

CHARITABLE COACHING CENTRE
Class X- Sample Paper
Subject-Science

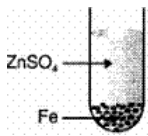
Time Allowed: 3 hours

Maximum Marks: 80

General Instructions:

1. This question paper consists of 39 questions in 5 sections.
2. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
3. Section A consists of 20 objective-type questions carrying 1 mark each.
4. Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should be in the range of 30 to 50 words.
5. Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should be in the range of 50 to 80 words.
6. Section D consists of 3 Long Answer type questions carrying 05 marks each. Answers to these questions should be in the range of 80 to 120 words.
7. Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

Section A

1. What happens in the test tube shown here? [1]

 - a) H_2O will produce
 - b) SO_2 will produce
 - c) No reaction
 - d) FeO will produce
2. Methane gas released from waste water treatment plants can be used as a source of fuel. Which chemical equation represents combustion of methane to produce heat energy? [1]
 - a) $2\text{O}_2 + 2\text{H}_2\text{O} \rightarrow \text{CO}_2 + \text{CH}_4$
 - b) $\text{CH}_4 + \text{CO}_2 \rightarrow 2\text{O}_2 + 2\text{H}_2\text{O}$
 - c) $\text{CO}_2 + 2\text{O}_2 \rightarrow \text{CH}_4 + 2\text{H}_2\text{O}$
 - d) $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$
3. Which of the following gives the correct increasing order of acidic strength? [1]
 - a) Hydrochloric acid < Water < Acetic acid
 - b) Water < Acetic acid < Hydrochloric acid
 - c) Water < Hydrochloric acid < Acetic acid
 - d) Acetic acid < Water < Hydrochloric acid
4. An organic compound X has the molecular formula $\text{C}_2\text{H}_6\text{O}$. Upon reaction with alkaline KMnO_4 it gets oxidised to compound Y. Which of the following reagents can be used to distinguish between compounds X and Y? [1]

a) All of these

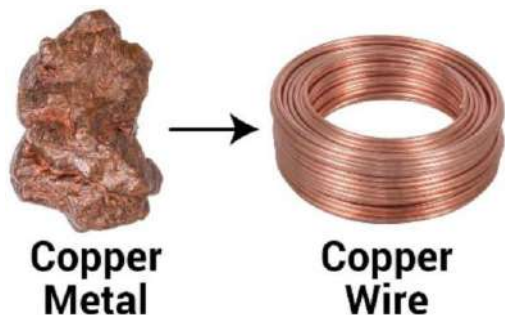
b) Sodium hydroxide

c) Sodium metal

d) Sodium carbonate

5. The property of metal by which it can be drawn into wires is called:

[1]



a) Ductility

b) Malleability

c) Conductivity

d) Sonorous

6. Select the incorrect match.

[1]

a) A metal used in joining electric wires - Magnesium

b) A metal extracted by using electrolytic reduction - Aluminium

c) A metal whose oxide is soluble in both acids and bases - Zinc

d) A metal unreactive towards oxygen and dilute acids - Gold

7. Which of the following represents the incorrect IUPAC name of the given compound?

[1]

a) $\text{CH}_3\text{CH}_2\text{-COOCH}_3$: Ethanoic acid

b) $\text{CH}_3\text{CH}_2\text{-CO-CH}_3$: Butanone

c) $\text{CH}_3\text{CH}_2\text{-CHO}$: Propanal

d) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-OH}$: Butanol

8. In the slide of an epidermal peel, the parts which appear pink coloured after staining with safranin are

[1]

a) nuclei only

b) all parts in the peel

c) cell membrane and cytoplasm

d) stomata only

9. The branch of biology-related with heredity and variation is called

[1]

a) Livinglogy

b) Genetics

c) Evolution

d) Taxonomy

10. A student decides to study the impact of removing certain flower parts on fruit formation in plant species X. He chooses three separate plants that are growing in the same plot under uniform conditions. The data is given in the table below.

[1]

Plant	Part removed	Impact on formation
1	Anther	30% less fruit formed than average plan in the plot
2	Stigma	No fruit formed
3	Petal	No significant impact

Which of the following cannot be inferred from the above data?

a) Anthers and stigmas are crucial in sexual reproduction in species X.

b) Species X relies completely on cross-pollination.

c) Species X is likely to be wind-pollinated.

d) Pollen grains are probably unable to

12. Refer to the given figure and select the incorrect statement regarding it. [1]



Reason (R): If several spermatozoa hit the egg at the same time, all can enter the egg.

- | | |
|---|---|
| a) Both A and R are true and R is the correct explanation of A. | b) Both A and R are true but R is not the correct explanation of A. |
| c) A is true but R is false. | d) A is false but R is true. |

19. **Assertion(A):** A compass needle is placed near a current-carrying wire. The deflection of the compass needle decreases when the compass needle is displaced away from the wire. [1]

Reason(R): Strength of a magnetic field decreases as one moves away from a current-carrying conductor.

- | | |
|---|---|
| a) Both A and R are true and R is the correct explanation of A. | b) Both A and R are true but R is not the correct explanation of A. |
| c) A is true but R is false. | d) A is false but R is true. |

20. **Assertion(A):** Decomposers help in recycling of nutrients between living and non-living components of ecosystem. [1]

Reason(R): Decomposers help in decomposing dead bodies of organisms and return various nutrient elements to their source viz soil, water and air.

- | | |
|---|---|
| a) Both A and R are true and R is the correct explanation of A. | b) Both A and R are true but R is not the correct explanation of A. |
| c) A is true but R is false. | d) A is false but R is true. |

Section B

21. What happens when ethanol reacts with [2]
 i. sodium
 ii. potassium permanganate solution.
22. What is the difference between internal & external fertilization? [2]
23. Why is diffusion insufficient to meet the oxygen requirements of multicellular organisms like humans? [2]

OR

State the function of Bowman's capsule and glomerulus.

24. An object of size 7.0 cm is placed 27 cm in front of concave mirror of focal length 18 cm. At what distance should the screen be placed so that a sharp focused image can be obtained? Find the size and nature of the image. [2]
25. What is the role of decomposers in the ecosystem? [2]

OR

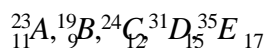
Mention the form of energy transfer, if a grasshopper is eaten by a frog.

26. What happens to a beam of white light when it gets refracted through glass prism? Which colour deviates the most and the least after refraction through a prism? What is likely to happen if a second identical prism is placed in an inverted position with respect to the first prism. Justify your answer. [2]

Section C

27. The atomic number of an element is 20. Write its electronic configuration. State whether this element is a metal or a non-metal. What is its valency? Write the name and formula of the compound which this element forms with chlorine. [3]
28. How is copper obtained from its ore (Cu_2S)? Write only the chemical equations. How is copper thus obtained refined? Name and explain the process along with a labelled diagram. [3]

- i. How do you classify elements into metals and non-metals on the basis of their electronic configuration? Choose metal and non-metal out of the following:



- ii. What type of bond will be formed if

- 'A' combines with 'B'?
- 'A' combines with 'E'?
- 'C' combines with 'E'?
- 'D' combines with 'E'?

29. Describe internal structure of a human heart. [3]

30. Give the respective scientific terms used for studying [3]

- The mechanism by which variations are created and inherited.
- The development of new types of organisms from the existing ones.

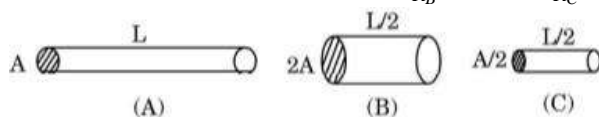
31. i. Name the spherical mirror used as: [3]

- shaving mirror
- Rear view mirror in vehicles
- Reflection in search-light.

- ii. Write any three difference between a real and a virtual image.

32. i. In the following figure, three cylindrical conductors A, B and C are shown along with their lengths and areas [3]

of cross-section. If these three conductors are made of the same material and R_A , R_B and R_C be their respective resistances, then find (a) $\frac{R_A}{R_B}$ and (b) $\frac{R_A}{R_C}$.



- ii. If the conductor A is made of copper and the conductor C is made of constant an (alloy of copper and nickel), then which one of the two will have more electrical resistance and why?

33. a. What is the meaning of electric power of an electrical device? Write its SI unit. [3]

- b. An electric kettle of 2 kW is used for 2h. Calculate the energy consumed in (i) kilowatt hour and (ii) joules.

Section D

34. A compound C (molecular formula, $\text{C}_2\text{H}_4\text{O}_2$) reacts with Na - metal to form a compound R and evolves a gas [5]

that burns with a pop sound. Compound C on treatment with an alcohol A in presence of an acid forms a sweet-smelling compound S (molecular formula, $\text{C}_3\text{H}_6\text{O}_2$). On the addition of NaOH to C, it also gives R and water. S on treatment with NaOH solution gives back R and A.

Identify C, R, A, S, and write down the reactions involved.

OR

An organic compound A is widely used as a preservative in pickles and has a molecular formula $\text{C}_2\text{H}_4\text{O}_2$. This compound reacts with ethanol to form a sweet smelling compound B.

- Identify the compound A.
- Write the chemical equation for its reaction with ethanol to form compound B.
- How can we get compound A from B?
- Name the process and write corresponding chemical equation.

v. Which gas is produced when compound A reacts with washing soda? Write the chemical equation.

35. a. What is reproduction? List its two types. [5]
b. How are the modes of reproduction different in unicellular and multi cellular organisms?

OR

Following are the two examples of plant movement. One is drooping of leaves in touch-me-not plant and second is attaching of pea plant to a support with the help of tendrils.

- What is the stimulus which is common for movement in both the cases?
- What is the difference in movement in both the plants? Explain.
- Give appropriate scientific terms for the movements described in both cases.

36. Form the image in case an object is moved from infinity to the concave mirror. [5]

OR

Draw a ray diagram in each of the following cases to show the formation of image, when the object is placed:

- between optical center and principal focus of a convex lens.
- anywhere in front of a concave lens.
- at 2F of a convex lens.

State the signs and values of magnifications in the above mentioned cases (i) and (ii).

Section E

37. **Read the text carefully and answer the questions:** [4]

Salt of a strong acid and strong base is neutral with a pH value of 7. NaCl common salt is formed by a combination of hydrochloride and sodium hydroxide solution. This is the salt that is used in food. Some salt is called rock salt, bed of rock salt was formed when seas of by gone ages dried up. The common salt thus obtained is an important raw material for various materials of daily use, such as sodium hydroxide, baking soda, washing soda, and bleaching powder.

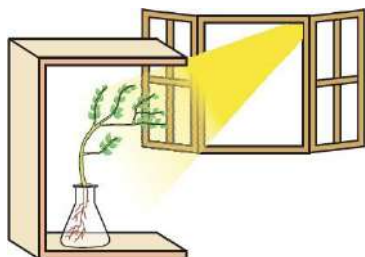
- If given acids are phosphoric acid, carbonic acid, hydrochloric acid and sulphuric acid, then which acid does not form an acidic salt?
- What is the formula of baking soda?

OR

Name the substance which on treatment with chlorine to obtain bleaching powder.

38. **Read the text carefully and answer the questions:** [4]

Fill a conical flask with water. Cover the neck of the flask with a wire mesh. Keep two or three freshly germinated bean seeds on the wire mesh. Take a cardboard box which is open from one side. Keep the flask a wire mesh. Kin the box in such a manner that the open side of the box faces light coming from a window as shown in the given figure. After two or three days, you will notice that the shoots bend towards light and roots Away from light. Now turn the flask so that the shoots are away from light and the roots towards the light. Leave it undisturbed in this condition for a few days. Plants show tropism in response to other stimuli as well. The roots of a plant always grow downwards while the shoots usually grow upwards and away from the earth. This upward and downward growth of shoots and roots, respectively, in response to the pull of earth or gravity, is



- What has represented by the given activities?
- Do old parts of the shoot and root change direction? Is there any difference in the direction of the new growth?
- What can we conclude from this activity?

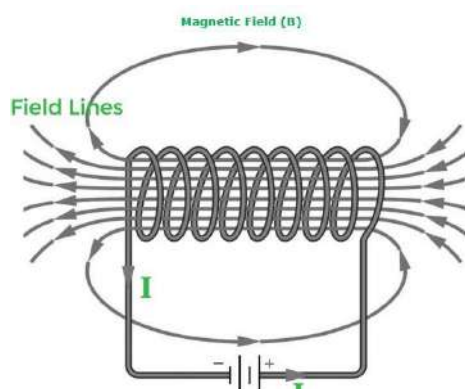
OR

What is geotropism?

39. **Read the text carefully and answer the questions:**

[4]

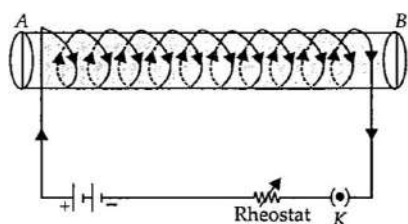
An insulated copper wire wound on a cylindrical cardboard tube such that its length is greater than its diameter is called a solenoid. When an electric current is passed through the solenoid, it produces a magnetic field around it. The magnetic field produced by a current-carrying solenoid is similar to the magnetic field produced by a bar magnet. The field lines inside the solenoid are in the form of parallel straight lines. The strong magnetic field produced inside a current-carrying solenoid can be used to magnetize a piece of a magnetic material like soft iron when placed inside the solenoid. The strength of the magnetic field produced by a current-carrying solenoid is directly proportional to the number of turns and strength of the current in the solenoid.



- What would be the strength of the magnetic field inside a long current-carrying straight solenoid?
- Which end is north and which end is south pole when current flows through a solenoid?
- Along solenoid carrying a current produces a magnetic field B along its axis. If the current is double and the number of turns per cm is halved, then what will be the new value of the magnetic field?

OR

A soft iron bar is enclosed by a coil of insulated copper wire as shown in the figure. When the plug of the key is closed, then where would the face B of the iron bar be marked?



Solution

Section A

1.

(c) No reaction

2.

$\text{Fe} + \text{ZnSO}_4 \rightarrow \text{No reaction}$ **Explanation:** No reaction takes place because Fe is less reactive than Zn

(d) $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$

Explanation: $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$

3.

(b) Water < Acetic acid < Hydrochloric acid

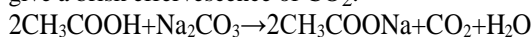
Explanation: Water < Acetic acid < Hydrochloric acid

Distilled water is neutral. Acetic acid is an organic acid so it is less acidic than hydrochloric acid which is an inorganic acid.

4.

(d) Sodium carbonate

Explanation: Compound X is ethanol ($\text{CH}_3\text{CH}_2\text{OH}$) and compound Y is ethanoic acid (CH_3COOH). Alcohols and acids can be distinguished by sodium carbonate as alcohols do not react with sodium carbonate while acids react with sodium carbonate to give a brisk effervescence of CO_2 .



5.

(a) Ductility

Explanation: Ductility

6.

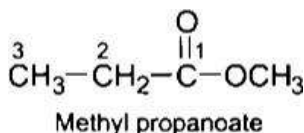
(a) A metal used in joining electric wires - Magnesium

Explanation: Copper metal is used in joining electric wires due to its high electrical conductivity, enough tensile strength and ductility.

7.

(a) $\text{CH}_3\text{CH}_2\text{-COOCH}_3$: Ethanoic acid

Explanation:



8.

(b) all parts in the peel

Explanation: Safranin stains epidermal cells of the onion peel.

9.

(b) Genetics

Explanation: Genetics is the study of genes, genetic variation, and heredity in living organisms. It is generally considered a field of biology, but intersects frequently with many other life sciences and is strongly linked with the study of information systems.

10.

(b) Species X relies completely on cross-pollination.

Explanation: The removal of anthers affects fruit formation in plant 1, this implies that species X relies partially on self-pollination. The removal of either anthers or stigmas affects rate of fruit formation significantly. No fruits are observed when the stigmas in plant 2 are removed. This shows that pollen grains are probably unable to germinate if they land on any other part of the carpel besides the stigma. The petals do not seem to play a significant role in facilitating fruit formation. Species X is therefore likely to be wind-pollinated.

CHARITABLE COACHING CENTRE

11. (d) copies of the same chromosome
Explanation: The two versions of a trait that are brought in by the male and female gametes are situated on copies of the same chromosome. Each parent contributes one copy of the gene for a particular trait.
12. (c) It uses both amino acids and fatty acids as a respiratory substrate.
Explanation: The given figure is of a neuron. Neurons use only glucose as a respiratory substrate.
13. (a) momentum
Explanation: We know when a proton moves in a magnetic field its velocity changes. Momentum is the product of mass and velocity, therefore momentum also changes. Velocity and momentum are the properties which change when a proton moves freely in a magnetic field.
14. (c) 25W
Explanation: Resistance of the electric bulb is $R = \frac{V^2}{P}$ or $R = \frac{220^2}{100}$
 When it is operated at 110V, the power consumed will be $P = \frac{V^2}{R}$ or $P = \frac{110^2 \times (100)}{(220^2)}$ or $P = \frac{100}{4}$ or $P = 25W$
15. (d) Frog and snake
Explanation: Frog and snake - both secondary consumers - belong to the same trophic level. Plant is a producer and belongs to the first trophic level. Deer is a herbivore (a primary consumer) and belongs to the second trophic level. Hawk belongs to the last trophic level.
16. (a) More UV radiations on earth
Explanation: The ozone layer shields the surface of the earth from ultraviolet (UV) radiation from the Sun. Ozone depletion has resulted in more UV radiations on earth.
17. (c) A is true but R is false.
Explanation: The colour of copper sulphate solution changes when iron nail is kept immersed in it due to the displacement reaction taking place between iron and copper leading to formation of iron sulphate. Thus assertion is true, but reason is false.
18. (c) A is true but R is false.
Explanation: A is true but R is false.
19. (a) Both A and R are true and R is the correct explanation of A.
Explanation: Both A and R are true and R is the correct explanation of A.
20. (a) Both A and R are true and R is the correct explanation of A.
Explanation: Both A and R are true and R is the correct explanation of A.

Section B

21. i. With sodium metal, sodium ethoxide is formed.

$$2\text{CH}_3\text{CH}_2\text{OH} + 2\text{Na} \rightarrow 2\text{CH}_3\text{CH}_2\text{ONa} + \text{H}_2$$
- ii. With alkaline potassium permanganate, ethanol is oxidised to ethanoic acid.

$$\xrightarrow[\text{H}_2\text{SO}_4]{\text{KMnO}_4 \text{ dil.}}$$

$$\text{CH}_3\text{CH}_2\text{OH} + 2[\text{O}] \rightarrow \text{CH}_3\text{COOH} + \text{H}_2\text{O}$$
22.
 - The internal fertilization process occurs within the body of female whereas, in external fertilization, fusion of sperm and egg occurs externally of the female body.
 - After the internal fertilization, egg will come out of the body having a thick shell whereas, in external fertilization, eggs are produced with thin tertiary membrane or without membrane.
 - External fertilization needs water, whereas internal fertilization does not need water to fertilize.
 - Organisms involved in external fertilization have mobile male gametes with flagella, whereas organisms involved in internal fertilization have immobile male gametes.
 - In internal fertilization, wastage of gametes is lower, whereas wastage of gametes is higher in external fertilization.

CHARITABLE COACHING CENTRE

- Organisms that involved in internal fertilization produce lower number of gametes, whereas organisms involved in external fertilization produce a large number of gametes.
- Survival of organisms that involved in internal fertilization is higher than the survival of organisms involved in external fertilization.

23. In multi-cellular organisms like humans, various body parts have specialized in the functions they perform. All the cells within different parts of human body need oxygen but all are not exposed to surrounding environment for intake of oxygen through diffusion. Therefore, process of diffusion is insufficient to meet the oxygen requirements of multi-cellular organisms like human.

OR

Bowman's capsule and glomerulus have semipermeable walls. The glomerulus, is a tuft of capillaries contained in Bowman's capsule. The water and dissolved substances (wastes and useful) are filtered into the Bowman's capsule and from here they are sent into the tubule. Thus, both the structures act as filtering apparatus.

24. $h_1 = 7\text{cm}, u = -27\text{cm}, v = ?, f = -18\text{cm}$ (concave mirror)

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

+1, we have

$$\frac{1}{v} - \frac{1}{(-27)} = \frac{1}{-18}$$

$$\frac{1}{v} = \frac{1}{-18} - \frac{1}{27}$$

$$\frac{1}{v} = \frac{-3+2}{54} = \frac{-1}{54}$$

$$v = -54\text{cm}$$

or $m = \frac{h_2}{h_1} = \frac{v}{u}$

$$-2 = \frac{h_2}{7} \times \frac{-54}{-27}$$

$$-2 = \frac{h_2}{7} \times 2$$

$$-2 = \frac{2h_2}{7}$$

$$-14 = 2h_2$$

$$h_2 = -14\text{cm}$$

Negative sign of h_2 indicates that image is on the same side as that of the object. It is real, inverted and 14cm in size.

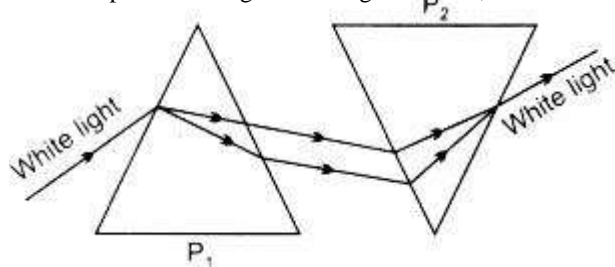
25. Decomposers include micro-organisms such as bacteria and fungi that obtain nutrients by breaking down the remains of dead plants and animals. They help in the breakdown of organic matter or biomass from the body of dead plants and animals into simple inorganic raw materials, such as CO_2 , H_2O , and some nutrients.

OR

In a food chain, if a grasshopper is eaten by a frog, then the energy transfer will be between primary consumer and secondary consumer.

Grasshopper feeds on producers, i.e. the grass and plants which starts the food chain. So, it occupies the level of primary consumer and stores energy in the form of biomass which is taken up by frog by eating grasshopper thus frog becomes the secondary consumer.

26. When white light is refracted through a glass prism, it gets split into its constituting colours at different angles. This phenomenon is called Dispersion of Light. Forming a rainbow,



Least deviated colour is red whereas most deviated colour is violet. When second identical prism is placed in an inverted position with respect to first prism, recombination of the spectrum will take place and white light will be obtained.

Section C

27. The element with an atomic number of 20 is calcium (Ca).

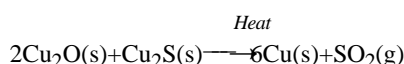
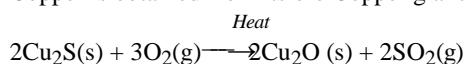
The electronic configuration of calcium is: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$.

Calcium is a metal because it is located in Group 2 (or Group IIA) of the periodic table, which consists of metals known as alkaline earth metals.

The valency of calcium is +2.

The compound that calcium forms with chlorine is calcium chloride. The chemical formula for calcium chloride is CaCl_2 .

28. Copper is obtained from its ore Copper glance (Cu_2S) in two steps:



The Copper thus obtained is refined by the process called "Electrolytic Refining". In this, the impure copper is made anode by

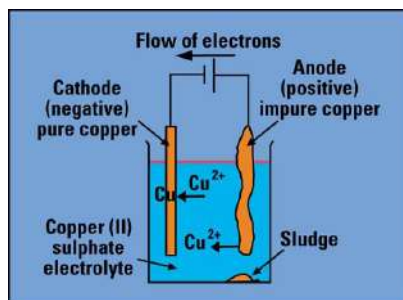
CHARITABLE COACHING CENTRE

connecting to the positive terminal of the battery and a thin plate of pure copper is made cathode by connecting to the negative terminal of the battery. The copper sulphate(acidified) solution is taken in the tank which acts as an electrolyte. When an electric current is passed through the solution, the pure copper from the anode passes into the solution and an equivalent amount of Cu^{2+} ions from the solution are deposited on the cathode as pure copper. Impure copper usually contains the impurities (Fe, Ag, Au) which collect below the anode as "Anode mud".

At cathode : $\text{Cu}^{2+}(\text{aq}) + 2\text{e}^{-} \rightarrow \text{Cu}(\text{s})$

At anode : $\text{Cu}(\text{s}) \rightarrow \text{Cu}^{2+}(\text{aq}) + 2\text{e}^{-}$

The diagram shown below is of electrolytic refining of copper



OR

- i. Elements which contain 1 to 3 electrons in their outermost shell are metals. Elements containing 4 to 7 electrons in their valence shell are non-metals.

Electronic configurations:

$^{23}\text{Na}(\text{Z}=11)=2,8,1$

$^{19}\text{B}(\text{Z}=9)=2,7$

$^{24}\text{C}(\text{Z}=12)=2,8,2$

$^{32}\text{D}(\text{Z}=15)=2,8,5$

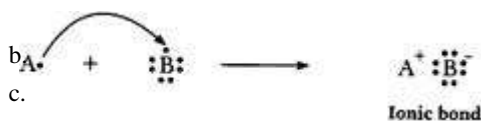
$^{35}\text{E}(\text{Z}=17)=2,8,7$

Hence A and C are metals whereas B, D and E are non-metals.

- ii. Type of bonds

- a. 'A' is metal and 'B' is non-metal, so the bond formed will be ionic.

A=2,8,1 B=2,7



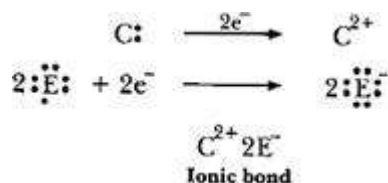
- d. 'A' is metal and 'E' is non-metal, so the bond formed is ionic.

A = 2, 8, 1 B = 2, 7

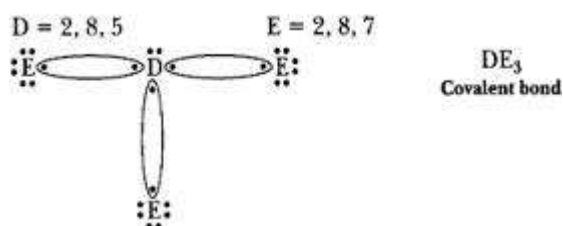


- e. 'C' is metal and 'E' is non-metal, so the bond formed is ionic.

C = 2, 8, 2 E = 2, 8, 7



- f. 'D' is a non-metal and 'E' is also a non-metal, so the bond formed will be covalent.



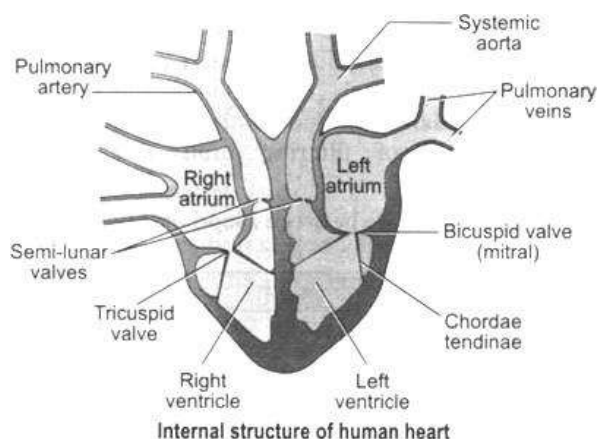
29. The heart lies in the thoracic cavity between the lungs. The heart is also protected within the thorax by the double-layered pericardium, which is fluid filled to prevent friction inside the chest cavity.

The human heart consists of 4 chambers- 2 upper chambers called atria and 2 lower chambers called ventricles.

The two auricles or atria are thin-walled and are separated from each other by a thin inter-atrial septum.

The right atrium receives venous blood (deoxygenated blood having very little O_2) from the entire body through a superior and inferior vena cava. The left smaller atrium receives oxygenated blood from the lungs through pulmonary veins.

The two auricles (atria) are separated from the ventricles by the auriculo-ventricular septum guarded by membranous valves. The valve separating right atrium from right ventricle is called right atrio-ventricular valve or tricuspid valve made up of three flaps. The valve separating left atrium from left ventricle is called left atrio-ventricular valve or mitral valve, formed of two flaps. These valves are attached with fine cords with the papillary muscles of the ventricular wall. These valves only allow blood flow from auricles into ventricles and not in opposite direction.



Both the ventricles are separated from each other by a thick inter-ventricular septum. The wall of left ventricle is much thicker than that of right ventricle. The left ventricle pushes blood into aorta which supplies blood to entire body. The opening of aorta is also guarded by a valve formed of 3 semilunar flaps. The right ventricle pumps venous blood into lungs by a pulmonary artery. Its opening is also guarded by a valve, having 3 semilunar flaps. These valves allow the flow of blood from ventricles into the aorta and not back. Heart is formed of cardiac muscle fibres, which rhythmically contract the heart without feeling fatigue.

30. i. Genetics is the study of mechanism by which variations are created and inherited. These variations are far more in sexual reproduction due to crossing over in meiosis and also new diploid recombination.
ii. Evolution is used for studying the development of new species of organisms from the existing ones through accumulation of variation.

31. i. a) Shaving mirror-Concave mirror
b) Rear view mirror-Convex mirror
c) Reflection in search-lights-Concave mirror.

ii. The three differences are:

- a) Real image can be obtained on screen but a virtual image cannot be obtained.
b) Reflected/Refracted rays actually meet where the real image is formed while for virtual they only appear to meet.
c) A Real image is always inverted while the virtual image is always erect.

32. i. Since, all three conductors are made up of same material therefore their resistivity will be same.

$$R_A = \frac{\rho L}{A}$$

$$R_B = \frac{\rho \left(\frac{L}{2}\right)}{\frac{A}{2}}$$

$$R_C = \frac{\rho \left(\frac{L}{2}\right)}{\frac{A}{2}}$$

a. $\frac{R_A}{R_B} = \frac{\frac{\rho L}{A}}{\frac{\rho \left(\frac{L}{2}\right)}{\frac{A}{2}}}$

$$= \frac{\rho L}{A} \times \frac{A}{2\rho \left(\frac{L}{2}\right)}$$

$$= \frac{\rho L(A)}{A} \times \frac{2}{2\rho \left(\frac{L}{2}\right)}$$

$$= \frac{R_A}{R_B} = 4$$

CHARITABLE COACHING CENTRE

$$\begin{aligned} \text{b. } \frac{R_n}{R_c} &= \frac{A}{\rho L} \\ &= \frac{\frac{2}{A}}{\rho L \times 2 \times A} \\ \frac{R_n}{R_c} &= 1 \end{aligned}$$

- ii. Conductor 'C' has more electrical resistance as its resistivity is more than conductor 'A'.
33. a. Electric power of an electrical device is defined as its rate of consumption of electrical energy.

$$\text{i.e., } P = \frac{E}{t}$$

The SI unit of electrical power is watt (W)

- b. We know,

$$\text{work} = \frac{\text{energy}}{\text{time}}$$

$$\Rightarrow \text{energy} = \text{work} \times \text{time}$$

$$\Rightarrow \text{energy} = 2 \text{ kW} \times 2 \text{ h} = 4 \text{ kWh}$$

$$\text{Now, } 1 \text{ kWh} = 3600000 \text{ joules}$$

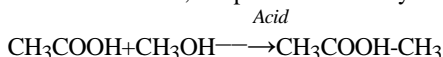
$$\Rightarrow 4 \text{ kWh} = 11,400,000 \text{ joules}$$

$$\therefore \text{Energy consumed} = 4 \text{ kWh or } 11,400,000 \text{ joules.}$$

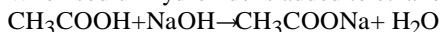
Section D

34. Compound 'C' is ethanoic acid. It reacts with sodium to form sodium ethanoate. Therefore, compound 'R' is sodium ethanoate or sodium acetate. We know that hydrogen gas burns with a pop sound. This reaction can be represented as-
- $$2\text{CH}_3\text{COOH} + 2\text{Na} \rightarrow 2\text{CH}_3\text{COONa} + \text{H}_2$$

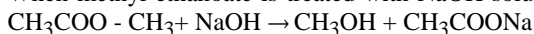
When ethanoic acid reacts with methanol in the presence of an acid, we get (methyl ethanoate) ester which is a sweet-smelling substance. Hence, compound S is methyl ethanoate and A is methanol. This reaction can be represented as-



When sodium hydroxide is added to ethanoic acid, it gives sodium ethanoate and water as given below-

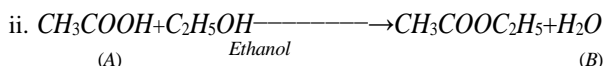


When methyl ethanoate is treated with NaOH solution, it gives back methanol and sodium ethanoate as shown below-



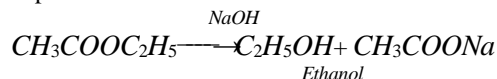
OR

- i. A is ethanoic acid (CH_3COOH). Commonly, known as acetic acid. Its 5% solution in water is used to prepare vinegar, which is used as preservatives for pickles. *Conc. H_2SO_4*

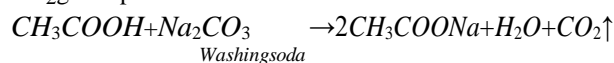


- iii. Compound A (ethanoic acid) can be obtained from compound B (ethyl ethanoate) by the action of a base.

- iv. Saponification.



- v. CO_2 gas is produced. This reaction is same as reaction of acid with metal carbonate.



35. a. **Reproduction**- It is a biological process by which new individual organisms (offspring) are produced from their parents. Types of reproduction:-

(i) Asexual reproduction

(ii) Sexual reproduction

b.	Unicellular Organisms	Multicellular Organisms
	Only one parent is required for reproduction.	Two parents are required for reproduction.
	It is a fast process of reproduction.	Slower than unicellular organisms.
	No specialized cells are required for reproduction.	Specialized cells are required for reproduction.

OR

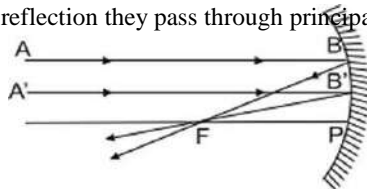
ii. Drooping of leaves in touch-me-not plant is an example of growth-independent movement which occurs due to change in turgour pressure of the cells. But attaching of pea plant to a support with help of tendrils is a growth dependent movement. The pea plants develop tendrils which are sensitive to touch. When they come in contact with a support they encircle the support and cling to them. Auxin hormone plays an important role. Auxin synthesized at the tip diffuses to parts away from the support, so those parts away from support grow faster than those parts in contact. So the tendrils encircle the support.

- iii. Drooping of leaves in touch-me-not plant is an example of seismonastic movement whereas attaching of pea plant to a support with the help of tendrils is an example of curvature movement.

36. Images formed by concave mirror.

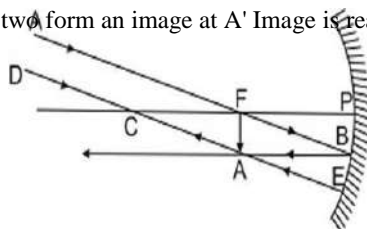
i. Object at Infinity. Two cases arise:

- a. When mirror is in parallel plane to the object. In such a case, rays from infinity come parallel to principal axis. After reflection they pass through principal focus F (Rule 1). Image is extremely small, it is real, inverted and at principal focus.



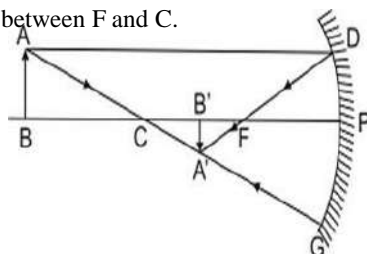
Object at infinity, real extremely diminished image is formed at principal focus.

- b. When mirror is inclined so that the rays strike the mirror obliquely. The ray AB passing through F after reflection goes parallel to principal axis towards BA' (Rule 2). Another ray DE through C striking the mirror at E is reflected back. The two form an image at A' . Image is real, inverted, extremely diminished and at F .



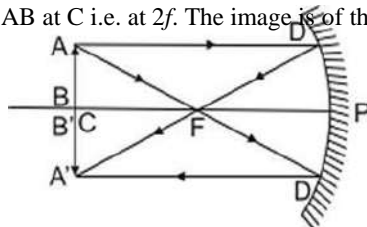
Object at infinity, image at F . It is real, inverted, very much diminished.

- c. Object beyond C . A ray AD from A parallel to principal axis after reflection passes through F (Rule 1). Another ray from A through C , ray AG is reflected back along the same path (Rule 3), forming real, diminished, inverted image of AB is formed at $A'B'$, between F and C .



Object beyond C , a real, inverted diminished image between F and C , inverted at C and is of same size as that of object.

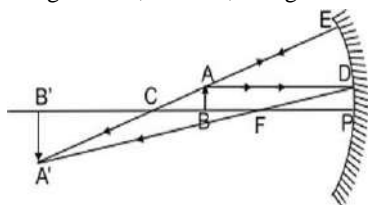
- d. Object at C i.e. at $2f$. A ray AD from A parallel to principal axis after reflection from mirror passes through F (Rule 1). Another ray AD' from A through F , goes parallel to principal axis i.e. towards $D'A'$ (rule 2) forming real, inverted image of AB at C i.e. at $2f$. The image is of the same size as the object.



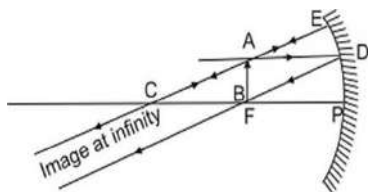
Object at C , Image is also at C . It is real.

- e. Object between F and C (f and $2f$) A ray AD from object going parallel to principal axis is reflected towards F (Rule 1). Another ray AE through C is reflected back (Rule 3) forming image of A at A' . Similarly image of B is formed at B' .

Image is real, inverted, enlarged and beyond $C(2f)$ i.e. as shown in fig.

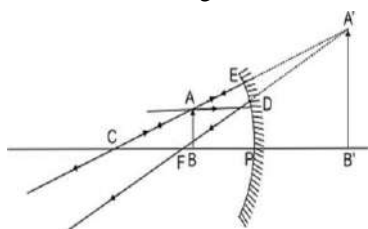


- f. Object at F. A ray AD parallel to principal axis passes through F. Another ray AE strikes the mirror normally at E is reflected back as it passes through C (Rule 3). They form image of object AB at infinity. The image is very much enlarged and is real and inverted.



Object at E. Real, inverted, extremely enlarged image is formed at infinity.

- g. Object between F and P. A ray AD from A goes parallel to principal axis after reflection passes through F (rule 1). Another ray AE striking the mirror normally through C is reflected back (rule 3). They form virtual image of the object behind the mirror. The image is erect and enlarged.



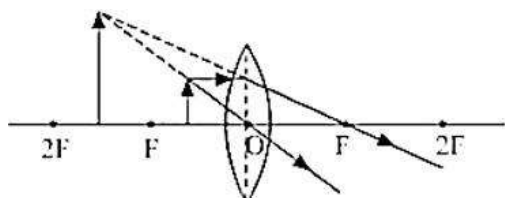
Object between F and P. An erect, enlarged, virtual image is formed behind the mirror.

Images Formed by a Concave mirror

Position of Object	Position of Image	Size of the Image	Nature of Image
At infinity	At focus F	Highly diminished	Real and inverted
At C	At C	Same size	Real and inverted
At F	At infinity	Highly Enlarged	Real and inverted
Beyond C	Between F and C	Diminished	Real and inverted
Between F and C	Beyond C	Enlarged	Real and inverted
Between P and F	Behind the mirror	Enlarged	Virtual and erect

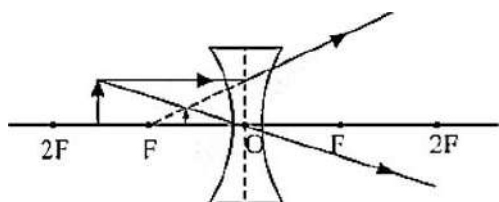
OR

- i. When an object is placed between the optical center and principal focus of a convex lens then image formed beyond $2F$ on the opposite side.



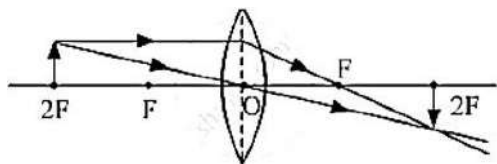
Since the image formed is virtual and erect so sign of magnification will be positive. Moreover, the image formed is magnified therefore the absolute value of magnification will be greater than one.

- ii. When an object is placed anywhere in front of a concave lens.



Since the image formed is virtual and erect so sign of magnification will be positive. Moreover, the image formed is diminished therefore the absolute value of magnification will be less than one.

iii. When an object is placed at $2F$ of a convex lens then the image is formed at $2F$ opposite side of the mirror.



Section E

37. Read the text carefully and answer the questions:

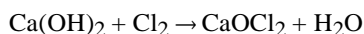
Salt of a strong acid and strong base is neutral with a pH value of 7. NaCl common salt is formed by a combination of hydrochloride and sodium hydroxide solution. This is the salt that is used in food. Some salt is called rock salt, bed of rock salt was formed when seas of bygone ages dried up. The common salt thus obtained is an important raw material for various materials of daily use, such as sodium hydroxide, baking soda, washing soda, and bleaching powder.

(i) Carbonic acid does not form an acidic salt.

(ii) Sodium bicarbonate, commonly known as baking soda or bicarbonate of soda, is a chemical compound with the formula NaHCO_3 .

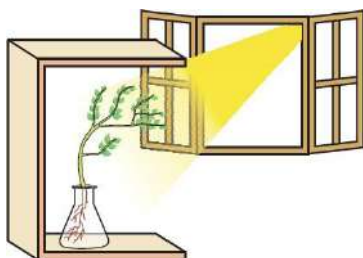
OR

Ca(OH)_2 treatment with chlorine to obtain bleaching powder.



38. Read the text carefully and answer the questions:

Fill a conical flask with water. Cover the neck of the flask with a wire mesh. Keep two or three freshly germinated bean seeds on the wire mesh. Take a cardboard box which is open from one side. Keep the flask and wire mesh in the box in such a manner that the open side of the box faces light coming from a window as shown in the given figure. After two or three days, you will notice that the shoots bend towards light and roots away from light. Now turn the flask so that the shoots are away from light and the roots towards the light. Leave it undisturbed in this condition for a few days. Plants show tropism in response to other stimuli as well. The roots of a plant always grow downwards while the shoots usually grow upwards and away from the earth. This upward and downward growth of shoots and roots, respectively, in response to the pull of earth or gravity, is obviously, geotropism.



(i) These activities show tropic movements in plants due to their growth.

(ii) Yes, old parts of the shoot and root change direction and there is a difference in the direction of new growth.

(iii) Movement is related to stimulus i.e. plant organs either move towards the source of stimulus or away from it. Stimuli that cause movements in plants are gravity, light, touch, water, and chemical substances.

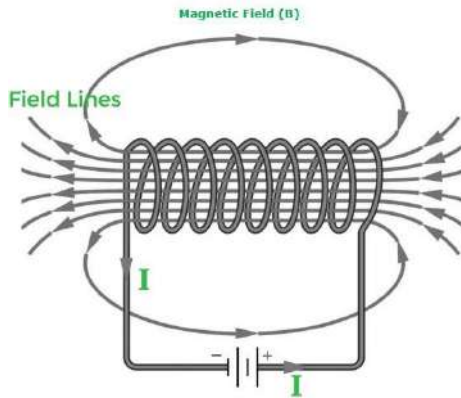
OR

Movements in the organs of a plant due to gravity are known as geotropism. This causes the roots to bend down towards the soil.

39. Read the text carefully and answer the questions:

An insulated copper wire wound on a cylindrical cardboard tube such that its length is greater than its diameter is called a solenoid. When an electric current is passed through the solenoid, it produces a magnetic field around it. The magnetic field produced by a current-carrying solenoid is similar to the magnetic field produced by a bar magnet. The field lines inside the solenoid are in the form of parallel straight lines. The strong magnetic field produced inside a current-carrying solenoid can be used to magnetize a piece of a magnetic material like soft iron when placed inside the solenoid. The strength of the magnetic field

produced by a current-carrying solenoid is directly proportional to the number of turns and strength of the current in the solenoid.



- (i) Magnetic field inside the infinite solenoid is uniform. Hence it is the same at all points.
- (ii) The end of the current carrying solenoid at which the current flows anti-clockwise behaves as a north pole while that end at which the direction of current is clockwise behaves as a south pole and this is according to the clockwise rule.
- (iii) For a long solenoid, magnetic field $B \propto In$; where I is the flowing current and n is number of turns per unit length in the solenoid. Therefore, in the given case magnetic field will remain unchanged.

OR

For a solenoid, if we imagine gripping the solenoid with your right hand so that your curl fingers follow the direction of the current then your thumb will point towards the north end of the electromagnet.