repairing the circuit.
- Do not touch switches with wet hands.
- Use always good quality wires.

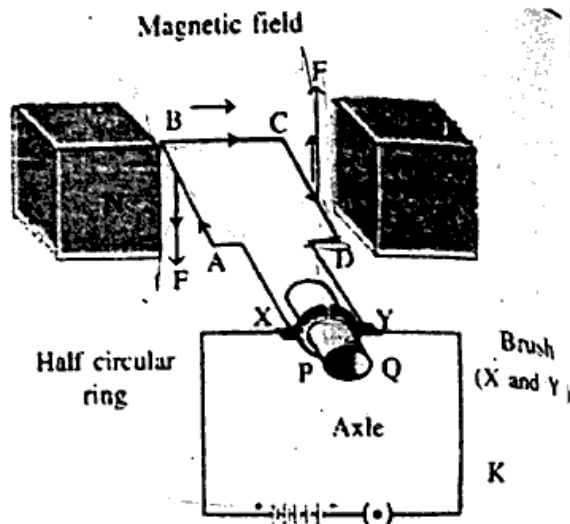
OR

12. Write principle and uses of electric motor with diagram.
(Constructions and working is not necessary)

Ans. Electric Motor : Principle an electric motor is a device that converts electrical energy into mechanical energy. The force acts on a current carrying wire placed in a magnetic field. The electric motor works on this principle.

Construction :

- A loop ABCD of an insulated copper wire is placed in a permanent magnetic field such that AB and CD remain perpendicular to the magnetic field.
- The ends of this wire are connected to the two semicircular rings P and Q.
- The inner part of both the rings is insulated. Both the rings are arranged on an axle such that they can rotate easily on it.
- The outer position of the ring is in contact with a stationary brush X and Y. (In actual motor, a loop containing many turns is arranged on axis. This arrangement is called an armature).



Working :

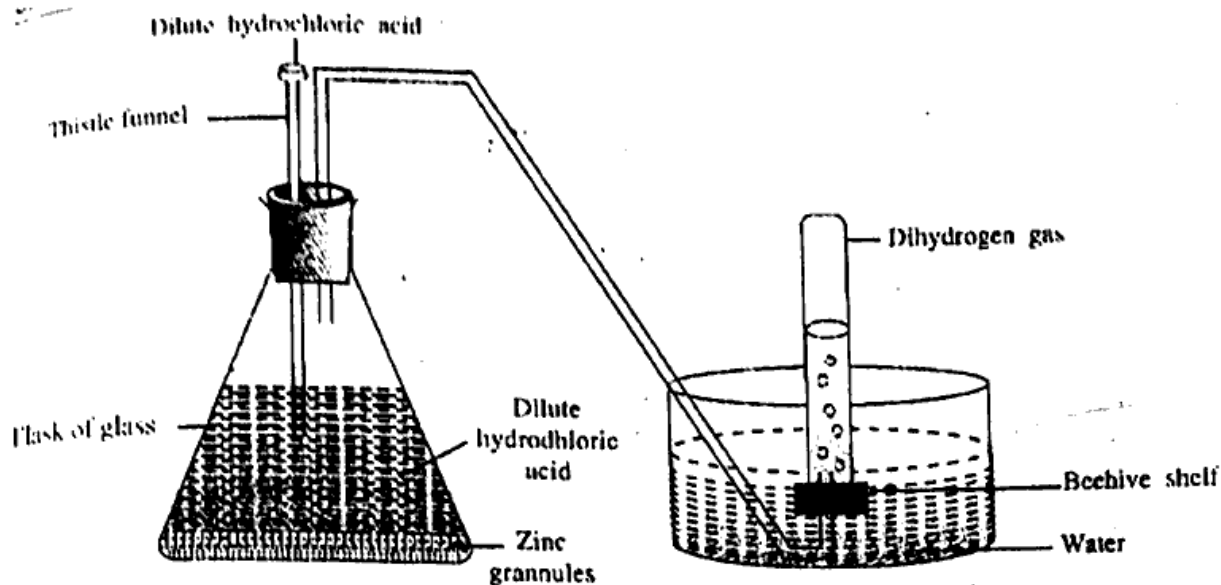
- The electric current flows through a loop ABCD by connecting a battery between the brushes X and Y.
- The current flowing through BC and AD is either parallel or antiparallel to magnetic field, so force does not acts on them.
- But the currents flowing in wires AB and CD are perpendicular to the magnetic field, hence force act on them.
- The direction of this force is obtained from Fleming's left hand rule. As shown in figure, the force on AB acts in the downward direction and the force on CD acts in upward direction. As these two forces are in the mutual opposite directions, the loop ABCD is rotated.
- After the completion of half rotation, the ring Q comes in contact with the brush X and the ring P with the brush Y, so that the direction of an electric current gets reversed. Due to this, the direction of force acting on AB and CD is also reversed.
- As a result, the loop continues to rotate in the same direction. At the end of one rotation loop comes to the earlier position.
- Thus, after every half rotation the direction of an electric current in a loop changes and loop rotates continuously.

Uses :

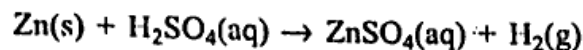
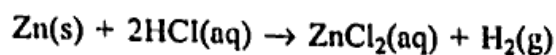
- The electric motor is used in the appliances like electric fan, mixer, washing machine, CD/DVD player etc. Make a list of other electrical appliances where an electric motor is used.

13. Explain the method of preparation of hydrogen gas in laboratory with chemical equation and diagram.

Ans. Preparation of Dihydrogen Gas (H_2) in Laboratory with Chemical equation and diagram method : In laboratory, for the preparation of dihydrogen gas, generally granular, pieces of zinc metal are taken in 500 ml conical flask as shown in Fig.. Dilute hydrochloric acid or dilute sulphuric acid is added through Thistle funnel. Dihydrogen gas is produced by the reaction between them. This gas is collected in a gas jar by downward displacement of water because it is a gas lighter than water.



→ Reactions :

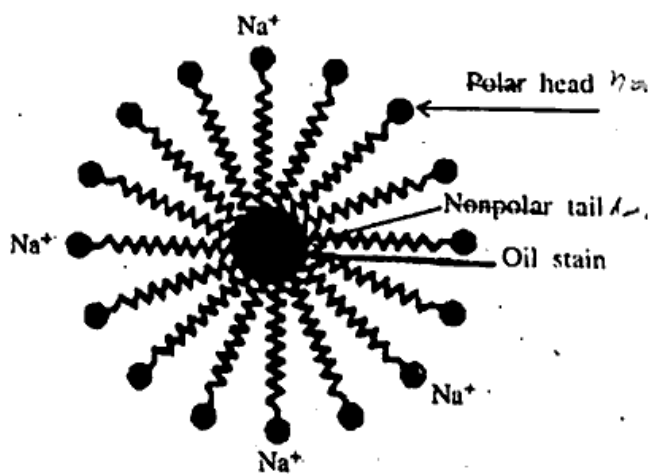


14. Explain the cleansing process of the soap and detergent.

3

Ans. Soap and Detergent cleansing process :

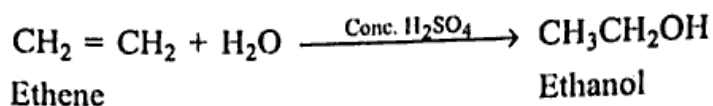
- The cleansing process of soap and detergent is same.
- There are two parts in the structure of soap and detergent; one part of a long hydrocarbon chain is known as nonpolar tail *code*.
- It does not possess attraction towards water but possesses attraction towards dirt or stain.
- While the other negatively charged part ($-\text{COONa}$ or $-\text{SO}_3\text{Na}$) is known as head.
- It possesses attraction towards water molecules.
- Concentrated solution of soap or detergent is applied on the dirty or oily stained surface.
- The nonpolar part possessing attraction towards dirt is attracted by oily stain or dirt.
- When polar part remains in water, it possesses attraction towards water.
- The spherical structure formed around the stain is called micelle.
- The hydrocarbon part remains attached with the surface containing dirt or oil while polar part remains in water.
- The part on which detergent is applied, is being dragged by water so that the water gets dirty and the surface becomes clean.



OR

14. Write industrial production of ethanol with two uses.

Ans. : Industrial Production of Ethanol : The industrial production of ethanol is carried out by hydration of ethene ($\text{CH}_2 = \text{CH}_2$) obtained as petrochemical. Ethanol is formed by hydration of ethene with water in presence of concentrated sulphuric acid.



Uses of Ethanol :

- (1) It is used as solvent in industry and in lacquers, varnish, and in fragrant materials like perfumes and in medicine also.
- (2) As it is antiseptic, it is used for dressing and cleaning of boils.
- (3) As ethanol should not be used as toxic drink, harmful substances like methanol, copper sulphate are mixed with it.
- (4) Ethanol solution containing 5% water is called rectified spirit which is useful for making the outer surface of the body germ-free. 100% ethanol is called absolute alcohol.

15. Explain the processes to control human population. 3

Ans. Many ways have been devised to avoid pregnancy and through its control population. The contraceptive methods can be broadly classified into the following three categories :

1. **Mechanical barriers :** In this method, the creation of mechanical barrier prevents the entry of sperm in the genital track. So fertilization cannot take place.
 - Condoms on the penis or Diaphragm worn in the vagina by female can serve this purpose.
 - In female, another Intra Uterine Contraceptive Devices (IUCDs) like copper-T are placed in uterus to prevent pregnancy.
 - Loop or copper-T is placed into the uterus by a practising doctor or a skilled nurse.
2. **Chemical methods :** In this method, contraceptive pills are used for female. This pills are two types.
 - The oral pills contain a combination of hormones (mainly progesterone) which stop the production of ova and fertilization cannot occur.
 - The vaginal pills contains the chemical known as spermicide which kills the sperms. Under the influence of it implantation of the embryo can be prevented.
3. **Surgical methods :** In surgical methods, in males small portion of vas deferens is surgically removed and both the cut ends are tied properly. This prevents the sperms from entering the urethra. This process is known as vasectomy.
 - In female, a small portion of oviduct (fallopian tubule) is removed and tied up. This process is known as tubectomy.

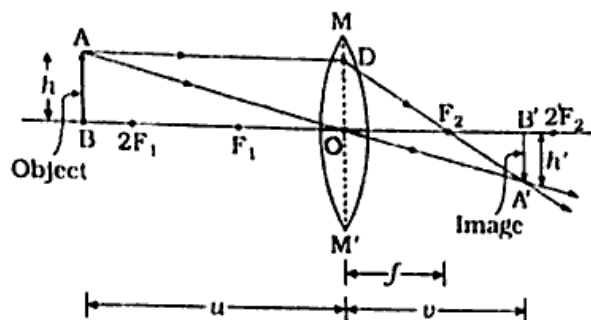
SECTION-D

Questions from 16 to 18 are to be answered in detail. Each question carries 5 marks.

16. What is len's formula? Derive the formula $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$ for spherical lens. 5

Ans. Len's formula : The equation which gives relation between (u), image distance (v) and focal length (f) is know as lens formula for a thin spherical lens of small aperature.

→ As shown in figure, an object AB of height h is placed at a distance u from optical centre, a little away from centre of curvature, in front of the convex lens MM'. An image A'B' is formed on the other side of lens, which is real, inverted and small in size as compared to object AB, at a distance v from optical centre O.



→ According to the Cartesian sign convention,

object distance = $OB = -u$

image distance = $OB' = +v$

focal length = $(OF_2 = OF_2) + f$

→ It is clear from the figure that the right-angled triangles, ΔABO and $\Delta A'B'O$ are similar.

$$\therefore \frac{AB}{A'B'} = \frac{OB}{OB'} = -\frac{u}{v} \quad \dots(1)$$

→ Now, the right-angled triangles, ΔDOF_2 and $\Delta A'B'F_2$ are similar.

$$\therefore \frac{OD}{A'B'} = \frac{OF_2}{F_2B'}$$

$$\therefore \frac{AB}{A'B'} = \frac{OF_2}{F_2B'} \quad (\because AB = OD \text{ is they are opposite sides of rectangle } \square ABOD)$$

$$\therefore \frac{AB}{A'B'} = \frac{OF_2}{OB' - OF_2}$$

$$\therefore \frac{AB}{A'B'} = \frac{f}{v - f} \quad \dots(2)$$

→ On comparing equation (1) and (2), we get

$$-\frac{u}{v} = \frac{f}{v - f}$$

$$\therefore -u(v - f) + uf = vf$$

$$\therefore -\frac{1}{f} + \frac{1}{v} = \frac{1}{u}$$

$$\therefore \frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

... (3)

\therefore Thus, equation $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$ is known as lens formula.

OR

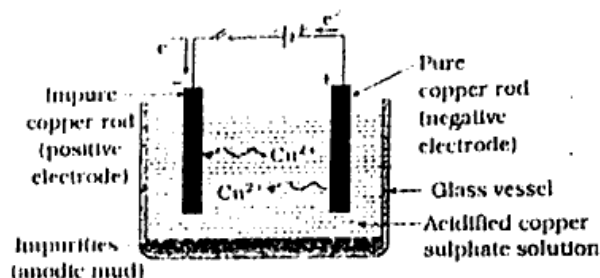
17. Write the name of different stage of obtaining pure metal from its ore. Explain refining of copper by electrolysis with diagram.

Ans. Stage of obtaining pure metal :

- (1) Powder from ore (2) Concentration of ore (3) Roasting, calcinations and smelting (4) Reduction (5) Refining of metal

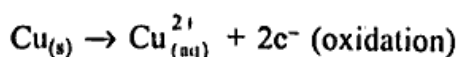
Refining of copper by electrolysis :

- Solution of CuSO_4 is taken as an electrolyte in the electrolytic process of purification of copper. A little amount of sulphuric acid is added to it. (2) In this process, a thin pure copper metal rod is taken as a cathode while thick impure copper metal rod is taken as an anode, and a DC supply of proper voltage is passed in the solution. (3) Pure Cu gets deposited at cathode and impure copper goes into the solution in the form of ions. (4) Less reactive metals like gold and silver are collected at the bottom of the anode and it is known as anodic mud. (5) 100% pure Cu is obtained by this method.
- Thus, copper is purified by electrolytic method and precious metals like silver and gold are also obtained.

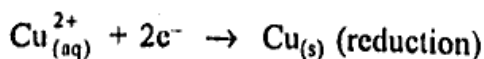


[Purification of copper by electrolysis]

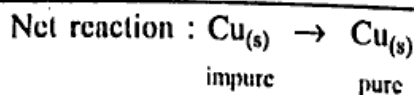
Anode (Positive electrode)



impure



pure



OR

17. Discuss the Bayer's method for extraction of alumina from bauxite ore with chemical equation.

Ans. The Bayer's method for extraction of alumina from bauxite ore :

- In bauxite, in addition to aluminum oxide (Al_2O_3) impurities like iron oxide (Fe_2O_3) and sand (SiO_2) are also present.
- On refining bauxite by Bayer's method, pure aluminium oxide is obtained which is also called alumina.

ii. The host is not benefited but harmed. Several bacteria, fungi, plant like cuscuta and animal-like-tapeworm, ascaris etc. live as parasites.

(3) Holozoic nutrition :

- In this type of nutrition parts of plants or animals or whole organism are taken in as food which then digested with the help of digestive enzymes into simple substance and then absorbed by body cells of the animals. The undigested food is thrown out of the body of animal through the process of egestion.

OR

18. What is respiration? Write the detail note on human respiratory organs.

Ans. Cells in order to perform various functions require energy. This energy is derived by the oxidation of food. The process of releasing energy from food is called respiration.

→ **Humans respiratory organs :**

- (1) **External nares (nostrils) :** There are two openings called external nares (nostrils) at the anterior end of the nose. They are important for the entry and exit of air for breathing.
- (2) **Nasal chamber :** The external nares lead to the lumen of the nose. It is called nasal chamber. The lining of the nasal chamber is provided with mucous glands and a few hair. The air that enters the nasal chamber is filtered and the micro-organisms and dust particles are prevented to go further in the respiratory path.
- (3) **Pharynx :** At the posterior end of the nasal chamber lie internal nares that open in pharynx.
- (4) **Glottis :** The pharynx opens in the trachea by a slit-like aperture called glottis. Above the glottis there is a protective, cartilagenous flap called epiglottis. When the bolus of food is being swallowed from the mouth the glottis is closed by the epiglottis, so that the food is prevented from entering the trachea. The glottis opens in the trachea.
- (5) **Trachea :** A larynx is located at the upper (anterior) end of the trachea. The trachea that starts from the lower (posterior) end of larynx extends upto the middle of thoracic cavity. It is, posteriorly, divided into two branches called bronchi.
- (6) **Bronchus :** Bronchi are the two branches from the lower part of trachea. Each bronchus enters a lung of its own side. The trachea and bronchi have 'C' shaped cartilagenous rings at short intervals lining the wall around their lumen. The respiratory passage is kept open and prevented from getting collapsed due to these rings.
- (7) **Bronchioles :** Each bronchus divides into a large number of branches and subbranches each of which finally results into a very fine tubular and microscopic bronchiole. Each bronchiole terminates into a sac-like structure called alveolus.
- (8) **Alveoli :** These are very thin-walled sac-like structures of the lungs. Each alveolus is surrounded by a close network of fine blood capillaries. The alveoli are of great importance in the exchange of respiratory gases.
- (9) **Lungs :** A pair of organs, called lungs, occupy the thoracic cavity. Each lung is thin-walled and surrounded by a double coat of membranes, called pleural membranes. There is a lubricant fluid between these two membranes.

