GSEB Batch : 10th Std. Eng. Medium	**MAHESH TUTORIALS** **SUBJECT : Science & Technology(011)** **First Preliminary Exam** **Model Answer Paper**	Date: Marks : 100 Time: 3 Hrs.

PART - A

1. (d) AFM
2. (a) Global Positioning System
3. (c) 1
4. (b) 2F
5. (d) distant object cannot be seen clearly.
6. (d) Red
7. (b) Yellow
8. (c) 2 A
9. (c) 1.6×10^{-19} C
10. (a) R =1.11MΩ
11. (d) $W = I^2Rt$
12. (c) Circular around the wire.
13. (c) 100
14. (c) Green
15. (a) Dry - ice
16. (c) Jupiter
17. (d) Indian Space Research Organization
18. (d) PSLV
19. (c) Dihydrogen
20. (a) 7 to 7.8
21. (b) Basic in nature
22. (d) Weak base (Moderate base)
23. (b) 5
24. (b) Cathode
25. (a) Inhibitors
26. (b) Carbon Monoxide and dihydrogen
27. (b) H_2SO_4
28. (c) Both d & b
29. (b) 4
30. (d) σ
31. (d) Non luminous bright
32. (d) 94% to 98%
33. (c) Paints; solvent
34. (c) Ethanol
35. (b) $KMnO_4$
36. (c) Phagocytosis
37. (c) Seive tubes
38. (b) Conical
39. (a) arteries
40. (b) Ureter
41. (d) Cerebrospinal fluid
42. (c) Progesterone
43. (d) Plasmodium
44. (d) 34°C
45. (c) On chromosomes
46. (c) Planaria
47. (a) Abiotic components
48. (d) All of given.
49. (a) Sabarmati
50. (b) Forest's product

		PART - B **SECTION - A**	**10**
		Answer the following questions : [2 marks]	
1.	⇨	Nanotechnology has two types of utility in the area of health care :	
		Higher functional efficiency of nano-devices results into better, cheaper and faster diagnostics and drug application.	½
	⇨	Accurate and precise diagnosis improves medical treatment.	½
	⇨	It is possible to design a nano-drug which acts only at the infected site in our body, thus it reduces the side effects to other metabolic functions.	
	⇨	For instance, anti cancer nano-drug can be transported to cancerous cells, and upon excitation through laser beam, these nano drugs are heated to destroy cancerous cells.	½
	⇨	Carbon nanotubes and their polymers nano composites are suitable scaffold materials for bone cell proliferation and bone formation.	½

**OR**

1.		The word 'Nano' is a Greek word meaning 'dwarf'.	½
	⇨	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) = $\dfrac{1 \text{ meter}}{1,000,000,000}$ = 10^{-9} meter (m)	
	⇨	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

2. Let is draw a circuit for the above example.

Given : $R_1 = 5\Omega$
$R_2 = 10\Omega$
$R_3 = 30\Omega$
$V = 12$ V
$I_1 = ?$
$I_2 = ?$
$I_3 = ?$
$R = ?$
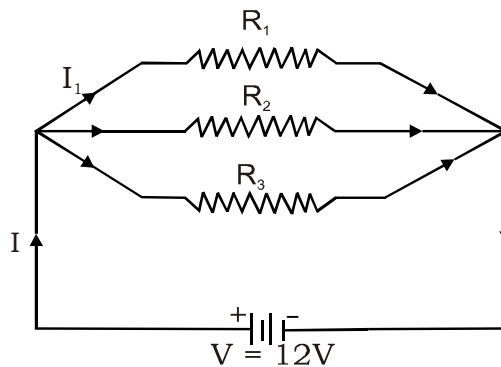
Formula : The Current passing through R_1 according to Ohm's law.

$$I_1 = \frac{V}{R_1} = \frac{12}{5} = 2.4 \text{ A}$$

$$I_2 = \frac{V}{R_2} = \frac{12}{10} = 1.2 \text{ A}$$

$$I_3 = \frac{V}{R_3} = \frac{12}{30} = 0.4 \text{A}$$

½

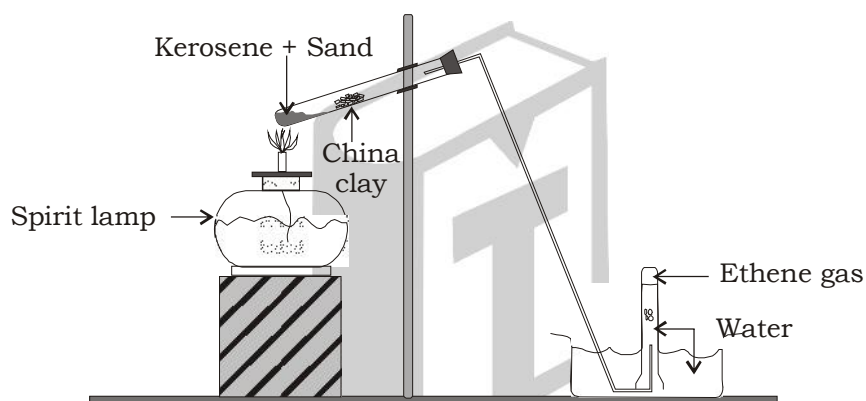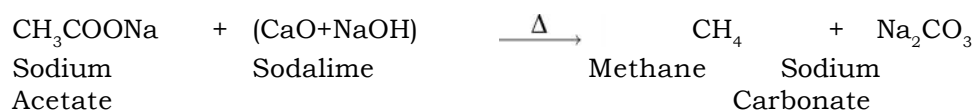|		
	Solution : Total current of the circuit $\quad I \quad = \quad I_1 + I_2 + I_3$ $\qquad\qquad = \quad 2.4 + 1.2 + 0.4$ $\qquad\qquad = \quad 4.0A$ The equitvalent resistance of the circuit. $$\frac{1}{R} = \frac{1}{R_1} = \frac{1}{R_2} = \frac{1}{R_3}$$ $$= \frac{1}{5} + \frac{1}{10} + \frac{1}{30}$$ $$= \frac{1}{3}$$ $$R = 3\Omega$$	½ ½
3. ⇨	Mix 3ml kerosene or melted wax and one tea spoon sand in a hard glass test tube. Then insert, some small pieces of china clay or porcelain in the front part of the test tube. Kerosene + Sand · China clay · Spirit lamp · Ethene gas · Water	½ ½
⇨	Arrange this test tube as shown in figure. Heat the test tube on the spirit lamp till the pieces of porcelain becomes red hot and then immediately heat the sand containing kerosene or wax.	½
⇨	Continue heating alternately the pieces of porcelain and the sand. When alkene vapour from wax passes through porcelain piece, ethene gas will be liberated by cracking.	½
⇨	Collect the gas in gas jar by downward displacement of water.	
	OR	
3.	Methane gas is the chief constituent in Marsh gas available from the mines of mineral coal and gas collected over petroleum in the sedimentary rocks in the crust of the earth.	½
⇨	In addition, methane is a chief constituent in dung, excretion of animals, and gobar gas, sewage gas and biogas obtained from decomposition of plant and animal waste.	
⇨	Preparation: Methane gas is obtained by heating sodium acetate and soda lime (3:1 proportion mixture of sodium hydroxide and calcium oxide).	½
	$$CH_3COONa + (CaO+NaOH) \xrightarrow{\Delta} CH_4 + Na_2CO_3$$ Sodium $\quad$ Sodalime $\qquad\qquad$ Methane $\quad$ Sodium Acetate $\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ Carbonate	½
⇨	Methane gas collected by downward displacement of water proves that it is insoluble in water. It is colourless and odourless gas.	
⇨	It is lighter than air. Observe by dropping burning piece of paper into a test tube filled with methane gas.	½

4.	In the field of communication, we use satellites for television transmission, radio networks and computer networks.	½
⇨	Country-wide classroom and tele-conferencing have enabled us to spread education in remote villages of the country.	1
⇨	For this purpose India has launched INSAT series. So far we have launched INSAT 1,2,3 series for these purposes.	½

5.	By reaction of acid with metal, salt corresponding to metal and dihydrogen gas are produced.	½
⇨	Acid + metal ⟶ Salt of metal + Dihydrogen gas Example :	
⇨	$2HCl \quad + \quad Ca \quad \longrightarrow \quad CaCl_2 \quad + \quad H_2$ **Hydrochloric** **Calcium** **Calcium** **Dihydrogen** **Acid** **Chloride** **gas**	½
⇨	$H_2SO_4 \quad + \quad Mg \quad \longrightarrow \quad MgSO_4 \quad + \quad H_2$ **Sulphuric** **Magnesium** **Magnesium** **Dihydrogen** **Acid** **Sulphate** **gas**	½

⇨	Nirtic acid being oxidising agent, by reaction with metal, water is produced instead of dihydrogen gas.
	$8HNO_3 \quad + \quad 3\,Zn \quad \longrightarrow \quad 3Zn(NO_3)_2 \quad + \quad 2NO \quad + \quad 4H_2O$
	   Nitric **Zinc** **Water**
	   Acid **Nitrate**
		½

⇨	Generally noble metals like Gold (Au), Silver (Ag) and platinum (Pt) do not easily react with acid.	½

SECTION - B

Answer the following questions : [2 marks]   **10**

6.

Human heart

2
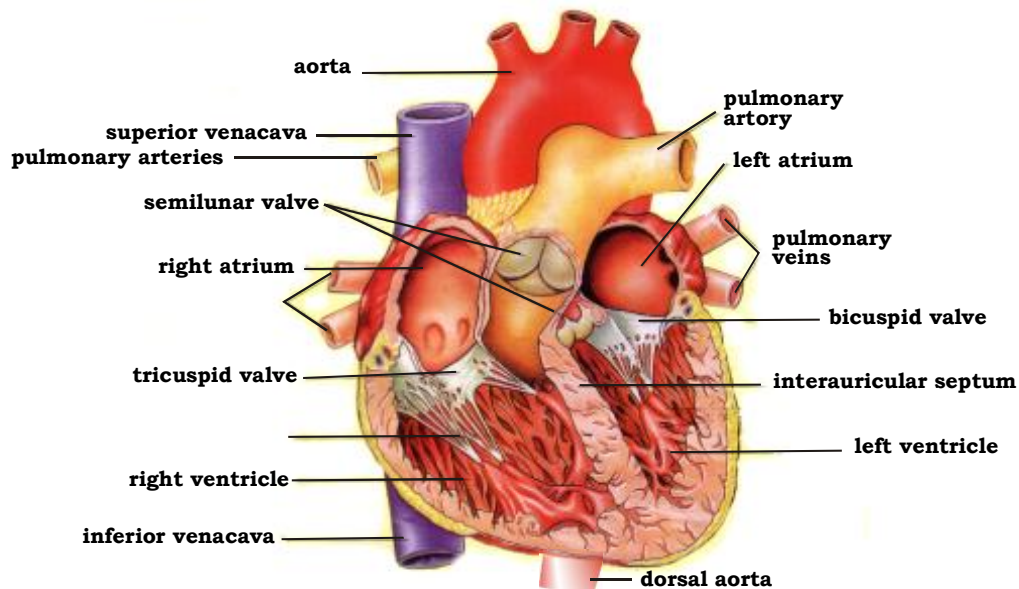
No.	Central nervous system	Autonomous nervous System	
1	It consist of brain and spinal cord.	It consist of special network of nerve fibres.	½
2	It regulates the voluntary, involuntary and reflex actions.	It regulates only involuntary activities in the body.	½
3	It is not divided into types.	It is divided into two types:(1) Sympathetic nervous system and (2) Parasympathetic nervous system.	½
4	It maintains its contacts with all the organs of the body through the cranial nerves and spinal nerves.	The nerves from the autonomous nervous system are connected with the lungs, heart, digestive tract, kidneys, glands and blood vessels.	½

8. The ozone layer in stratosphere absorbs harmful ultraviolet radiation from the sun light and prevents it from reaching the earth. ½

⇨ CFC (Chlorofluorocarbon) adds chlorine (Cl⁻) in atmosphere. The chlorine atom reacts with ozone and removes an atom of O one by one. One atom of chlorine can decompose 1,00,000 molecules of ozone in this fashion. ½

⇨ CFC is responsible compound for almost 80 % of the total depletion of ozone in the stratosphere. ½

⇨ Thus, the main responsible factor for depletion of ozone layer is CFC. ½

9. The ancestors of - ½
(a) Broccoli- wild cabbage ½
(b) Kohlrabi- wild cabbage ½
(c) Kale- wild cabbage. ½

OR

9.

No.	Artificial selection	Natural selection	
1	It is an artificial process of evolution.	It is a natural process of evolution.	½
2	It is a controlled process for a limited period by the human beings.	It is an unlimited process for an unlimited period by nature that affects all the global organisms.	½
3	The selection of improvement in the offsprings is beneficial for mankind.	The characters selected for evolution are beneficial for the species.	½
4	The results of artificial selection are obtained in a short period	The results of natural selection are obtained after a very long period of time.	½

10. In national parks wild lives are allowed to survive without interference with human activities. 1

→ In sanctuaries also wild life is protected but many necessary human activities are allowed. 1

SECTION - C
Answer the following questions : [3 marks] 15

11. Place a strong source (s) of a white light at the " focus " of convex lens (L₁) as shown in the figure to produce a parallel beam of light. ½

⇨ Allow the light beam to pass through a transparent glass vessel(T) containing clean water..

⇨ Now allow the beam of light to pass through the circular hole (C) made in the cardboard ½

|	and obtain a sharp image of the circular hole on screen using second convex lens (L_2)	½
⇨	Dissolve 100g of sodium thiosulphate in about 1 litre of clean water in glass vessel. Add 1 to 2 ml of concentrated sulphuric acid to water.	½
⇨	After sometime you will see blue coloured light when looking from side of the vessel and crimson red colour will be on screen.	
⇨	**Conclusion of this activity is :** The vessel is seen blue coloured while looking from one side due to more scattering of blue colour among white light. The light of reddish colour having longer wavelength is less scattered so that it reaches to the screen and the screen appears reddish.	½
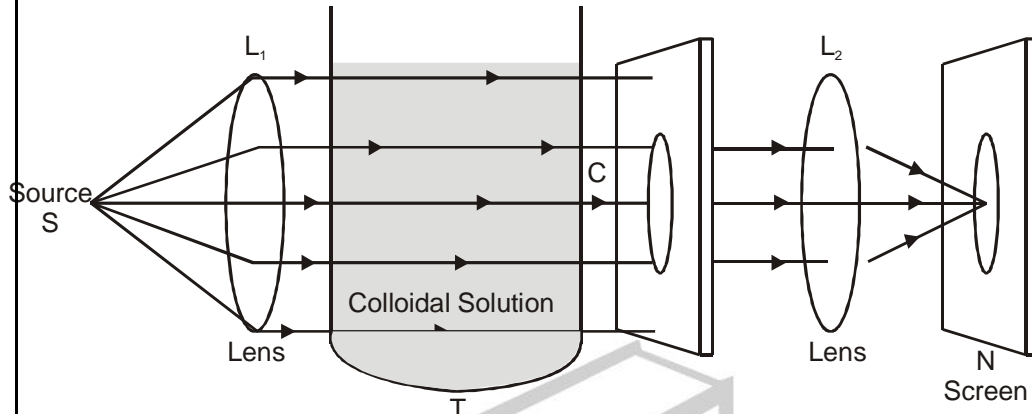
Experimental arrangement for the observation of scattering of light through collodial solution

1

| 12. |
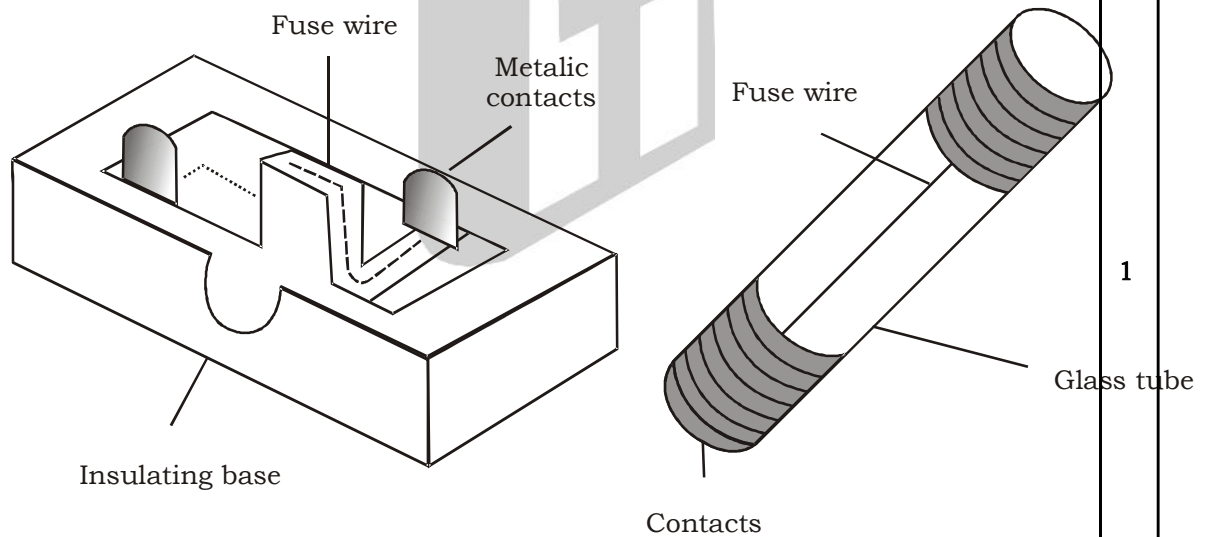
(a) Fuse construction (b) | 1 |
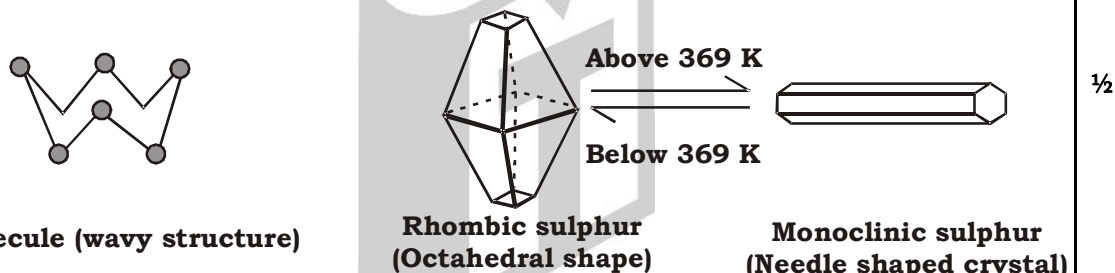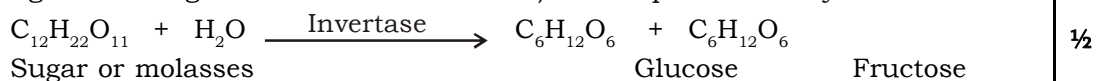| --- | --- | --- |
⇨	A conducting wire having a low melting point is connected with the metallic contacts on an insulator base.	
⇨	In Figure a fuse wire in a small glass tube connected with metallic contacts is shown.	½
⇨	Such small fuses are used in the domestic appliances such as T.V., refrigerator.	
⇨	Due to some reason if current increases in the circuit, the fuse wire burn off immediately due to the heat produced and the electric current stops to flow, and major damage can be prevented.	½
⇨	Many types of fuse wires are available. The fuse wires are prepared from a pure tin or an alloy of lead and tin.	½
⇨	Apart from this, while using appliances with large power consumption, a three-pin plug is employed. The third pin indicates earthing with the help of which we can prevent an electric shock.	½

OR

12.	The following precautions should be taken while using electricity:	
⇨	We must ensure that the positive and negative terminal of the electric circuit are not accidentally connected. If this happens, there will be short circuit and there is danger of fire breaking out.	½ ½
⇨	The insulating layer over the wires should not be broken.	½
⇨	All wiring in the circuit should be done properly.	
⇨	Ensure that each electrical appliance is connected with the earthing wire. Hence, three pin plugs should be used.	½
⇨	Do not touch switch, plug or socket with wet hands.	
⇨	One should wear rubber gloves or wear rubber shoes while dealing with AC mains.	½
⇨	Do not connect many appliances with AC mains.	½
⇨	Overloading due to connection of many appliances should be avoided.	½

13. Two or more forms of an element having existence because of the different arrangements of atoms in allotropes of that element is called **allotropy.**

⇨ There are two crysalline forms of sulphur in solid state like rhombic sulphur and monoclinic sulphur. — ½

⇨ These two forms are called **alltropes** of sulphur.

⇨ Rhombic sulphur is stable at temperature lower than 369 K and monoclinic sulphur is stable at temperature higher than 369 K. — ½

⇨ Both these forms i.e. allotropes have same chemical properties but different physical properties because the crystal structures of allotropes are different. — ½

⇨ Rhombic sulphur possesses octahydral structure, while monoclinic sulphur possesses needle like crystals. — ½


Above 369 K

Below 369 K

S_8 **molecule (wavy structure)**　　**Rhombic sulphur (Octahedral shape)**　　**Monoclinic sulphur (Needle shaped crystal)**

— ½

⇨ There is S_8 ring in both the allotropes of sulphur.

⇨ When sulphur is heated then this ring will break, but as we go on heating the pieces of the ring, they combine with each other and get converted into small particles after being viscous. — ½

14. 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. — 1

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow{\text{Invertase}} C_6H_{12}O_6 + C_6H_{12}O_6$$
Sugar or molasses　　　　　　　　　　Glucose　　　Fructose — ½

⇨ Ethanol and carbon dioxide are formed by fermentation of this glucose or fructose in presence of enzyme zymase. — ½

⇨ Both the enzymes invertase (sucrase) and zymase are present in yeast, (which is in the skin of the grapes). — ½

$$C_6H_{12}O_6 \xrightarrow{\text{Zymase}} 2C_2H_5OH + 2CO_2(g)$$
Glucose or fructose　　　　　Ethanol — ½
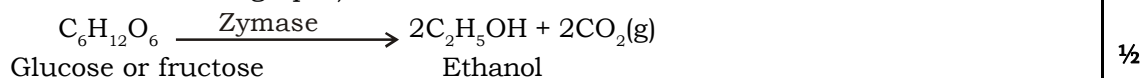
OR

14. The nomenclature of alcohol corresponding to its hydrocarbon is carried out by removing last alphabet 'e' from the hydrocarbon the suffix - ol is added. — ½

⇨ After removing 'e' from methane and by adding 'ol' to methan, methan + ol = methanol. — ½

⇨ Similarly from ethane, ethan + ol = ethanol. — ½

⇨ The first five alkane compounds and their corresponding alcohol compounds are given in Table. — ½ ½

Alkane Name	Molecular Formula C_nH_{2n+2}	Common Name	IUPAC Name	(C_nH_{2n+1}OH) Molecular formula
Methane	CH_4	Methyl alcohol	Methanol	CH_3OH
Ethane	C_2H_6	Ethyl alcohol	Ethanol	CH_3CH_2OH
Propane	C_3H_8	Propyl alcohol	Propanol	$CH_3CH_2CH_2OH$
Butane	C_4H_{10}	Butyl alcohol	Butanol	$CH_3CH_2CH_2CH_2OH$
Pentane	C_5H_{12}	Pentyl alcohol	Pentanol	$CH_3CH_2CH_2CH_2CH_2OH$

1

15. AIDS (Acquired Immuno Deficiency Syndrome) is a highly infectious and fatal disease caused by HIV (Human Immuno Deficiency Virus). 1

⇨ In India also National AIDS Control Organization (NACO) has taken steps to create awareness and provide relevant information about reproductive health. 1

⇨ This are either government organization or Non-Government Organization (NGO's). To check the spread of this disease in human population,which steps to be taken individually by men and women, its list is also published. 1

SECTION - D

Answer the following questions :   [5 marks] 15

16. The formula which gives relation between object distances (u), image distance (v) and focal length (f) of mirror is known as mirror formula. ½

1
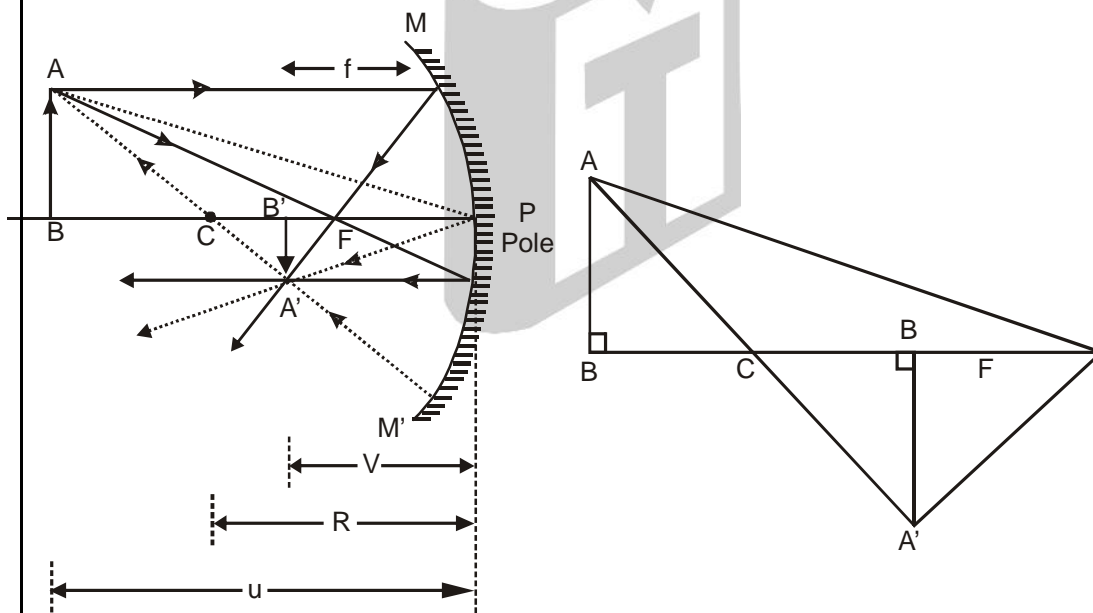
⇨ We shall derive this formula for concave mirror of small aperture.

⇨ As shown in figure when the object AB of height (h) is kept in front of the concave mirror beyond the centre of curvature (C) the image formed is real, inverted and diminished (of height h'). ½

⇨ According to Cartesian Sign Convention.

Object distance =   PB =   -u
Focal length   PF =   -f
Image distance   PB' =   -v
Radius of curvature PC =   -R

⇨ From figure it is clear that right angled triangles ΔABP and ΔA'B'P are similar triangles.

$$\therefore \quad \frac{A'B'}{AB} = \frac{PB'}{PB} = \frac{-v}{-u} = \frac{v}{u} \qquad \dots\dots (1)$$ ½

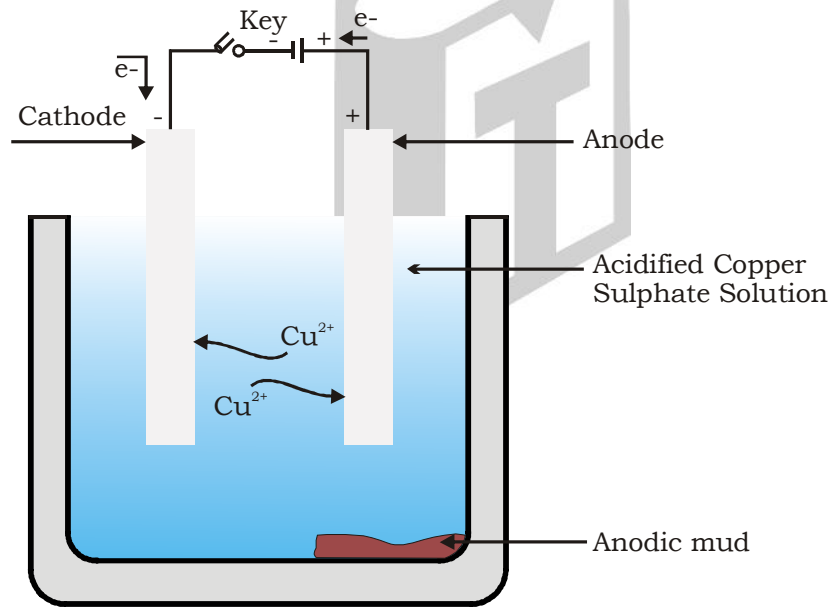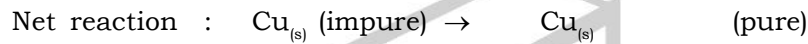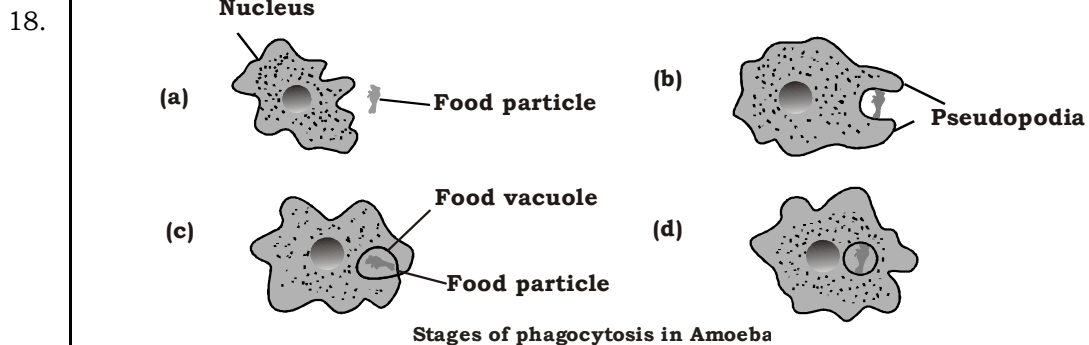| ⇒	Similarly right angled triangles ΔABC and ΔA'B'C are similar triangles	
	$\dfrac{A'B'}{AB} = \dfrac{CB'}{CB}$ .... (2)	½
⇒	But, CB' = PC - PB' = -R - (-v) = -R + v CB = PB - PC = - u - (- R) = - u + R ∴ $\dfrac{A'B'}{AB} = \dfrac{-R+v}{-u+R}$ .... (3)	½
⇒	Comparing equation (1) and (3), $\dfrac{v}{u} = \dfrac{-R+v}{-u+R}$ ∴ -uv + Rv = -Ru + vu ∴ Rv + Ru = 2uv ∴ R(v + u) = 2uv .... (4)	
⇒	Dividing equation (4) by Ruv on both sides, $\dfrac{v+u}{uv} = \dfrac{2}{R}$ $\boxed{\dfrac{1}{u}+\dfrac{1}{v}=\dfrac{2}{R}}$ .... (5)	½
⇒	When the object is at infinite distance, the image is formed at the focus F. Therefore, substituting object distance u = ∞ and image distance v = f in equation (5) we have, $\dfrac{1}{\infty}+\dfrac{1}{f}=\dfrac{2}{R}$ ∴ $\dfrac{1}{f}=\dfrac{2}{R}$ $\left(\because \dfrac{1}{\infty}=0\right)$ $\boxed{f=\dfrac{R}{2}}$ .... (6) This shows that the principal focus (f) is a midpoint between pole (P) and centre of curvature(c) along principal axis.	½
⇒	Substituting the value of R = 2f from equation (6) in equation (5), we have $\boxed{\dfrac{1}{u}+\dfrac{1}{v}=\dfrac{1}{f}}$ .... (7) Equation (7) is known as Mirror formula which is also valid for convex mirror.	
17.	Alloy is homogeneous mixture of two or more metals or non-metals.	
⇒	We know that the iron is the metal that is maximum used, but it is not in its pure form. The reason for this is that when it is hot, t is soft and gets easily pressed.	½
⇒	But if very small amount of carbon is added, it becomes hard and strong. If nickel and chromium are added to iron, stainless steel is obtained. It is strong and does not get corroded.	½
⇒	Thus, when any other substance is added to iron, its properties are changed. The substances added to it may be metal or non-metal. Thus, homogeneous Mixture of two or more metals or non-metal is called an alloy.	½ ½
⇒	In preparation of alloy, firstly the chief metal is melted and the substance which is to be mixed is added in definite proportion and then melted again.	½
⇒	Then this molten mixture is cooled. The alloy prepared by adding zinc metal to copper is known as brass.	½

⇨	Cooking vessels, parts of machines, instruments of music are prepared from it. if one of the metals in an alloy is mercury, then it is called amalgam. The electrical conductivity of an alloy is less than that of pure metal. e.g. If impurity is there in copper, its electrical conductivity is less than that of pure copper.	1
⇨	The melting point of an alloy is less than those of component elements. e.g. The melting point of the alloy prepared from lead and tin, is less and so it is used in soldering the electric wires.	1

OR

17.	Rod of impure copper is arranged as anode.	½
⇨	Rode of pure copper as cathode as in figure.	
⇨	The aqueous solution of copper sulphate is taken as the electrolyte.	
⇨	A little dilute sulphuric acid is added to it.	½
⇨	Electric current is passed through the electrolyte the proportion in which copper from anode is dissolved in aqueous solution of copper sulphate.	½
⇨	Copper in the same proportion from copper sulphate solution is deposited at the cathode.	½
⇨	Thus, the copper deposited at the cathode in this way has almost 100% purity.	½

Anode : $Cu_{(s)}$ impure $\rightarrow$ $Cu^{2+} + 2e^-$ (oxidation)   ½

Cathode : $Cu^{2+} + 2e^-$ $\rightarrow$ $Cu_{(s)}$ pure (Reduction)

_____

Net reaction : $Cu_{(s)}$ (impure) $\rightarrow$ $Cu_{(s)}$ (pure)   ½

Refining of Copper by electrolysis

    2

|		
18.	**Stages of phagocytosis in Amoeba**	1
⇨	Amoeba is a unicellular organism and mode of nutrition in amoeba is holozoic.	½
⇨	In Amoeba the process of obtaining food is called phagocytosis (means cell feeding).	
⇨	The various processes involved in its nutrition are	½

	(i) Ingestion (ii) Digestion (iii) Absorption (iv) Assimilation (v) Egestion	½

⇨ **Ingestion** : Amoeba ingests food particles by forming temporary finger like projections known as pseudopodia around them so the food is encaptured along with lysosomes into a bag called food vacuole. ½

⇨ **Digestion** : In amoeba food is digested in the food vaculoes by digestive enzymes. ½

⇨ **Absorption** : The digested food found in food vaculoes is absorbed directly into cytoplasm by diffusion. ½

⇨ **Assimilation :** A part of the food absorbed in the cell is used to obtain energy through respiration. The remaining part is used in the growth of Amoeba. ½

⇨ **Egestion** : The undigested food remains in food vacuole and it is thrown out of the body by rupturing of cell membrane. ½

OR

18.
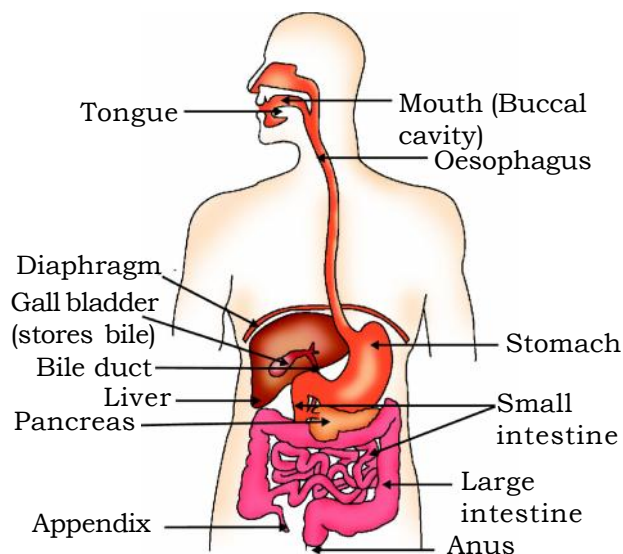
Digestive system of Man

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. ½

⇨ The digestion of food start in the mouth.

⇨ The mouth cavity contains teeth, tongue and salivary gland.

⇨ The Salivary gland secrets amylase which digest the starch of food into maltose. ½

⇨ 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. ½

⇨ 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. ½

⇨ 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. ½

⇨ The small intestine gets the secretion from liver and pancreas.

⇨ Liver secrets bile which is stored temprorily 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. ½

⇨ Pancretic juice from Pancrease contains amylase, trypsin, and lipase.

⇨	Amylase digest starch, trupsin 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.	½
⇨	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.	½
⇨	Now the left food is removed from the body through anus.	

~~~~~~ All the Best ~~~~~~