

Preliminary Examination : 2019

Date : 31/01/2019

Std.: 10

Marks : 100

Day : Thursday

Subject : Science & Technology

Time : 3.00 Hrs

Answer

1. A $5000A^0$
2. C Richard P. Feynman
3. D Irregular reflecting surface
4. B Water, ruby
5. B Violet, Green, Blue
6. D All of these
7. C Multiplied
8. B Heat
9. A Speed of relative motion
10. C It production is cheap
11. A Dry ice
12. D Ceres
13. C PSLV
14. C 2062
15. D Antacids
21. C $2ZnS + 3O_2 \rightarrow 2ZnO + 3SO_2$
22. C Ag_2S
23. D Sulphur
24. A $CaSO_3$
25. C It is useful in preparation of Nitric acid by Haber process
26. D (a-ii), (b-i), (c-iii), (d-iv)
27. C Bitumin
28. D Tar
29. A Containing paraffin hydrocarbon
30. C Sp^3
31. B 90
32.
$$\begin{array}{c} CH_3-CH-CH_3 \\ | \\ OH \end{array}$$
33. D Bacteria, fungus
34. A Phagocytosis
35. D 38 ATP
41. C Clones
42. B Epididymis
43. C Euglena
44. A Producer, decomposers
45. A Non-degradable solid waste
46. A TT
47. A Cyclic
48. B 1,00,000
49. C (A) & (B) both
50. C 18999 Sq. Km.

- | | |
|---|--|
| 16. B Bronsted-Lowery | 36. B Salivary glands – liver - pancreas |
| 17. B NH_4^+ | 37. C Urine |
| 18. C 98% | 38. C Menings |
| 19. C $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$ | 39. D In Vacule |
| 20. A Aluminum | 40. C Tropism, Nastism |

PART – II

Section – A

Write the answer of the following questions in brief : (2 marks each)

10

1. Explain : bottom-up and top down.

Ans. → Prof. Feynman described such atomic scale fabrication as a ‘bottom-up’ approach, as opposed to conventional ‘top-down’ technology approach.

→ In bottom-up manufacturing of device, positionally – controlled atom-by-atom or molecule by – molecule nanostructures or nanoparticles are designed to achieve desired properties.

OR

Give account of electrical properties of carbon nanotube.

Ans → Metallic nanotubes can carry electric current of 10^9 Ampere per 1 cm^2 cross section of the tube, which is 1000 times more than conducting copper metal.

→ MWNT also show superconductivity up to the temperature of 12 K.

2. State Ohm’s law, write its equation and give its SI unit.

Ans → Is there relation between the current (I) passing through the conductor and the potential difference (V) resulting across two ends.

→ Ohm deuced the relation between electric current (I) and voltage (V) which is termed as Ohm’s Law. It is stated as under.

→ **Ohm’s Law** : “ In the definite physical situation the electric current flowing through the conductor is directly proportional to the potential difference applied across it.

That means, $I \propto V$

It is also written as, $V \propto I$

$$\therefore V = IR \quad (R = \text{constant})$$

$$\text{Resistance (R)} = \frac{\text{Voltage (V)}}{\text{Electric current (I)}}$$

→ The SI Unit of resistance is volt/ampere which is known as "ohm". Its symbol is Ω (omega)

3. Explain the importance of pH in digestion of food.

Ans → Stomach plays an important role in the digestion of food. As the food enters the stomach, HCl is secreted in the stomach.

→ The pH of this acid changes between 1 and 3. At this low value of pH the enzyme named pepsin becomes active. It becomes helpful in the digestion of protein in the food.

4. In F2 generation 25% plants are dwarf, what does it mean ?

Ans → When F1 generation plants were self-fertilized, it was found that some plants were dwarf (25%) some were tall (75%) in F2 generation.

→ This indicates that both tallness and dwarfness characters were inherited in F1 generation from the parents, but only the character for tallness was expressed.

OR

Explain the hormones of master gland

Ans → Intermediate pituitary lobe secretes melanocyte stimulating hormone (MSH).

→ Posterior pituitary lobe secretes two hormones vasopressin and oxytocin. Vasopressin or Anti-diuretic hormone (ADH) stimulates re-absorption of water, and controls the loss of water through urine.

5. Explain the sources of fresh water and describe the importance.

Ans → Fresh water is the key factor in the lives of man and other living organisms.

→ There are mainly three sources of fresh water. Their details are as follows :

Rainfall, Rivers, Ground water.

→ Usually man depends upon fresh water for fulfilling his daily requirements.

→ Life on earth is fully dependent on fresh water.

Section – B

Answer in short : (2 marks each)

10

6. What is lens ? Explain its main type.

Ans → A piece of glass or other transparent materials with curved sides for constricting or dispersing light rays. Is called a lens.

→ **Concave lens** : A lens which diverges the parallel beam of light is called a concave lens.

→ **Convex lens** : A lens which converges the parallel beam of light is called a convex lens.

7. Explain about multistage rocket, mention its advantages and limitations.

Ans → **Multi-stage rocket** : A rocket which has two or more than two stages, each of which contains its own engine and fuel is known as a multi-stage rocket.

→ **Advantages** : Once the fuel of a specific stage of rocket gets exhausted, it can be dropped off to reduce the weight of the rocket.

→ This provides more acceleration to the remaining part of the rocket.

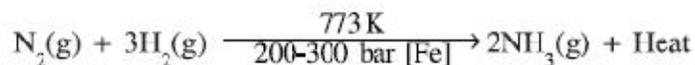
→ **Limitations** : The different stages may get separate from each other, ignition may not occur in the other stage after it gets over in previous stages and chances of collision are a few drawbacks of multistage rockets. Moreover, building a multistage rocket is a costly affair.

8. Write a note about Haber's method for the industrial production of Ammonia gas.

Ans → The method of artificially produced ammonia was developed by German chemist Haber.

→ In this method, dihydrogen (H_2) and di-nitrogen (N_2) gas are mixed in the proportion of 3 : 1 by volume.

→ This mixture is then passed over iron catalyst over iron catalyst at 200-300 bar pressure and 773 K temperature.



- To increase the efficiency of the catalyst, substances such as aluminium oxide (Al_2O_3) and potassium oxide (K_2O) are added. These substances are called promoters.
- As per one of the principles, by cooling the reaction mixture at temperature lower than 273 K, ammonia can be separated from the unreacted N_2 and H_2 gases.
- Thus ammonia is obtained in the liquid form.
- The remaining unreacted quantity of N_2 and H_2 can be reused in the reaction.

9. Labelled diagram of heart.

Ans →

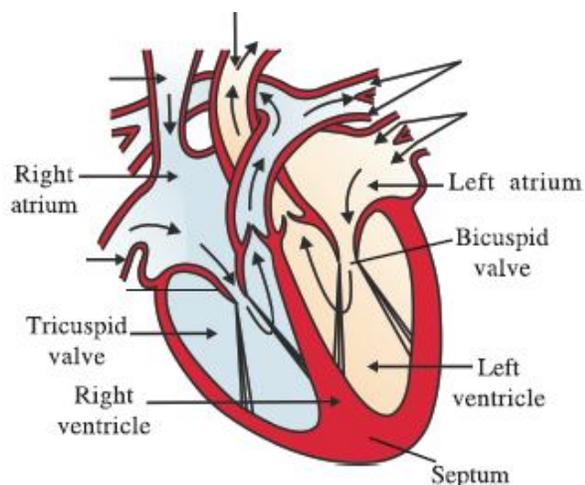


Fig. 13.2 Internal structure of heart

10. Describe the series of processes leading to depletion of ozone layer.

Ans → Ozone (O_3) is a type of gas.

- It is formed when molecules of oxygen absorb ultraviolet photons.
- When a single molecule of oxygen absorb ultraviolet photons. Known as photodissociation or photolysis. $\text{O}_2 \rightarrow \text{O} + \text{O}$
- The free oxygen atom O then combines with a molecule of oxygen and this is how a molecule of ozone O_3 is formed. $\text{O} + \text{O}_2 \rightarrow \text{O}_3$

→ A layer of ozone is located about 50 kms in the stratosphere.

→ The ozone layer absorbs ultraviolet rays between 310 to 200 nm wavelength coming from the sun.

OR

Explain component of ecosystem and describe about consumer.

Ans → The biotic system and the physical environment around it together form an interacting system which is called the ecosystem.

→ Plants, animals microorganisms and human beings and the physical surrounding they interact with are all the part of an ecosystem.

→ Each ecosystem consists of two main components – the biotic component and the abiotic one.

→ The biotic component includes all living organisms like the producers, the consumers and the decomposers, while all the non-living factors such as soil, water, light, temperature, wind, humidity, rain, inorganic nutrients and dead organic matter containing proteins, lipids, carbohydrates, etc. are included in the abiotic component.

→ **Consumers** : These type of organisms cannot produce food for themselves.

→ Therefore, these organisms consume other organism or their products as their food.

→ The consumer organisms are heterotrophic.

Herbivores, Carnivores, Omnivores, Decomposers.

Section – C

Answer the following question. (3 marks each)

15

11. Explain with the help of a simplified sketch the working of important organs of human eye.

Ans →

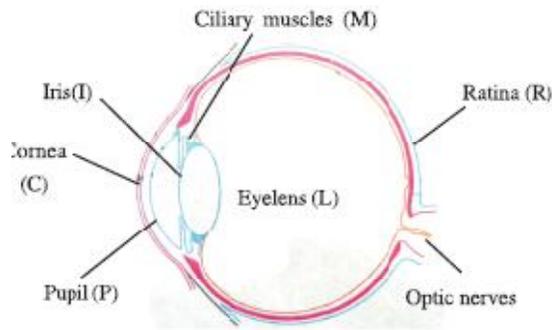


Fig. 3.6 : Construction of human eye

→ The human eye is the best natural optical instrument whose construction can be compared with the camera.

→ Working of eyes : The light rays coming from the object enter the eye through cornea.

→ Just behind the cornea, there lies a muscular diaphragm called iris which controls the amount of light that enters the eye.

→ There is a hole in the iris which is the aperture of the eye i.e. the pupil of eye.

→ The size of this aperture or pupil is controlled by iris.

→ After passing through the pupil, the light rays are incident on the eye-lens.

→ The eye lens is a convex lens made of transparent jelly like material.

→ Ciliary muscles hold the eye lens.

→ The screen on which the image is formed in the eye is called retina.

→ The retina is a delicate membrane having a large number of light sensitive cells.

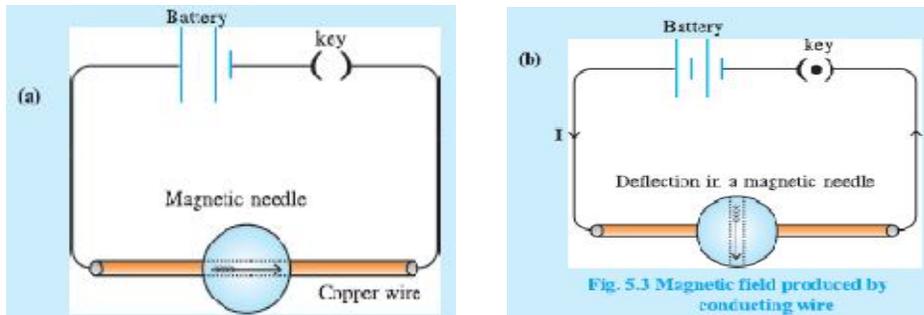
→ The retina is a delicate membrane having a large number of light sensitive cells.

→ When light rays falls on retina, its light sensitive cells generate electrical signals.

→ This interpretation allows us to see the objects.

12. Explain the oersted's experiment for the magnetic field resulting by a current Carrying straight conducting wire.

Ans →



→ As shown in figure (a) connect a conducting copper wire in series with a battery and a key.

→ Arrange a magnetic needle near the copper wire and arrange the wire in such a way that it remains parallel to the magnetic needle.

→ Pass electric current through the wire and observe the magnetic needle.

Observation : You will observe that the magnetic needle deflects under the influence of electric current (Figure b)

→ Moreover, on reversing the polarity of the battery in the circuit, the current will flow through the wire in a reverse direction and magnetic needle will also deflect in the opposite direction.

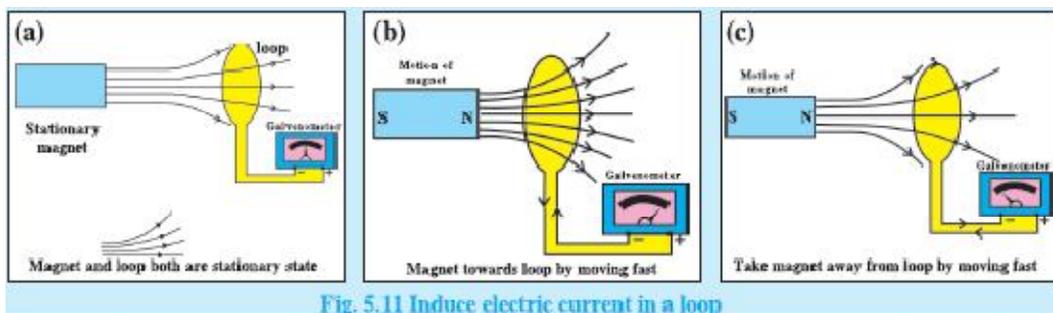
→ **Conclusion :** Here, we conclude that on passing the electric current through the wire, the wire behaves as a magnet and creates its own magnetic field under which the magnetic needle gets deflected.

→ Moreover, on reversing the direction of electric current, the direction of magnetic field is also reversed.

OR

Describe the experiment that explains the phenomenon of an electromagnetic induction & give its conclusion.

Ans →



- In 1831, a British scientist Michael Faraday gave the principle of electro magnetic induction.
- He, through his experiments, showed that a magnetic field can produce electric current.
- As shown in the figure a loop of conducting wire is connected to a galvanometer.
- Galvanometer indicates the status of current.

Situation 1 :

- As shown in figure (a), we keep the bar magnet in a stationary position.
- Here, the pointer of galvanometer remains stationary which indicates that there is no flow of current in the loop.

Situation 2 :

- When we quickly move the magnet towards the loop, the pointer of the galvanometer shows deflection (Figure (B))
- This indicates that current is induced in the coil due to the motion of the magnet.

Situation 3 :

- Again, when we move the magnet away in the opposite side from the loop, the pointer of the galvanometer gets deflected in the opposite direction (Figure(c)).
- This indicates that current is induced in the opposite direction.

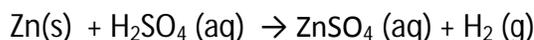
Conclusion :

- We can conclude from the above experiment that current is induced in the loop when there is a change in the magnetic field produced by bar magnet.
- Here, the current is said to be induced by the motion of the magnet.

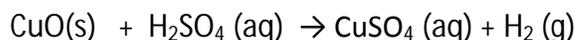
13. Explain chemical properties of dilute sulphuric acid.

Ans → Dilute sulphuric acid contains 10 % sulphuric acid (H_2SO_4) and 90 % (H_2O).

- Dilute sulphuric acid can be prepared by adding concentrated sulphuric acid slowly to water.
- It change colour of blue litmus paper to red.
- When this acid reacts with metals, it produces metal sulphate and dihydrogen gas.



→ When this acid reacts with metal oxides, hydroxides or carbonates, it produces metal sulphate and water or carbon dioxide and water both.



14. Explain giving chemical equation. The industrial method to prepare ethanol from sugar.

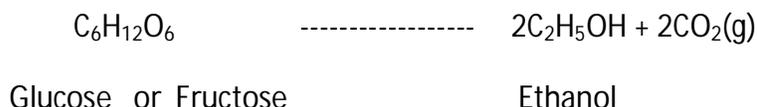
Ans → First glucose and fructose are formed by fermentation reaction of sugarcane juice, juice of fruits or grapes, molasses (The waste which is without sugar after removal of sugar from sugarcane is called molasses) etc.

→ In presence enzyme invertase.



→ Ethanol and carbon dioxide are formed by fermentation of this glucose or fructose in presence of enzyme zymase.

→ Both the enzymes – invertase and zymase are present in yeast.



→ Ethanol is obtained as a mixture of 95 % ethanol and 5% water which cannot be further concentrated. But pure ethanol is obtained by membrane technology.

OR

Write in detail classification of polymers.

Ans → **(I)** Polymer substances found in nature are called natural polymers.

→ For e. g. starch, protein, nucleic acid rubber etc. are essential natural polymers.

(II) → Semi-synthetic polymer substances semisynthetic polymers are obtained by chemical by vulcanization of natural rubber is used in the formation of tyres.

(III) → Synthetic polymer substances

→ Man –made synthetic polymers are made up of polymeric substances.

→ This is an important big class of polymers in which fibres, plastic and rubber are included.

→ Synthetic polymers are used in textile industry, electrical appliances, and in place of wood and metal.

15. Explain the excretory (Urinary) system of human beings.

Ans →

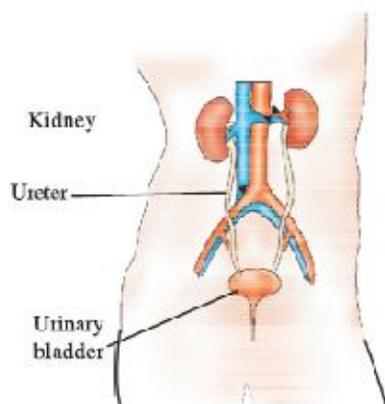


Fig. 13.4 Excretion in Human Beings

→ A pair of reddish brown bean shaped kidney which lies at the back of abdominal cavity, just below the waist level.

→ A pair of ureter, one from each kidney.

→ A urinary bladder and a muscular tube called urethra.

→ Kidney is divided in to two main part known as cortex and medulla.

→ These regions consist of excretory units called nephrons.

Section – D

Answer the following question in detail. (5 marks each)

15

16. Obtain Mirror formula for spherical lens.

Ans →

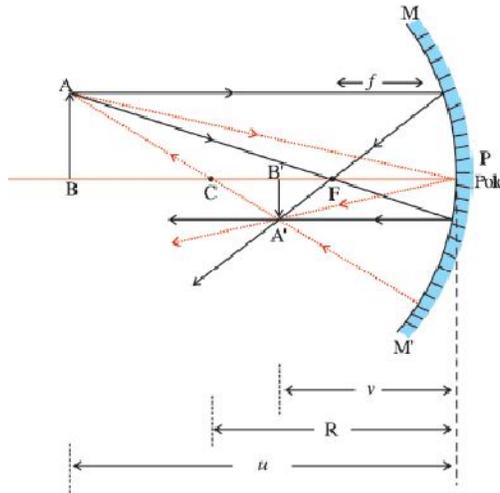


Fig. 2.12 Reflection by a concave mirror

→ The formula which gives relation between object distance (u), image distance (v), and focal length (f) of a spherical mirror is known as the mirror formula.

→ Mirror formula : The formula which gives relation between object distance (u) image distance (v) and focal length (f) of a spherical mirror is known as the mirror formula.

→ An object AB of height h is kept on the left i.e. in front of the mirror beyond the centre of curvature C.

→ The image, B'A' of height h' is formed at distance v in front of the mirror.

→ It is real, inverted and diminished.

→ According to the sign convention :

Object distance $PB = -u$

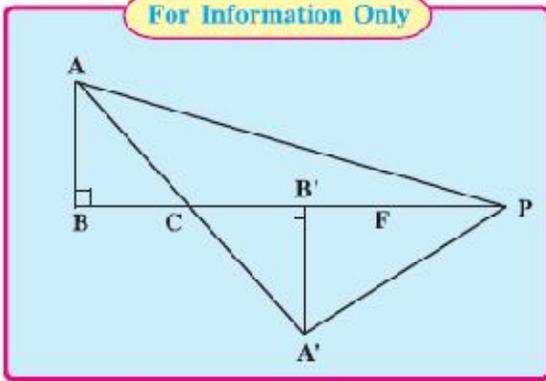
Image distance $PB' = -v$

Focal length $PF = -f$

Radius of curvature $PC = -R$

From the figure, it is clear that triangle ABP and A'B'P are similar triangles.

For Information Only



$$\therefore \frac{A'B}{AB} = \frac{PB'}{PB} = \frac{-v}{-u}$$

$$\therefore \frac{A'B'}{AB} = \frac{v}{u} \quad (2.10.1)$$

In the similar way ΔABC and $\Delta A'B'C$ are similar

$$\therefore \frac{A'B'}{AB} = \frac{CB'}{CB} \quad (2.10.2)$$

From Figure 2.12

$$CB' = PC - PB' = -R - (-v) = -R + v \text{ (Do not forget to use sign convention)}$$

$$\text{and } CB = PB - PC = -u - (-R) = -u + R$$

\therefore From equation (2.10.2)

$$\frac{A'B'}{AB} = \frac{-R + v}{-u + R} \quad (2.10.3)$$

Comparing equation (2.10.1) and (2.10.3) $\frac{v}{u} = \frac{-R + v}{-u + R}$

$$\therefore -uv + Rv = -Ru + vu$$

$$\therefore Rv + Ru = 2uv$$

$$\therefore R(v + u) = 2uv \quad (2.10.4)$$

Dividing equation (2.10.4) by uv on both the sides, $\frac{v+u}{uv} = \frac{2}{R}$

$$\therefore \frac{1}{v} + \frac{1}{u} = \frac{2}{R} \quad (2.10.5)$$

Now when the object is placed at an infinite distance, its image will be formed at the principal focus (F).

\therefore Object distance $u = \infty$ and image distance $v = f$

Putting these values in equation (2.10.5)

$$\begin{aligned} \frac{1}{f} + \frac{1}{\infty} &= \frac{2}{R} \\ \therefore \frac{1}{f} &= \frac{2}{R} \quad \left(\because \frac{1}{\infty} = 0 \right) \\ \therefore f &= \frac{R}{2} \end{aligned} \quad (2.10.6)$$

This shows that the principal focus (F) is a mid point between pole (P) and centre of curvature (C) along principal axis.

Substituting the value of R from equation (2.10.6) into (2.10.5)

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{f} \quad (2.10.7)$$

This equation is known as **mirror formula**.

This mirror formula is true for both types of spherical mirrors for all the positions of object.

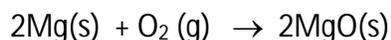
17. Explain chemical properties of metals with equations.

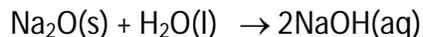
Ans → Metal loses electron and changes to positive ion. Hence they are called Electropositive elements. The number of electrons lost by metal is like is the valency of the metal.



→ **Reaction of metal with dioxygen** : Metal elements can easily give electrons to oxygen atom. Hence, metal elements combine with oxygen and form the oxides.

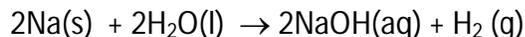
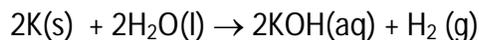
Metal + Dioxygen gas → Metal oxides.





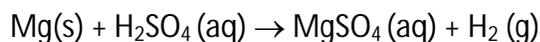
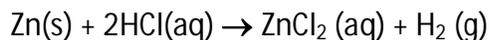
→ **Reaction of metal with water** : Metals on reaction with water form metal hydroxides or oxides and produce dihydrogen gas. But all the metals do not react with water.

Metal + Water → Metal hydroxide or Metal oxide + Dihydrogen gas.



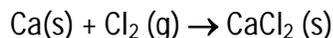
→ **Reaction of Metals with Acid** : All the metals do not react with dilute acids but when the metal reacts with dilute acid, salt corresponding to metal and dihydrogen gas are produced.

Metal + Dil. Acid → Salt corresponding to metal + Dihydrogen gas



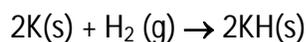
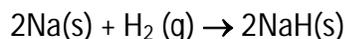
→ **Reaction of Metals with Dichlorine** : Metal reacts with dichlorine and forms metal chlorides.

Metal + Dichlorine → Metal chloride



→ **Reaction of Metal with Dihydrogen** : Generally metals do not give reaction with dihydrogen because metals have a tendency to lose the electron and so react with those element which can accept electron..

Active(s) + H₂(g) → Metal hydride



OR

Give brief information about Metallurgy.

Ans → The process of extracting pure metals from their ores and then refining them for commercial use is called metallurgy.

→ **Powdering of ore** : Ores are available in the form of rocks by digging the earth's crust.

Ores also contain minerals of other metals, clay silica, etc. as impurities.

→ The bigger pieces of ores are powdered by grinding in big mills of special type.

→ **Concentration or enrichment of ore** : In this step, most of the impurities of ores are removed by ore concentration method.

Following methods are used for ore concentration :

→ Concentration or centrifugation on the basis of difference in densities.

→ Froth Flotation method

→ Magnetic separation method.

→ The ores are concentrated on the basis of type of impurities and their percentage proportions.

→ **Roasting calcinations and smelting :**

→ These three methods are used for converting ore in to metal oxide.

→ Roasting is done to convert carbonate ores in to metal oxide.

→ Calcination is done to convert carbonate ores in to metal oxide.

→ Converting ore in to molten state by heating it at high temperature for purifying is known as smelting.

Following methods are used in reduction :

→ **Chemical reduction :**

→ Reduction by carbon

→ Reduction by aluminium

→ **Electrochemical reduction :**

→ Metals which cannot be reduced by carbon or aluminium are reduced by the process of electrochemical reduction.

→ **Refining (purification) of metals :**

→ The metals obtained after various metallurgical operations still contain some impurities.

→ The methods to obtain about 100% pure metal by removing impurities present in very small amount in metals is called refining.

These impurities are removed by various refining processes such as :

→ Electrolysis refining. → Liquation → Zone refining

18. Describe male reproductive system with diagram in details.

Ans →

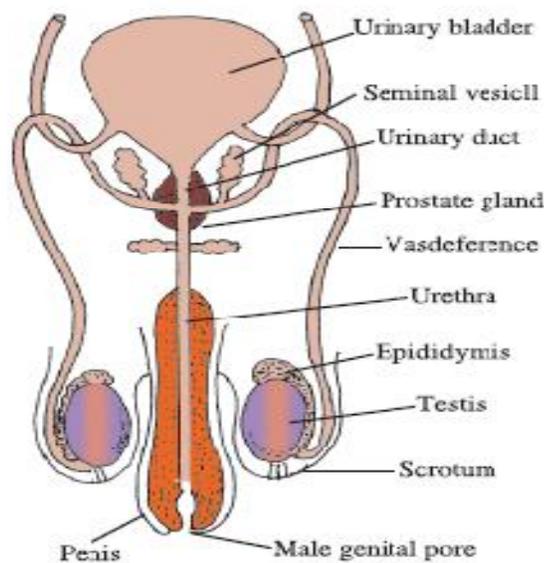


Fig. 15.12 Male reproductive system

Male Reproductive System. It consists of portions that produce the germ-cells and other portions that deliver the germ-cells to the site of fertilisation.

→ The testes occur in muscular pouch scrotum present outside the abdominal cavity.

→ The temperature of testes remain 2-3 degree C below the body temperature, which is essential for the formation of sperms.

→ The human male reproductive system consists of the following organs :

→ **Testes** (singular testis) are the oval-shaped primary reproductive organs in man. A pair of testis lies in a small sac-like muscular structure outside the abdominal cavity called scrotum. The function of testis is to produce sperm and male sex hormone called testosterone. The scrotum provides the optimal temperature for formation of sperms.

→ **Epididymis** is a coiled tube-like structure firmly attached to the testis and serves as the

Epididymis is a coiled tube-like structure firmly attached to the testis and serves as the storehouse of sperms. Inside the epididymus, sperms become mature and develop motility.

→ **Vas Deferens.** The sperms are carried by a long tube called vas deferens or sperm duct into organs called seminal vesicles, where the sperms get nourished and stored.

→ **Urethra** is a common duct for the passage of both urine and spermatic fluid. Urethra carries the sperms to an organ called penis which opens to the outside through a male genital pore.

→ **Penis** forms the external male genital organ. It is a copulatory organ with thick muscular walls.

→ **Accessory Glands.** Seminal vesicles are a pair of thin-walled muscular elongated sac which secrete fluid for nourishment of sperms.

→ **Prostate glands** also produce fluid which is released in the urethra along with secretion of seminal vesicle. The secretion of accessory glands together with sperms is called semen.

→ **Sperms** are tiny bodies that consist of mainly genetic material and a long tail which help them to move towards the female germ cell.

OR

Describe female reproduction system with diagram in detail.

Ans →

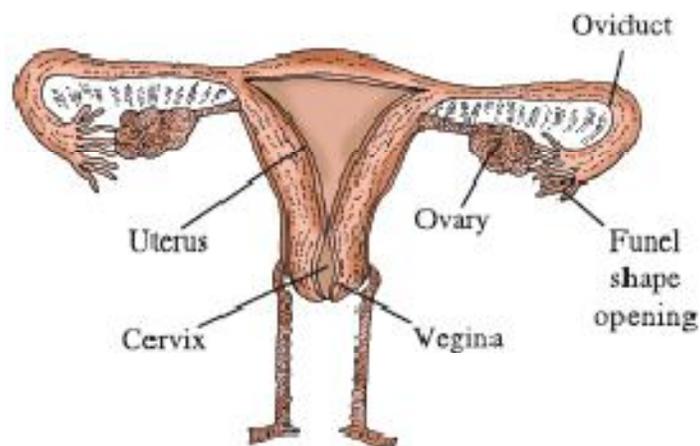


Fig. 15.13 Female reproductive system

Female Reproductive System. The female germ-cells or eggs are made in the ovaries and are

Responsible for the production of some hormones. The female reproductive system is more complicated than male because it takes care of fertilization and the development of embryo till the birth.

→The human female reproductive system consists of the following organs: Ovaries, oviduct, fallopian tube, uterus and vagina are the main parts of a female reproductive system.

→ **Ovaries** are a pair of small and oval-shaped organs, located in the abdominal cavity near the kidney. Ovaries are the female primary reproductive organs which perform dual functions of production of female gamete or ovum and the secretion of female sex hormones, estrogen and progesterone.

→ **Fallopian tube or Oviduct** are a pair of long convoluted tubes that carry ova or eggs from the ovary to the uterus. The fallopian tube has a funnel-shaped opening near the ovary. These tubes from both the sides open into an elastic bag-like structure, the uterus.

→ **Uterus** or womb is a hollow, pear-shaped organ within which the embryo develops. Its upper portion is broader, while its lower portion is narrower, called cervix.

→ **Vagina**. The uterus opens into the vagina through the cervix. Vagina is a tubular structure called "birth canal". It receives sperms from the male and also serves as the passage through which the fully developed foetus is born.