

SET - A

GSEB
Batch :
10th Std.
Eng. Medium

MAHESH TUTORIALS
Subject : Science And Technology
Chapter : 1, 2, 3, 4, 7, 8, 9, 12, 13, 14
Model Answer Paper

Test -
Date:
Marks : 100
Time: 3 Hrs.

PART - A

Select a proper option (a), (b), (c) or (d) from those given below each questions : 50

1. (d) K. Eric Drexler
2. (a) 2 nm
3. (a) Soccer ball
4. (a) Carbon
5. (c) 63×10^9
6. (a) Virtual image
7. (c) plane
8. (b) Convex
9. (a) 4 D
10. (d) Violet
11. (a) Magenta
12. (c) complementary
13. (b) thin
14. (a) Blue
15. (c) Bifocal
16. (a) Reflection
17. (a) Sour
18. (a) Robert Boyle
19. (b) Basic
20. (d) Sulphuric acid
21. (a) 4.5 to 5.5
22. (b) Sulphides and oxides
23. (c) Turpentine and water
24. (a) 3,2,2
25. (c) Molten
26. (a) Copper sulphate
27. (c) Anhydrous calcium chloride
28. (c) $\text{Na} > \text{Al} > \text{Ag} > \text{Au}$
29. (d) Dilute hydrochloric acid
30. (b) Carbonic acid
31. (b) Carbon Monoxide and dihydrogen
32. (d) Nitrogen
33. (c) Cu
34. (b) NO
35. (c) Water
36. (b) Solar
37. (d) 6.5 m
38. (a) Electric ray
39. (a) Mitochondria
40. (c) Thoracic
41. (c) Seive tubes
42. (c) Transpiration
43. (b) Translocation
44. (b) Cardiac muscles
45. (b) veins
46. (b) veins
47. (d) Contractile Vacuole



48. (d) Chemotropism
49. (c) Photonastic
50. (c) Adrenaline

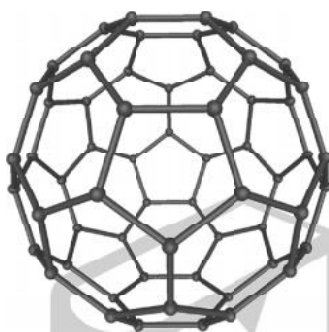
PART - B
SECTION - A

Answer the following questions : [2 marks]

1. The word 'Nano' is a Greek word meaning 'dwarf'. 10
 ⇒ The prefix 'nano' is a mathematical term. ½
 ⇒ In mathematical terminology nanometer means one billionth of a meter. It's mathematically written as 1/1,000,000,000 of a meter. ½
 ⇒ This means, 1 nanometer (nm) = $\frac{1 \text{ meter}}{1,000,000,000} = 10^{-9} \text{ meter (m)}$ ½
 ⇒ Technology is a process of using scientific principles and techniques to design new materials, devices and systems for prosperity, comforts, betterment and enhancement of human life. ½

OR

1.



- ⇒ Bucky ball/ Fullerenes is a special form of carbon molecule. Bucky ball is also known as Buckminsterfullerene. ½
 ⇒ Bucky ball comprises of 60 carbon atoms in the architectural configuration of a soccer ball (sphere). ½
 ⇒ Here, each carbon atom is bonded to three adjacent carbon atoms forming a sphere, which is around 1.0 nm in diameter. ½
 ⇒ The bonds between 60 carbon atoms form a pattern of joined hexagons and pentagons that is similar to the panels on a soccer ball. ½

2. Convex mirror is used to see the traffic behind the vehicle. ½
 ⇒ In the case of a convex mirror, wherever the object is kept, the image is always obtained behind the mirror which is virtual, erect and diminished. ½
 ⇒ The size of the image is diminished; as a result the view range is enhanced. This enables to view the entire traffic behind the vehicle. ½

3. Molecular mass of H₂SO₄ ½
 = 2 (Atomic mass of H) + 1 (Atomic mass of S) + 4 (Atomic mass of O)
 = 2 × 1 + 1 × 32 + 4 × 16
 = 2 + 32 + 64
 = 98 gm/mole. ½

∴ To prepare 1000ml, 1M H₂SO₄ solution 98gm H₂SO₄ will be required.
 To prepare 500ml 0.2M H₂SO₄ solution

$$= \frac{500 \times 0.2 \times 98}{1000}$$

½

$$= 9.8 \text{ gm H}_2\text{SO}_4 \text{ is required.}$$

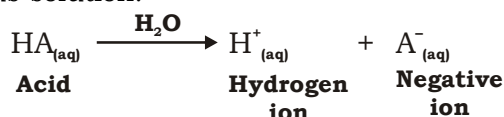
½

OR

3.

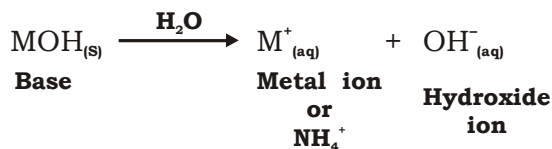
(i) Arrhenius acid:

- ⇒ Acid is a substance containing hydrogen which produces hydrogen ion (H⁺) in its aqueous solution. ½



(ii) **Arrhenius base:**

⇒ Base is a substance containing hydroxide which produces hydroxide ion (OH⁻) in its aqueous solution.



4. **Given :** Object height $h = 4 \text{ cm}$
 Object distance $u = -12 \text{ cm}$
 Focal length $f = -24 \text{ cm}$

Formula : Mirror formula $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

Solution : $\therefore \frac{1}{-12} + \frac{1}{v} = \frac{1}{-24}$
 $\therefore \frac{1}{v} = \frac{1}{12} - \frac{1}{24}$
 $\therefore \frac{1}{v} = \frac{2-1}{24}$
 $\therefore \frac{1}{v} = \frac{1}{24}$
 $\therefore v = 24 \text{ cm}$

Here v is positive hence image is formed behind the mirror at a distance 24 cm from mirror and image is virtual

Magnification $m = \frac{h'}{h}$
 $= \frac{-v}{u} = \frac{-24}{-12} = 2$

Image height $h' = 2h = 2 \times 4 = 8 \text{ cm}$

5. Pure gold [gold of 24 carats) is very soft and so the ornaments or jewellery cannot be made from it
 ⇒ So, it is alloyed with other metals like copper and silver to make it harder and modify its colour.
 ⇒ 22 carat gold means it contains 22 parts of gold and 2 parts of copper or silver in-24 parts by weight of an alloy.

SECTION - B

Answer the following questions : [2 marks]

6. Sulphur dioxide gas is present in the fumes exhausted by industries and in use of sulphur containing fuels by the automobiles.
 ⇒ It is considered as a chief pollutant in spreading air pollution. Sulphur dioxide is responsible for the acid rain.
 ⇒ This sulphur dioxide is oxidized into sulphur trioxide which forms sulphuric acid by dissolving in rain water.
 ⇒ Buildings, bridges and trees are destroyed because of acid rain.
7. Animals obtain their food either from plants or animals.
 ⇒ All the animals can be divided into three group on the basis of their food eating habits.
 ⇒ They are -

- (a) Herbivorous - Animals which eat only plants. E.g. Goat, Cow. 1/2
 (b) Carnivorous - Animals which eat only animals. E.g. Lion, Tiger. 1/2
 (c) Omnivorous - Animals which eat both plants and animals. E.g. Man, Rat. 1/2

8.

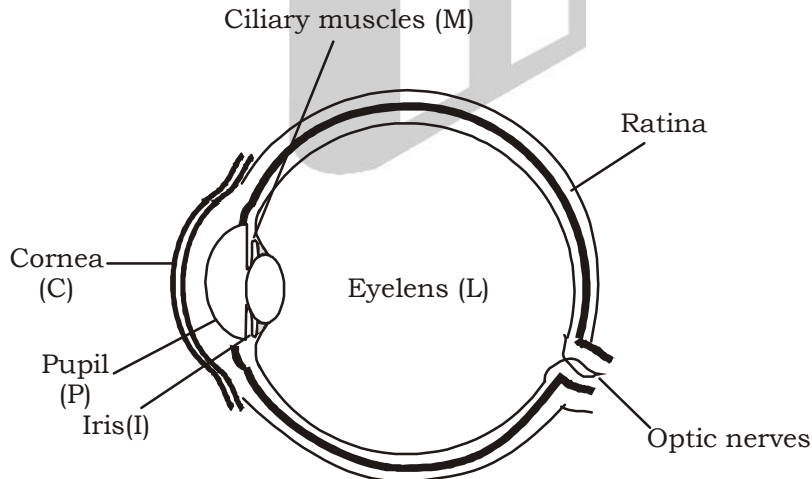
No.	Arteries	Veins
1	They carry blood from heart to organs.	They carry blood from organs to heart.
2	Arteries are under pressure.	Veins are not under pressure.
3	Walls of arteries are thick and elastic.	Walls of veins are thin.
4	Arteries carry pure blood except pulmonary arteries.	Veins carry impure blood except pulmonary vein.

9. **Geotropism** - The movement of a plant towards gravity. 1/2
 Stems show negative geotropism, while roots show positive geotropism. 1/2
 → **Hydrotropism** - The movement of a plant part in response to water. 1/2
 → **Thigmotropism** - The movement in response to touch. 1/2

OR

9. Spinal cord is a cylindrical structure which is a posterior extension of medulla oblongata. 1/2
 → It is protected within the vertebral column. It is also protected by meninges. 1/2
 → There are 31 pairs of spinal nerves arising from the spinal cord. 1/2
 → They connect various organs of the body to the brain and help in the conduction of impulses from brain to organs and from organs to brain. 1/2

10. The human eye is the best natural optical instrument whose construction can be compared with the camera. 1/2
 → A simple sketch of human eye along with labeling of its main parts is as shown in the figure. 1/2



- The light rays coming from the object first enter the eye through cornea. A muscular diaphragm behind the cornea is known as an "iris" which can control the amount of light that enters the eye. 1/2
 → An aperture of an eye behind the cornea at the center of iris is known as pupil whose size can be controlled by iris. Pupil controls the amount of light that enters the eye by changing its size. 1/2
 → After passing through the pupil the light rays are incident on a jelly like elastic material known as an eyelens. 1/2
 → The muscular structures which hold the eyelens in its position are known as ciliary muscles. They change the focal length of an eyelens by changing its thickness. 1/2
 → Position at which image is formed due to refraction of light by eyelens is called "retina". When light rays fall on retina, the light sensitive cells generate electrical signals. The signals are sent to the brain through the optic nerves where image of an object is interpreted. 1/2

SECTION - C

Answer the following questions : [3 marks]

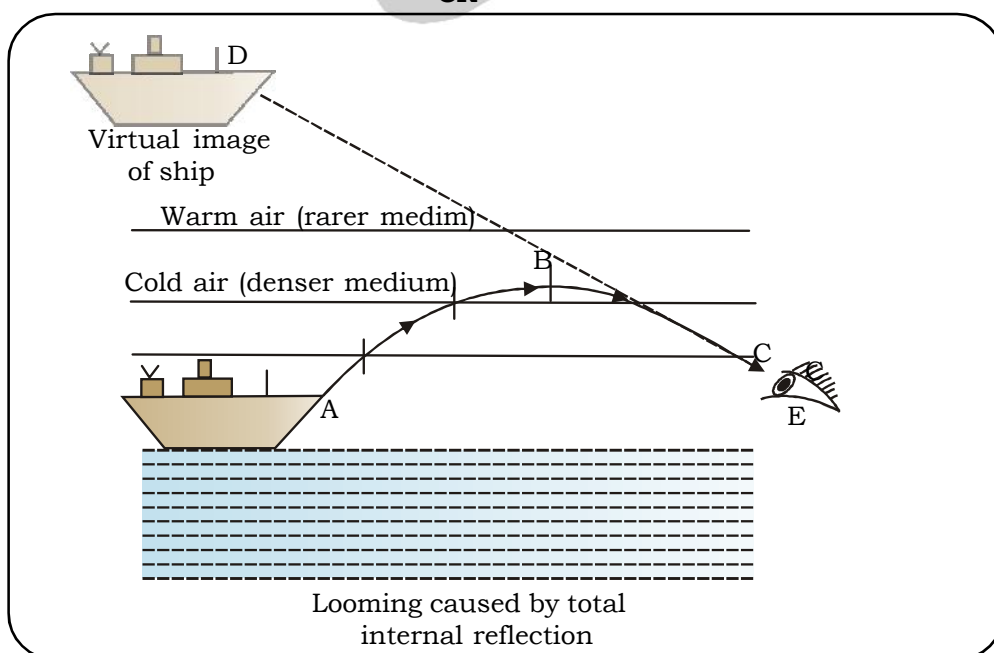
11. We know that stomach plays an important role in digestion of food. As food enters the stomach, hydrochloric acid is secreted in the stomach. 15
½
- ⇒ The pH of this acid changes between 1 and 3. At this low value of pH the enzyme named pepsin becomes active. ½
 - ⇒ Pepsin is helpful in digestion of protein in the food. ½
 - ⇒ Proportion of protein is much more in food like fish, eggs, meat, etc. Hydrochloric acid is secreted more for the digestion of such food. ½
 - ⇒ Because of this, there is pain or, irritation in the stomach. In common language, we call it acidity. ½
 - ⇒ Basic substances are taken for the remedy of acidity. They are known as antacids. ½
 - ⇒ Mostly sodium hydrogen carbonate (NaHCO_3) and magnesium hydroxide [$\text{Mg}(\text{OH})_2$] are used as antacids. ½
 - ⇒ Calcium carbonate and aluminium hydroxide are also known antacid substances. Such liquid mixtures and tablets are available in market. ½

12.

	Near-sightedness	Far-sightedness	
1.	The eye lens does not vary its thickness as per the requirement but remains thick.	1. The eye lens does not vary its thickness as per the requirement but remains thin.	½
2.	The light rays from objects at far distances are focused before the retina. As a result the distant objects cannot be seen clearly.	2. The light rays from objects nearby the eyes are focused behind the retina. As a result the nearby objects are not seen clearly.	1
3.	The light rays from objects nearby the eyes are focused on retina. As a result the nearby objects are seen clearly.	3. The light rays from distant objects are focused on the retina and a clear image is formed. Hence distant objects are seen clearly.	1
4.	This defect can be removed by using concave lens of appropriate focal length.	4. This defect can be removed by using convex lens of appropriate focal length.	½

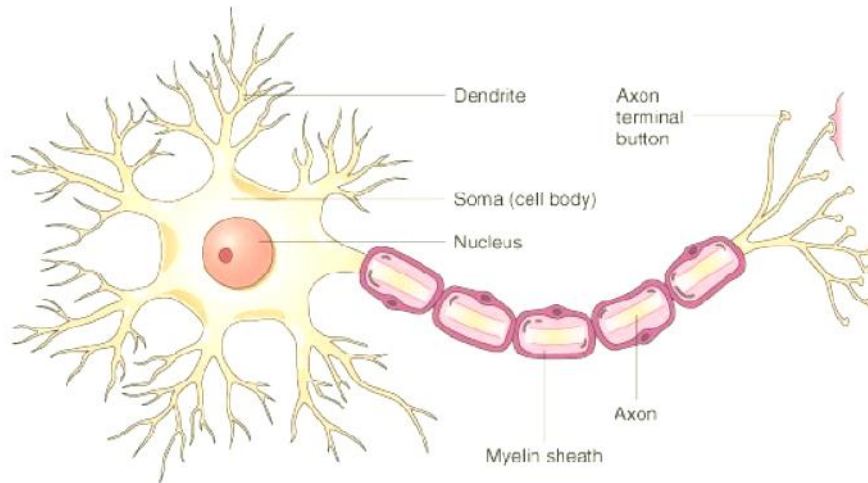
OR

12.



- ⇒ Looming is such a phenomenon which can be said as mirage of cold region. 1
- ⇒ Looming is observed in a very cold region in which distant object appears to be hanging mid way in the air. ½

⇒	It is produced by the total internal reflection of light (but in downward direction) caused by atmospheric refraction.	½
⇒	Looming produces virtual and erect image of an object above horizon where the warmer (rarer medium) air remains above the colder air (denser medium) in the atmosphere.	1
13.	Many years ago sulphur was used as medicine in Ayurvedic treatments.	½
⇒	Sulphur is available in nature in both free and combined forms.	
⇒	Sulphur is obtained in combined form with certain metal ions viz Copper Pyrites (CuFeS_2), Zinc Blende (ZnS), Galena (PbS) etc.	½ ½
⇒	Sulphur is in noticeable proportion in petroleum and natural gas.	
⇒	The place of sulphur is in group-16 below oxygen in periodic table.	½
⇒	The atomic number of sulphur is 16. Hence, its electronic configuration is 2,8,6.	½
⇒	Sulphur also possesses property of catenation.	½
14.	There are three types of blood vessels, (1) Arteries, (2) Veins and (3) Capillaries.	
(i)	Arteries :	
⇒	The blood vessels which carry blood from the heart to different organs are called arteries.	½
⇒	Their walls are thick and elastic.	
⇒	They enter into the organs and branch into small vessels called arterioles.	½
(ii)	Veins :	
⇒	The blood vessels which carry blood from the different organs to the heart are called veins.	½
⇒	Their walls are thin and non-elastic.	
⇒	They contain valves. Different veins join to form the vena cava.	½
(iii)	Blood Capillaries :	
⇒	Around the tissue, the arterioles break up into fine vessels, called capillaries.	½
⇒	The capillaries are thin-walled and narrow.	
⇒	Capillaries unite to form very small blood vessels called venules. Venules unite to form veins.	½
OR		
14.	Blood is a living red coloured, liquid connective tissue. Blood is circulated constantly through the blood vessels in the body.	1
⇒	The two main components of blood are :	
	(1) Blood plasma	1
	(2) Blood corpuscles.	1
15.	The nerve cell is the structural and functional unit of nervous system.	
⇒	The nerve cell has 3 components -	½
	(a) Cell body	
	(b) Dendrites	½
	(c) Axons	
⇒	The cell body has cytoplasm and nucleus.	
⇒	Nerve fibres i.e short & long fibres stretch out from cell body.	
⇒	Dendrites - are the short fibres on the cell body.	½
⇒	Axon - are the long fibres on the cell body.	
⇒	Insulating myelin sheath made up of fat & protein protects axons.	
⇒	Messages acquired at the dendrite sets off a chemical reaction creating an electric impulse called nerve impulse.	½
⇒	Dendrite pick up message from the receptors pass it to cell body then to axon.	
⇒	Axon pass the message to another nerve cell through synapse.	
⇒	Synapse - is a very small gap present between the two nerve cells.	½



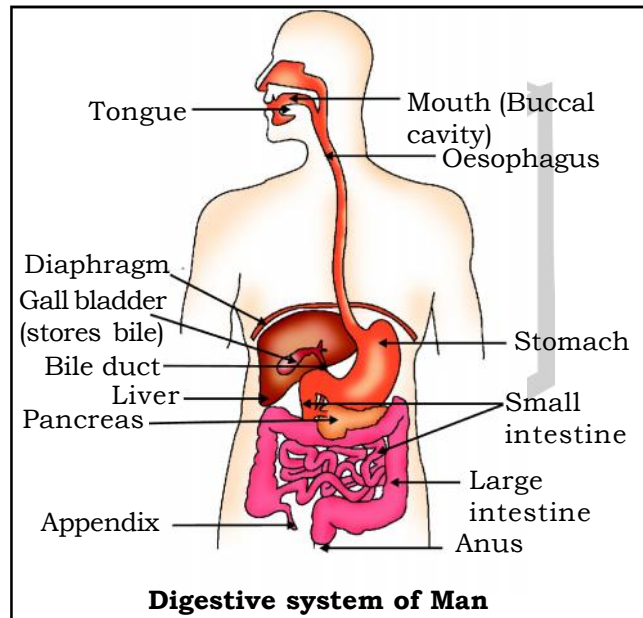
1/2

Nerve Cell
SECTION - D

Answer the following questions : [5 marks]

15

16.



Digestive system of Man

1

The digestive system of human consist of the alimentary canal and its associated glands.

- ⇒ The digestive organs are mouth, oesophagus, stomach, small intestine, large intestine and associated glands like Salivary glands, Liver, and Pancreas.
- ⇒ The digestion of food start in the mouth.
- ⇒ The mouth cavity contains teeth, tongue and salivary gland.
- ⇒ The Salivary gland secretes amylase which digest the starch of food into maltose.
- ⇒ The partly digestive food in the mouth goes down to Oesophagus then to Stomach.
- ⇒ Food is churned of in stomach for 3 hours.
- ⇒ Food is broken into small pieces and semi - solid paste.
- ⇒ The walls of stomach secretes gastric juice.
- ⇒ The gastric juice contains dilute hydrochloric acid, enzyme pepsinogen and mucus.
- ⇒ The mucus protects the wall of stomach from HCl.
- ⇒ HCl makes the stomach acidic and kills the bacteria of food.
- ⇒ In acidic medium the pepsin enzyme digests the protein of food.
- ⇒ Protein digestion begin in the stomach.
- ⇒ Partly, digested food then goes from stomach into small intestine.
- ⇒ Spincter muscle regulates the exit of food from stomach.
- ⇒ In small intestine the complete digestion of Carbohydrates, Proteins and Fats occurs.
- ⇒ The small intestine gets the secretion from liver and pancreas.

1/2

1/2

1/2

- ⇒ Liver secretes bile which is stored temporarily in the gall bladder.
- ⇒ The bile is alkaline and makes the food from stomach alkaline.
- ⇒ So Pancreatic juice can act on it.
- ⇒ Bile salt breaks the fat in food into small globules making it easy for enzyme to act and digest.
- ⇒ Pancreatic juice from Pancrease contains amylase, trypsin, and lipase.
- ⇒ Amylase digest starch, trypsin digest protein and lipase digest fats.
- ⇒ Finally food is digested completely and then the absorption of digested food occurs.
- ⇒ Inner wall of small intestine has many small, finger like projection called villi which increase the surface area of absorbtion and rapid absorbtion occurs.
- ⇒ The absorbed food through walls of small intestine goes to blood.
- ⇒ From blood the food is assimilated.
- ⇒ The undigested food from small intestine goes to large intestine where absorption of water occurs.
- ⇒ Now the left food is removed from the body through anus.

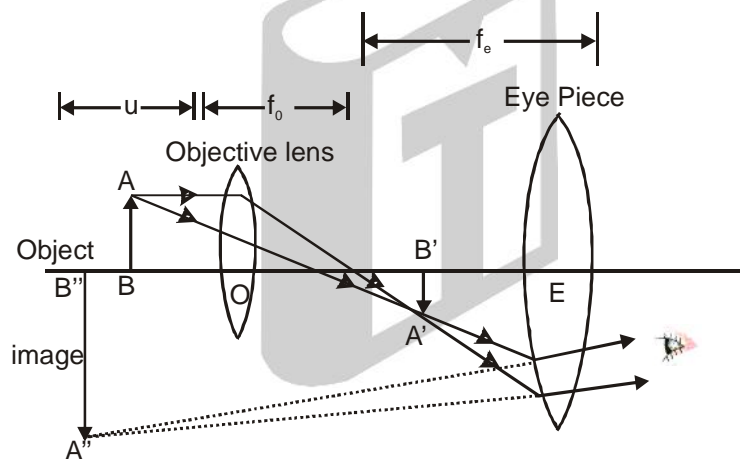
1/2
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17. The compound microscope can form the magnified image of the object with better clarity as it uses two lenses.

1/2

- ⇒ The ray diagram for the compound microscope is shown in figure.
- ⇒ The lens toward the object is called objective lens and the lens near the eye is called eye piece. The focal length of objective lens is small compared to the eye piece.

1/2



2

⇒ **Working :**

- The object AB to be observed is placed at a distance slightly more than focal length (f_o) of objective lens so that its real, inverted and magnified image A'B' is obtained beyond the centre of curvature (C) of objective lens.
- The image A'B' becomes an object for the eye piece. The position of image A'B' is adjusted such that it will be within the focal length (f_e) of eye piece. The eye piece forms virtual, erect and magnified image A''B'' of the object.
- ⇒ Thus, the final image formed by compound microscope is virtual, inverted and magnified behind the object

1/2
1
1/2

OR

17. Figure shows a convex lens MM' and an object AB of height h placed in front of the lens. Image A'B' formed by lens is real, inverted and diminished in size.

1/2

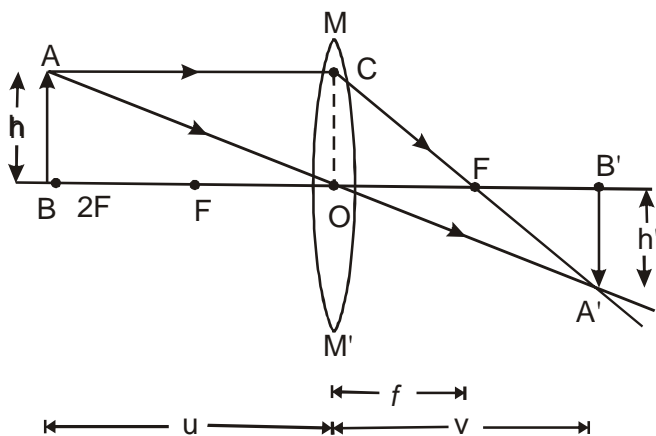
- ⇒ According to the Cartesian sign convention.
- ⇒ Object distance = OB = - u
- Image distance = OB' = + v
- Focal length = OF = + f

1/2

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

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

1/2



lens formula

Now, the right angled $\triangle OCF$ and $\triangle B'A'F$ are similar triangles.

$$\therefore \frac{OD}{A'B'} = \frac{OF}{FB'}$$

$$\therefore \frac{AB}{A'B'} = \frac{OF}{FB'} \quad (\because AB = OC) \quad (OC = AB \text{ as they are opposite sides of rectangle } \square ABOC)$$

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

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

\Rightarrow On comparing equation (1) and (2), we have.

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

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

$$\therefore -uv + uf = vf$$

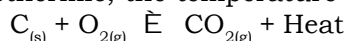
Dividing each term by uvf

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

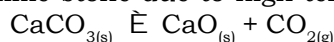
$$\therefore \frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

This equation is known as lens formula.

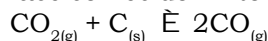
18. Coke combines with oxygen and forms carbon dioxide. This reaction being exothermic, the temperature of the furnace becomes 1773 K to 1973 K.



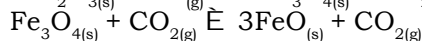
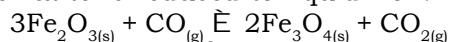
\Rightarrow Calcium oxide and carbon dioxide are formed in the blast furnace by decomposition of lime stone due to high temperature in blast furnace.

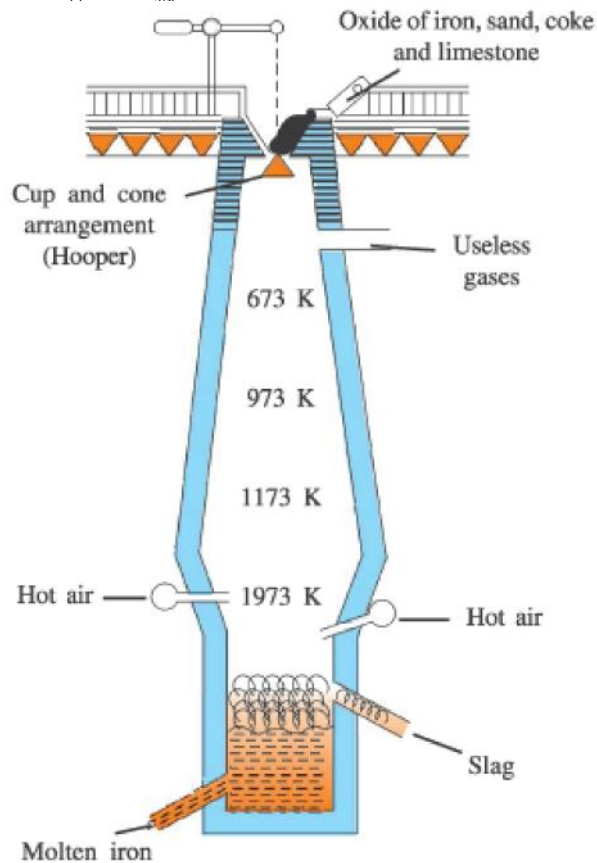
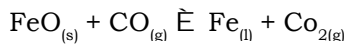


\Rightarrow Hot carbon dioxide when goes up in the furnace combines again with coke and forms carbon monoxide. As this reaction is endothermic, the temperature of the furnace comes down to 1173 K.



\Rightarrow When temperature of the furnace is 673 K to 973 K, the iron oxide present in haematite is reduced to liquid iron.



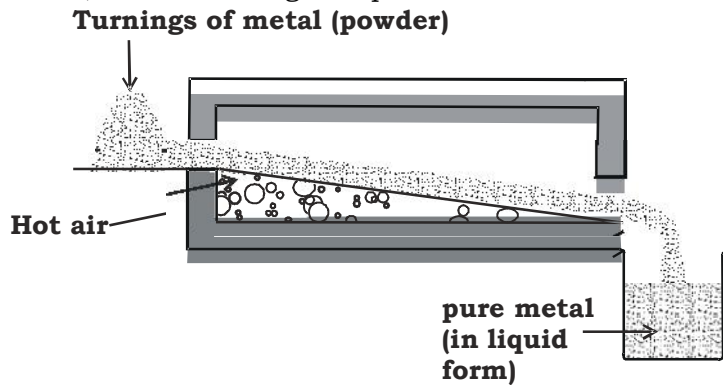


Blast furnace

- ⇒ The molten iron and slag are removed out by different paths from the bottom of the furnace.
 - ⇒ The molten iron cools down to solid form and iron blocks are prepared, while liquid slag is changing into a solid form by cooling and useful in construction of roads.
 - ⇒ The extraction of iron from haematite is a continuous process.
 - ⇒ Once it starts operating the blast furnace can continue for ten years.
- The extraction of iron is carried out in India, at Bhilai, Durgapur, Rourkela, Jamshedpur etc.

OR

- 18.** This method is used for refining of metal having low melting point i.e. metals like tin, lead etc. which melt easily.
- ⇒ In this method, furnace having a slope is used.



Purification of metal by liquifaction method

- ⇒ The temperature of this furnace is kept slightly higher than the melting point of the metal.

- ⇒ When impure metal is passed on the slope, the metal in it is melted and collected in the vessel kept below it. ½
- ⇒ The melting points of impurities are higher and so do not melt at this temperature and found in solid form on the slope. ½
- Zone Refining:**
- Trace impurities present in metal are removed by this method. ½
- ⇒ It is based on the principle of fractional crystallization. ½
- ⇒ These impurities remain soluble in the form of molten metal. ½
- ⇒ As the molten metal get cooled, the solubility of impurities decreases and separates from the metal in the form of crystal. Semi-metals like Silicon, boron, germanium are used as semi-conductor. ½

★★★★ Best of Luck ★★★★★

