SAMPLE PAPER TEST 05 FOR BOARD EXAM 2025

SUBJECT: SCIENCE **(QUESTION PAPER)** **MAX. MARKS: 80**
CLASS : X **DURATION: 3 HRS**

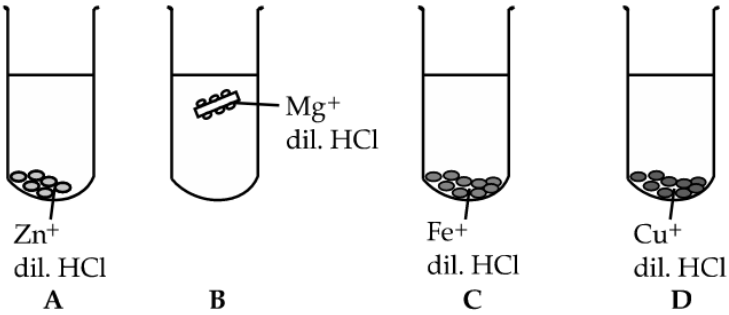
General Instruction:

1. This Question Paper has 5 Sections A-E.
2. **Section A** has 20 MCQs carrying 1 mark each.
3. **Section B** has 5 questions carrying 02 marks each.
4. **Section C** has 6 questions carrying 03 marks each.
5. **Section D** has 4 questions carrying 05 marks each.
6. **Section E** has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

SECTION – A

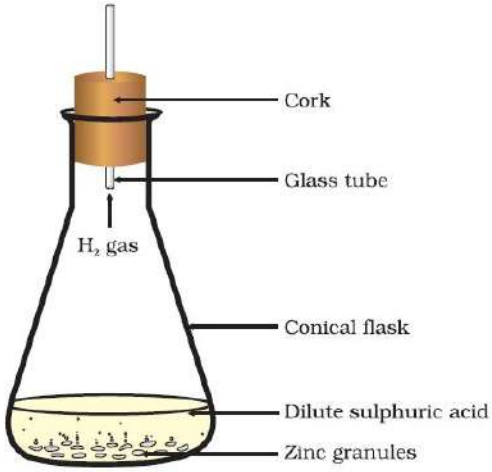
Questions 1 to 20 carry 1 mark each.

1. The diagram shows the reaction between metal and dil. acid. What is the reason for different behaviour of Mg in test tube B?



(a) Mg is lighter element than dil. HCI.
(b) Mg reacts with dil. HC1 to produce H_2 gas which helps in floating.
(c) Mg reacts with dil. HC1 to produce N_2 gas which helps in floating.
(d) Mg reacts with dil. HCI to produce CO_2 gas which helps in floating.

2. Observe the given figure carefully and select the incorrect options.



(i) The colour of solution changes to green due to formation of ZnSO4.
(ii) The flask will be warm due to release of heat.
(iii) Evolution of H_2 gas in the reaction.
(iv) Formation of precipitate.
(a) (i) and (ii) (b) (ii) and (iii) (c) (i) and (iii) (d) (i) and (iv)

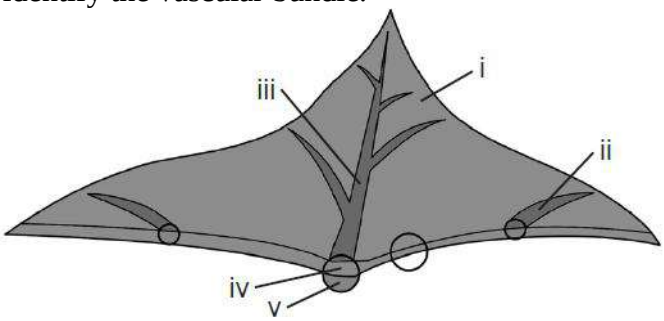
3. Which among the following is not a base?
(a) NaOH (b) KOH (c) NH_4OH (d) C_2H_5OH

4. Ethanol reacts with Na to form
(a) $CH_3ONa + H_2$ (b) $C_2H_5ONa + H_2$
(c) $CH_3ONa + H_2O$ (d) $C_2H_6ONa + H_2O$

5. Four student- 'A', 'B', 'C' and D measured pH value of water, lemon juice and sodium bicarbonate solution. The student who has expressed correct pH values in decreasing order.
(a) Water > lemon juice > Sod. bicarbonate solution
(b) Lemon juice > Water > Sod. bicarbonate solution
(c) Sod. bicarbonate solution > water > lemon juice
(d) Water > Sod. bicarbonate solution > lemon juice

6. In these reactions
$ZnO + 2HCl \rightarrow ZnCl_2 + H_2O$,
$ZnO + 2NaOH \rightarrow Na_2ZnO_2 + H_2O$
zinc oxide behaves as
(a) acidic oxide (b) basic oxide (c) neutral oxide (d) amphoteric oxide

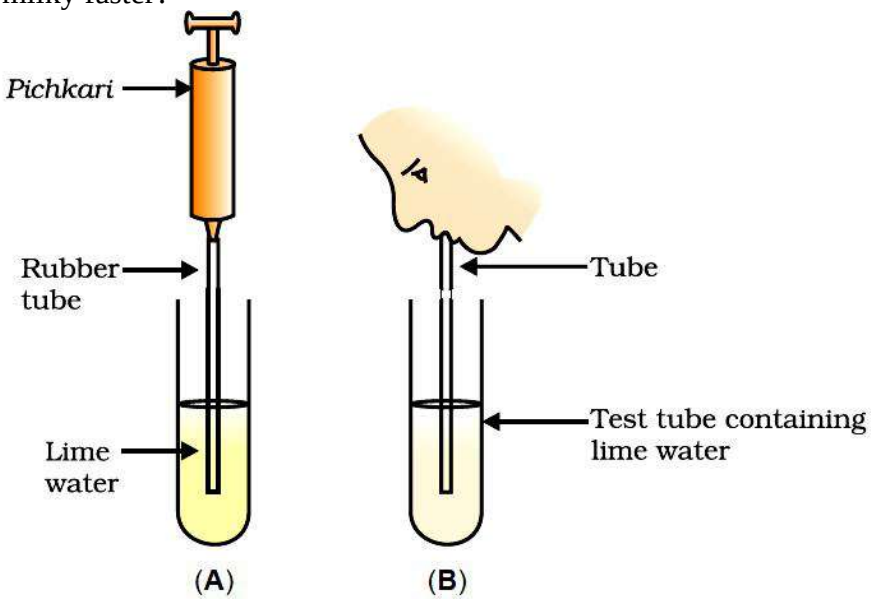
7. In the given diagram, identify the vascular bundle.



(a) (i) and (iv) (b) (ii) and (v) (c) (iv) and (v) (d) only (iii)

8. In an electric circuit ammeter and voltmeter are connected in
(a) series and parallel respectively
(b) both are connected in series
(c) both are connected in parallel
(d) parallel and series respectively

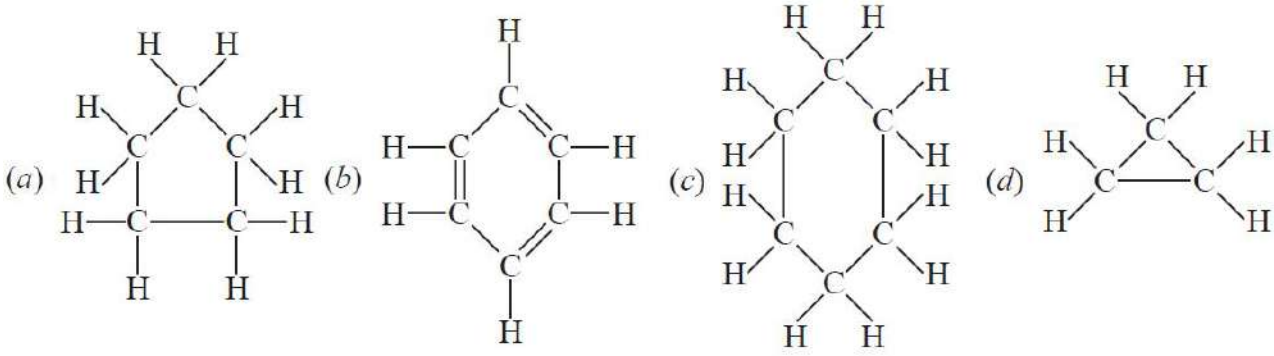
9. Observe the experimental set up shown below. In which of the test tube/test tubes, the lime water will get milky faster?



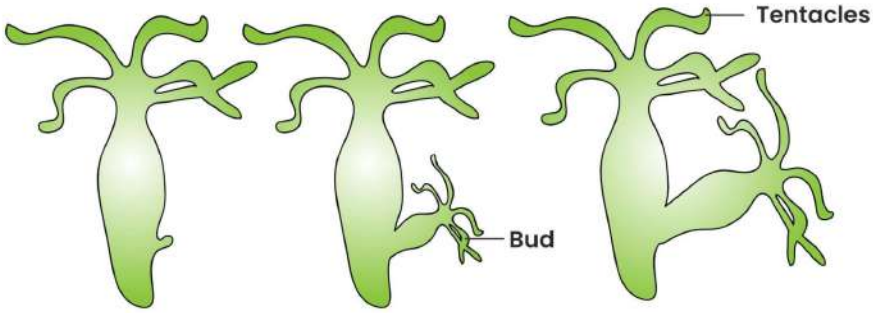
(a) Test tube A (b) Test tube B
(c) Both test tubes will take same time. (d) Milkiness won't appear in test tube A

10. Mendel selected garden pea plant for hybridisation experiments for which of the following reasons?
I. Pea plants have short life cycle and are easy to maintain.
II. Pea plants are cross pollinating plants.
III. The flowers of pea plants are unisexual.
IV. Pea plants have distinct, easily observable contrasting traits.
(a) I, II and IV (b) I, III and IV (c) I and III (d) I and IV

11. Which of the following is a cyclic unsaturated hydrocarbon called Benzene?

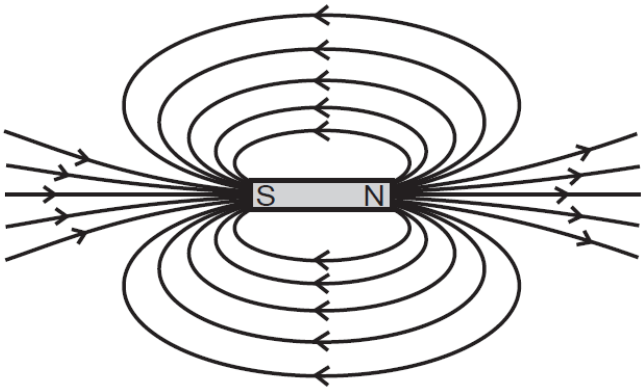


12. The diagram shown below depicts budding in Hydra. Which type of cells are used by Hydra for reproduction in the process of budding?



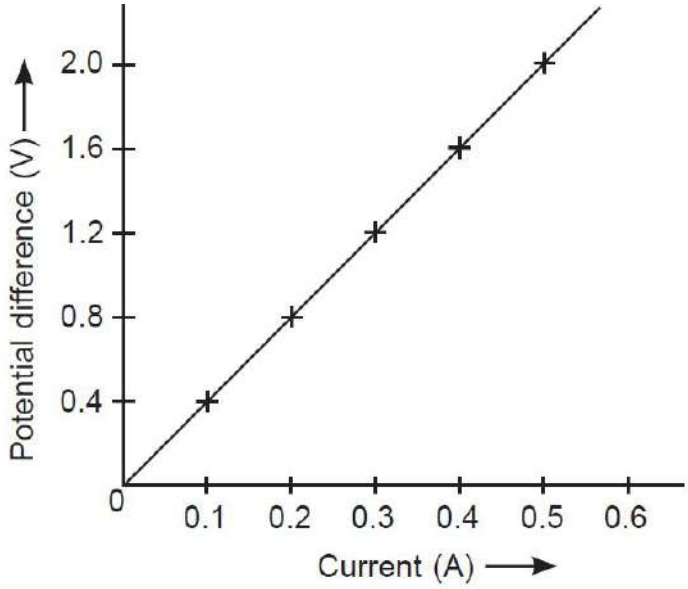
(a) Stem cells (b) Regenerative cells
(c) Endothetial cells (d) Nerve cells

13. The given diagram shows the field lines around a bar magnet.



The properties of magnetic field lines are given below. Select the correct options:
(i) Magnetic field lines emerge from the south pole and enter the north pole.
(ii) Magnetic field lines don't intersect each other.
(iii) Magnetic field lines have only magnitude and are scalar in nature.
(iv) Magnetic field lines form closed and continuous curve.
(a) (i) and (ii) (b) (ii) and (iii) (c) (i) and (iv) (d) (ii) and (iv)

14. The given diagram is a V–I graph for nichrome wire. Which of the following statement/s verify/verifies Ohm's law?



(i) V is diretly proportional to the I
(ii) As I increases through a wire, V increases linearly
(iii) R is directly proportional to I
(iv) R always remains constant
(a) (i) and (ii) (b) (i) and (iv) (c) (iii) and (iv) (d) only (i)

15. Swallowing, coughing, sneezing and vomiting is controlled by
(a) Reflex action (b) Fore brain (c) Mid brain (d) Hind brain

16. A current through a horizontal power line flows in east to west direction. What will be the direction of magnetic field at a point directly below it and at a point directly above it?
(a) Below the wire – South to North
Above the wire – North to South
(b) Below the wire – North to South
Above the wire – South to North
(c) South to North in both the cases
(d) North to South in both the cases

DIRECTION: In the question number 17 and 20, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**.
Choose the correct option
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)
(b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

17. Assertion (A): Ammonium hydroxide is weak base.
Reason (R): Phenolphthalein becomes pink in NH4OH but becomes colourless if kept for long time.

18. Assertion (A): Paramaecium is a unicellular organism.
Reason (R): Paramaecium takes in food at a specific spot which is moved there by cilia.

19. Assertion (A): Acquired trait cannot be passed on from one generation to next generation.
Reason (R): Inaccuracy during DNA copying of acquired trait is minimum.

20. Assertion (A): The direction of flow of electric current is same as the direction of flow of electrons.
Reason (R): Electric current can flow through a closed circuit only.

SECTION – B

Questions 21 to 26 carry 2 marks each.

21. Name the type of chemical reaction represented by the following equation:

(a) $CaO + H_2O \longrightarrow Ca(OH)_2$

(b) $2Pb(NO_3)_2 \xrightarrow{heat} 2PbO + 4NO_2 + O_2$

OR

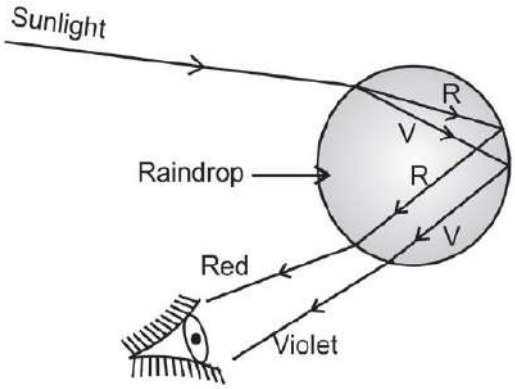
What is meant by: (a) Oxidation reaction. (b) Reduction reaction.
Write balanced chemical equation for each reaction.

22. How is the movement of leaves of Chhui-mui plant different from the movement of a shoot towards light?

23. Name two main parts of hind brain and state the functions of each.

24. (a) How does water enter continuously into the root xylem?
(b) Why do fish die when taken out of waster?

25. Explain the phenomena observed in the diagram.



OR

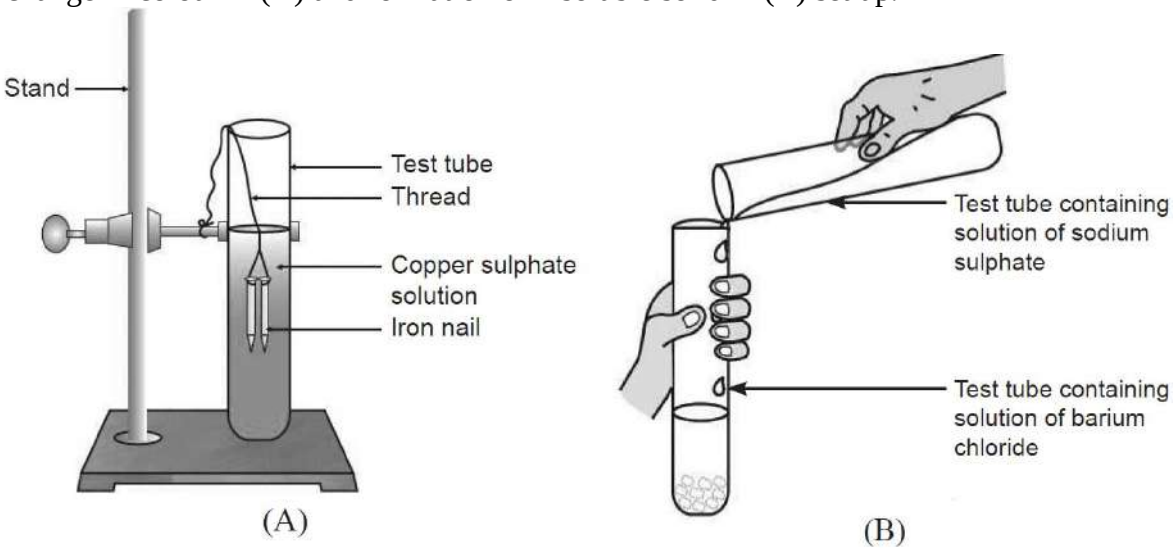
Why do stars twinkle? Explain with the help of a diagram.

26. (a) What do you call the functional unit of environment which comprises both living and non-living components?
(b) What will be the impact on ecosystem if microorganisms are removed from the environment?

SECTION – C

Questions 27 to 33 carry 3 marks each.

27. A student observes the reactions taking place in (A) and (B). Among other changes, he observed the change in colour in (A) and formation of insoluble solid in (B) set up.



(a) How will you differentiate between these reactions in the set up (A) and (B)?
(b) Write one more example of each only in the form of a chemical equation.

28. What happens when 'X' reacts with H2 in presence of Ni or Pd to form 'Y'? 'Y' on reaction with chlorine in presence of sunlight gives 'Z'. Identify X, Y and Z. What type of reaction is Y to 'Z'?

29. Various events take place during the process of photosynthesis. Do these events take place one after the other immediately? Write the events which occur during this process.

30. (a) What is the basic cause of refraction of light?
(b) State two situations where no refraction occurs.
(c) Draw a diagram showing two refractions through a rectangular glass slab.

31. (a) Priya is unable to read the letters written in doctor's room beyond 80 cm. What is the reason for this?
(b) What is nature and power of the lens required to correct the problem?

32. (a) Describe activity with labelled diagram to show that a current carrying conductor experience a force in a magnetic field.
(b) State the rule to determine the direction of force.

OR

What is short circuiting? State one factor/condition that can lead to it. Name a device in the household that acts as a safety measure for it. State the principle of its working.

33. (a) What will happen to the dead plants, animals and the garbage in the absence of decomposers?
(b) Will the natural replenishment of the soil take place even if micro-organisms are not there.

SECTION – D

Questions 34 to 36 carry 5 marks each.

34. (a) Your mother prepared a cake for you but you found that the cake was bitter in taste. Which ingredient has she added which made the cake bitter? Suggest what she would have added in the dough of the cake. Give reason. Write one more use of this compound.
(b) A student observes that a young child while playing on the swing is stung by a wasp. She started crying. Her teacher immediately applied some white paste on the stung area. Name the white substance and why did her teacher apply it on the affected area?
(c) Identify the acid and the base whose combination forms the common salt that you use in your food. Write its formula and chemical name. What will be the pH of this salt?

OR

(a) Identify the substance that is used to prepare false ceilings and used by doctors for setting fractured bones. How is this substance prepared? What happens when it is mixed with water and allowed to stand?
(b) Fresh milk has a pH of 6. How do you think the pH will change as it becomes sour? Explain. Why sour substances should not be kept in brass and copper vessels?
(c) The colour of copper sulphate crystals changes on heating. Explain why?

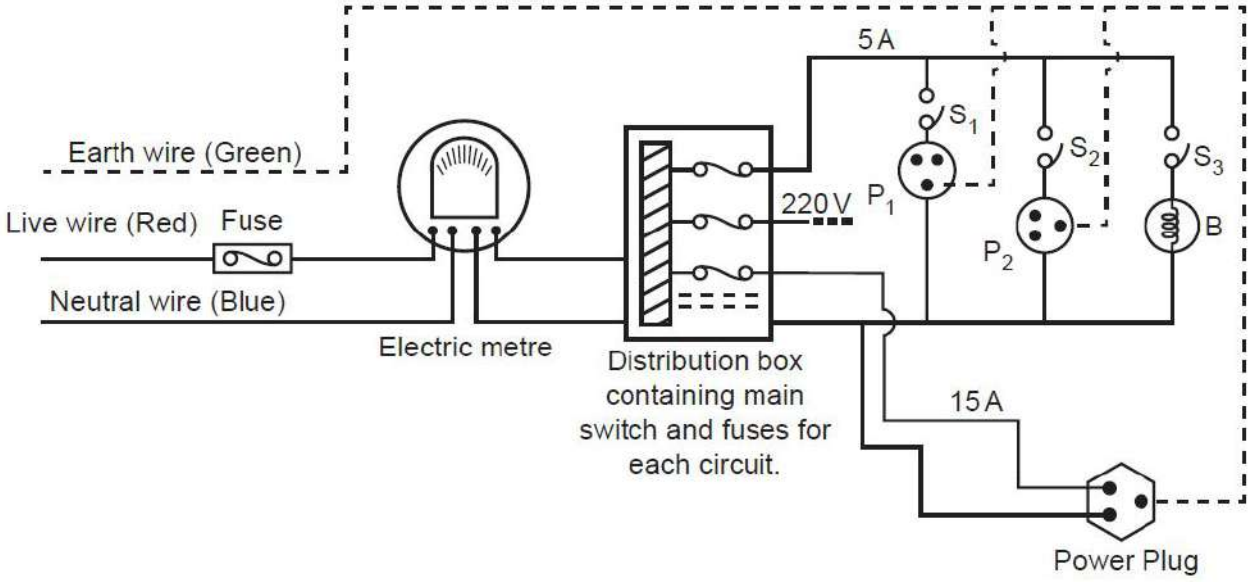
35. (a) Draw a sectional view of human female reproductive system and label the parts where:
(i) eggs develop.
(ii) fertilization takes place
(iii) fertilized egg gets implanted.
(b) Describe, in brief, the changes that the uterus undergoes:
(i) to receive the zygote
(ii) if zygote is not formed.

OR

Answer the following:
(a) Name any four asexual methods of reproduction.
(b) Explain the diagram by which an Amoeba reproduces.

(c) Give one difference between fission and fragmentation.

36. Study the schematic diagram of one of the common domestic circuits given below:



(a) What is the potential difference between live and neutral wire?
(b) The domestic appliances are connected across the line and neutral wires. These appliances are connected parallel to each other. Explain.
(c) If an electric kettle connected to 5A switch consumes 2 kW when operated at 220 V, what will happen?
(d) Meenal uses the following electric appliances at home.
(i) Refrigerator of rating 400 W for 24 hours.
(ii) Two electric fans at rating 80 W each for 8 hours every day.
(iii) Three electric tubes of rating 18 W for 8 hours everyday.
Calculate the electricity bill of Meenal's house for the month of September if the cost of electric energy per unit is Rs. 4.

OR

(a) What happens to the force acting on current carrying conductor placed in magnetic field when:
(i) Direction of magnetic field is reversed without changing the direction of current.
(ii) Direction of the current is reversed without changing the direction of magnetic field.
(iii) Direction of both the current and the magnetic field is reversed.
(b) What does the divergence of magnetic field lines near the ends of a current carrying straight solenoid indicate?

SECTION – E(Case Study Based Questions)

Questions 37 to 39 carry 4 marks each.

37. The metal activity series lists metals according to their reactivity. The more reactive metals are placed at the top of the list. While the less reactive metals are placed near the bottom of the series. Less reactive metals like silver, gold platinum occur in their native form along with the earthy impurities. Element or compounds which occur naturally in the earth's crust are known as minerals. Minerals from which metals can be extracted are known as ores. Different techniques are used for obtaining metals falling in metals of low reactivity, metals of medium reactivity and metals of high reactivity.
(a) Why is it necessary to remove the impurities from ore before processing?
(b) Name an ore of mercury and copper.
(c) Which reduction process is used to obtain the following metals from their compounds? Explain.
(i) Metal X which is low in reactivity series
(ii) Metal Y which is in the middle of reactivity series
(iii) Metal Z which is high in the reactivity series

OR

(c) During extraction of metals, electrolytic refining is used to obtain pure metals. Draw a well labelled diagram to show electrolytic refining of copper. Also write the reactions taking place at cathode and anode.

38. Reetu knows that DNA is the carrier of the genetic information from one generation to generation. Reetu studied that in sexual reproduction, male and female gametes fuse during fertilization to form a zygote. This zygote then develops into male or female offspring. But how the sex of the offspring is determined. We know that both the parents contribute equally to the DNA.

(a) "We cannot pass on to our progeny the experiences and skills like dancing, singing etc. acquired during our life time." Justify the statement giving reason and example.

(b) How do variations occur in an offspring?

(c) 'Different species use different strategies to determine sex of a newborn individual. It can be environmental cues or genetically determined'. Explain the statement by giving examples for each strategy.

OR

(c) Transmission of genetic characteristic from one generation to the next is termed as inheritance. Give the basic features of mechanism of inheritance.

39. The below images are of optical instruments. These instruments use a combination of lenses which increases the sharpness of the image. The image produced by using a combination of lenses is also free from many defects which otherwise occur while using a single lens.

(a) Alankrita was not able to see clearly so she went to an optician. The optician prescribes the corrective lens +2.0 D and +2.5 D for the left and right eye respectively. Find the focal length of each lens. Are the prescribed lenses diverging or converging?

(b) If the image formed by a lens for all positions of the object placed in front of it is always virtual, erect and diminished, state the type of the lens. When a convex lens of power + 5D is placed in contact with a concave lens of power –2D, what is the power of combination?

(c) At what distance from a concave lens of focal length 30 cm, a 5 cm tall object be placed so as to obtain its image at 20 cm from the lens? Also calculate the size of the image formed.

OR

(c) A converging lens can form a magnified inverted image of an object as well as magnified erect image of an object placed infront of it. Draw ray diagrams to justify this statement stating the position of the object with respect to the lens in each case.

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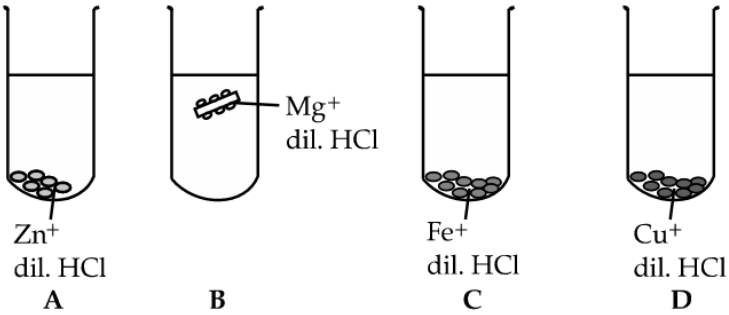
SECTION – A

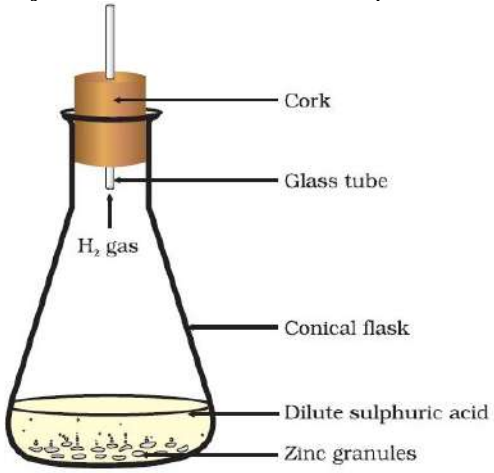
Questions 1 to 20 carry 1 mark each.

1. The diagram shows the reaction between metal and dil. acid. What is the reason for different behaviour of Mg in test tube B?



(a) Mg is lighter element than dil. HCI.
(b) Mg reacts with dil. HC1 to produce H_2 gas which helps in floating.
(c) Mg reacts with dil. HC1 to produce N_2 gas which helps in floating.
(d) Mg reacts with dil. HCI to produce CO_2 gas which helps in floating.
Ans: (b) Mg reacts with dil. HC1 to produce H_2 gas which helps in floating.
All metals reacts with dil. HCl and dil. sulphuric acid except for few less reactive metals like copper, mercury, gold, silver, etc. Since, Zn, Fe and Cu are less reactive, so they do not react with acid. Mg on the other hand is more reactive, so it reacts with HC1 to form hydrogen gas, which helps in floating.

2. Observe the given figure carefully and select the incorrect options.



(i) The colour of solution changes to green due to formation of ZnSO4.

(ii) The flask will be warm due to release of heat.
(iii) Evolution of H_2 gas in the reaction.
(iv) Formation of precipitate.
(a) (i) and (ii) (b) (ii) and (iii) (c) (i) and (iii) (d) (i) and (iv)
Ans. (d) (i) and (iv)
$Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2 \uparrow$
Bubbles of the hydrogen gas will be formed and the conical flask will be warm as the reaction is exothermic. $ZnSO_4$ is colourless.

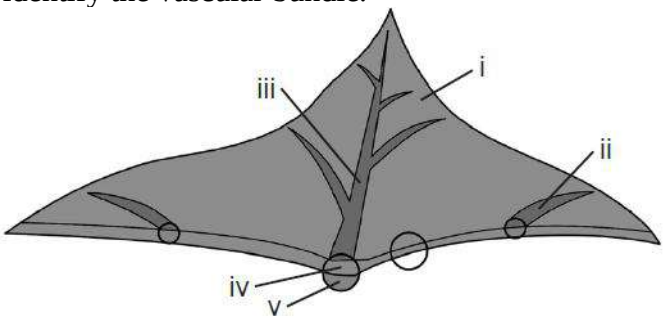
3. Which among the following is not a base?
(a) NaOH (b) KOH (c) NH_4OH (d) C_2H_5OH
Ans. (d) C_2H_5OH
It does not give OH^- In aqueous solution.

4. Ethanol reacts with Na to form
(a) $CH_3ONa + H_2$ (b) $C_2H_5ONa + H_2$
(c) $CH_3ONa + H_2O$ (d) $C_2H_6ONa + H_2O$
Ans. (b) $C_2H_5ONa + H_2$
$2C_2H_5OH + 2Na \longrightarrow 2C_2H_5ONa + H_2$

5. Four student- 'A', 'B', 'C' and D measured pH value of water, lemon juice and sodium bicarbonate solution. The student who has expressed correct pH values in decreasing order.
(a) Water > lemon juice > Sod. bicarbonate solution
(b) Lemon juice > Water > Sod. bicarbonate solution
(c) Sod. bicarbonate solution > water > lemon juice
(d) Water > Sod. bicarbonate solution > lemon juice
Ans. (c) Sod. bicarbonate solution > water > lemon juice

6. In these reactions
$ZnO + 2HCl \rightarrow ZnCl_2 + H_2O$,
$ZnO + 2NaOH \rightarrow Na_2ZnO_2 + H_2O$
zinc oxide behaves as
(a) acidic oxide (b) basic oxide (c) neutral oxide (d) amphoteric oxide
Ans. (d) amphoteric oxide

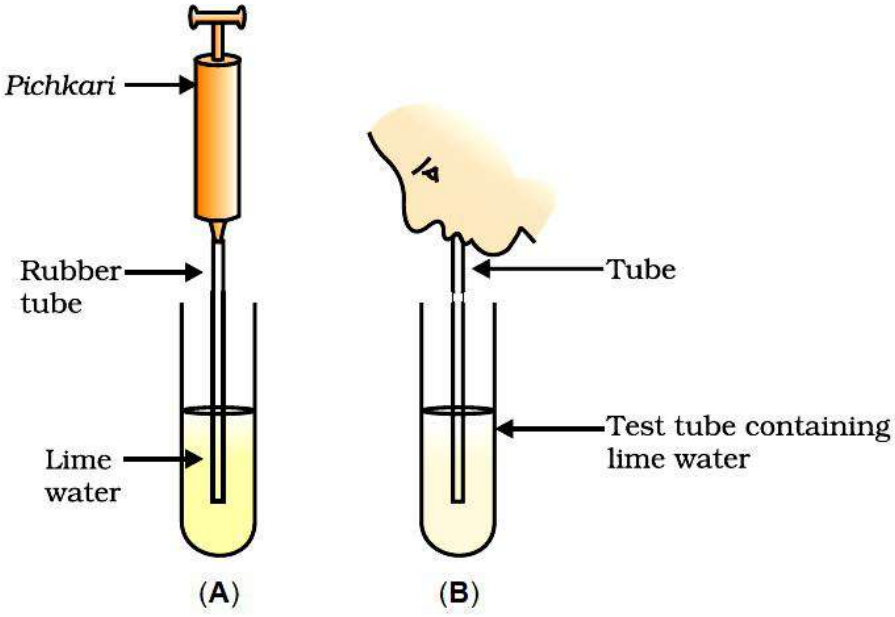
7. In the given diagram, identify the vascular bundle.



(a) (i) and (iv) (b) (ii) and (v) (c) (iv) and (v) (d) only (iii)
Ans. (c) (iv) and (v)

8. In an electric circuit ammeter and voltmeter are connected in
(a) series and parallel respectively
(b) both are connected in series
(c) both are connected in parallel
(d) parallel and series respectively
Ans. (a) series and parallel respectively

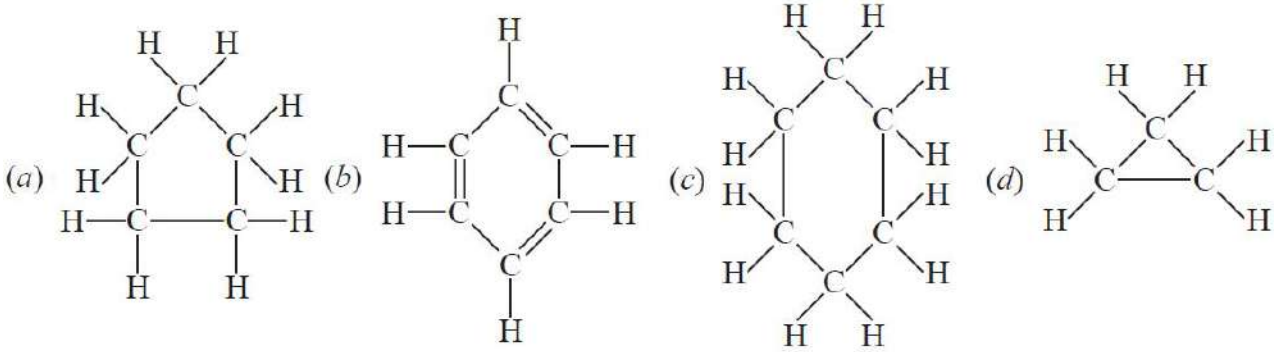
9. Observe the experimental set up shown below. In which of the test tube/test tubes, the lime water will get milky faster?



(a) Test tube A
(b) Test tube B
(c) Both test tubes will take same time.
(d) Milkiness won't appear in test tube A
Ans. (b) Test tube B

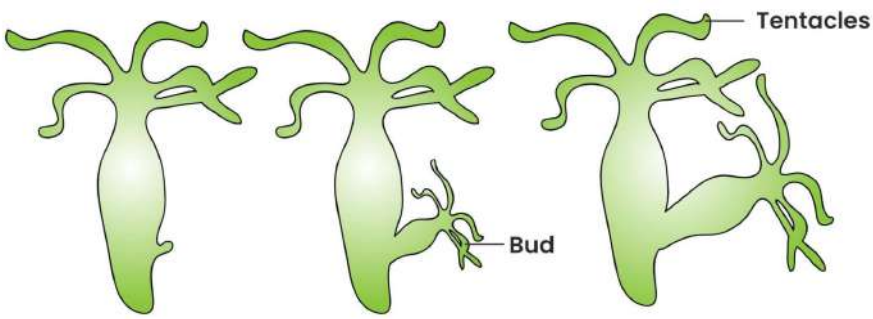
10. Mendel selected garden pea plant for hybridisation experiments for which of the following reasons?
I. Pea plants have short life cycle and are easy to maintain.
II. Pea plants are cross pollinating plants.
III. The flowers of pea plants are unisexual.
IV. Pea plants have distinct, easily observable contrasting traits.
(a) I, II and IV (b) I, III and IV (c) I and III (d) I and IV
Ans. (a) I, II and IV
Pea plants are self-pollinating and flowers of pea plants are bisexual.

11. Which of the following is a cyclic unsaturated hydrocarbon called Benzene?



Ans. (b)

12. The diagram shown below depicts budding in Hydra. Which type of cells are used by Hydra for reproduction in the process of budding?



(a) Stem cells (b) Regenerative cells
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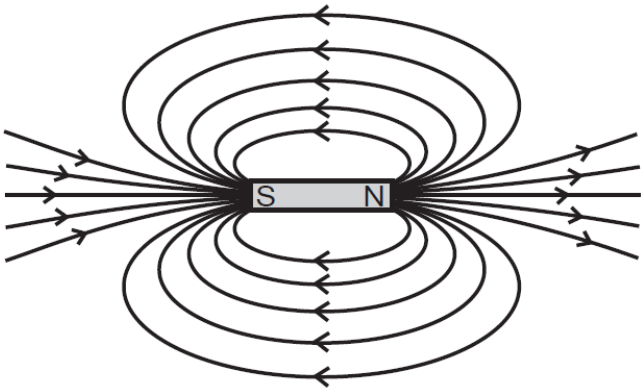
Ans. (b) Regenerative cells

13. The given diagram shows the field lines around a bar magnet.



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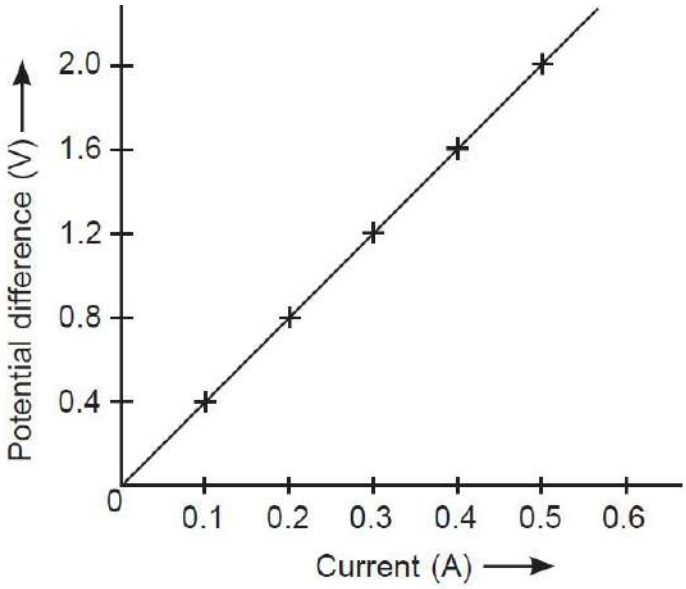
(ii) Magnetic field lines don't intersect each other.
(iii) Magnetic field lines have only magnitude and are scalar in nature.
(iv) Magnetic field lines form closed and continuous curve.
(a) (i) and (ii) (b) (ii) and (iii) (c) (i) and (iv) (d) (ii) and (iv)
Ans. (d) (ii) and (iv)
Magnetic field lines change both directions and magnitude and are vector quantities. They emerge from the North Pole and enter the South Pole.

14. The given diagram is a V–I graph for nichrome wire. Which of the following statement/s verify/verifies Ohm's law?



(i) V is diretly proportional to the I
(ii) As I increases through a wire, V increases linearly
(iii) R is directly proportional to I
(iv) R always remains constant
(a) (i) and (ii) (b) (i) and (iv) (c) (iii) and (iv) (d) only (i)
Ans. (b) (i) and (iv)
V-I graph is straight line. V/I is a constant-ratio. V/I = R
(R) Resistance is a constant for the given metallic wire at a given temperature.

15. Swallowing, coughing, sneezing and vomiting is controlled by
(a) Reflex action (b) Fore brain (c) Mid brain (d) Hind brain
Ans. (d) Hind brain

16. A current through a horizontal power line flows in east to west direction. What will be the direction of magnetic field at a point directly below it and at a point directly above it?
(a) Below the wire – South to North
Above the wire – North to South
(b) Below the wire – North to South
Above the wire – South to North
(c) South to North in both the cases
(d) North to South in both the cases
Ans. (b) Below the wire — North to South
Above the wire — South to North
Applying the right hand thumb rule, we get the direction of magnetic field at a point below the wire is from North to South. The direction of magnetic field at a point directly above the wire is from South to North.

DIRECTION: In the question number 17 and 20, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**.
Choose the correct option
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)
(b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

17. Assertion (A): Ammonium hydroxide is weak base.
Reason (R): Phenolphthalein becomes pink in NH4OH but becomes colourless if kept for long time.
Ans. (b) Both A and R are true and R is not the correct explanation of A.

18. Assertion (A): Paramaecium is a unicellular organism.
Reason (R): Paramaecium takes in food at a specific spot which is moved there by cilia.
Ans. (b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)

19. Assertion (A): Acquired trait cannot be passed on from one generation to next generation.
Reason (R): Inaccuracy during DNA copying of acquired trait is minimum.
Ans. (c) A is true but R is false.

20. Assertion (A): The direction of flow of electric current is same as the direction of flow of electrons.
Reason (R): Electric current can flow through a closed circuit only.
Ans. (d) Assertion (A) is false but reason (R) is true.

SECTION – B

Questions 21 to 26 carry 2 marks each.

21. Name the type of chemical reaction represented by the following equation:
(a) $CaO + H_2O \longrightarrow Ca(OH)_2$
(b) $2Pb(NO_3)_2 \xrightarrow{heat} 2PbO + 4NO_2 + O_2$
Ans. (a) Combination reaction. (b) Decomposition reaction.

OR

What is meant by: (a) Oxidation reaction. (b) Reduction reaction.
Write balanced chemical equation for each reaction.
Ans. (a) **Oxidation reaction:** The reaction in which loss of electrons takes place e.g.
$Fe(s) \longrightarrow Fe^{2+}(aq) + 2e^-$

(b) **Reduction reaction:** The reaction in which H_2 is added or O_2 is removed or gain of electrons takes place, e.g.

$Fe^{3+} + e^- \longrightarrow Fe^{2+}$

22. How is the movement of leaves of Chhui-mui plant different from the movement of a shoot towards light?

Ans.

Movement of leaves of Chhui-mui plant	Movement of a shoot
1. Movement is independent of growth.	1. Movement is dependent on growth.
2. It is not related to the direction of stimulus.	2. It is related to the direction of stimulus.
3. Plant does not have specialised tissues.	3. Plants have specialised tissue.
4. Movement is fast and temporary.	4. Movement is slow and permanent.

23. Name two main parts of hind brain and state the functions of each.

Ans. Two main parts of hind-brain are — Medulla and Cerebellum. Their functions are:

Medulla: It controls the involuntary actions such as blood pressure, salivation and vomiting.

Cerebellum: It is responsible for precision of voluntary actions and maintaining the posture and balance of the body.

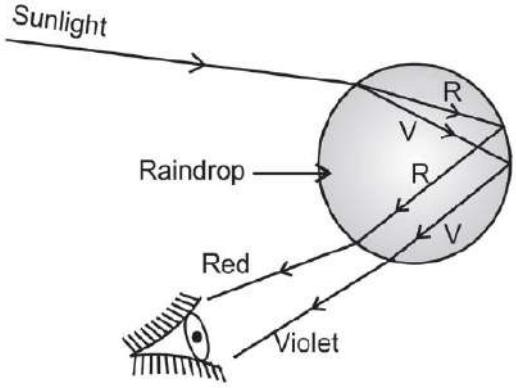
24. (a) How does water enter continuously into the root xylem?

(b) Why do fish die when taken out of waster?

Ans. (a) Root cells are in close contact with the soil. They take up ions from soil. Ion concentration increases inside the root. That leads to increase in osmotic pressure. Thus, the movement of water from the soil into root takes place continuously.

(b) Fish utilise dissolved oxygen of water through gills. When taken out of water, fish are unable to obtain oxygen from air and thus they die.

25. Explain the phenomena observed in the diagram.



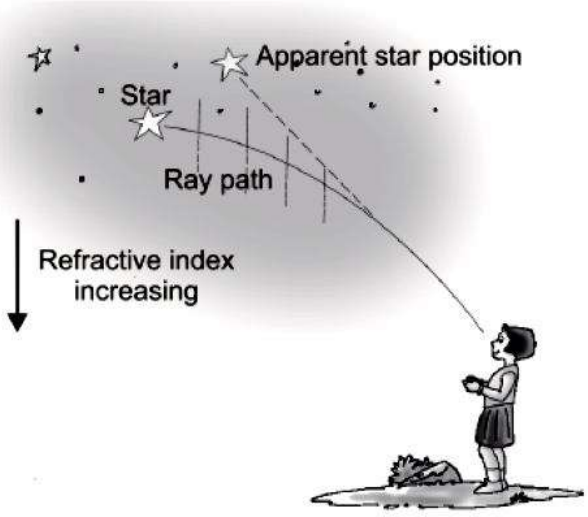
Ans. The phenomena observed in the diagram are refraction, dispersion, total internal reflection and finally refraction. A rainbow is a natural spectrum appearing in the sky after rain shower. A rainbow is always formed in a direction opposite to that of the Sun. The water droplets act like small prisms. They refract and disperse the incident sunlight, then reflect it internally and finally refract it again when it comes out of the raindrop.

Due to dispersion of light and internal reflection, different colours reach the observer's eye.

OR

Why do stars twinkle? Explain with the help of a diagram.

Ans. Stars are very far away from us, so they behave as point source of light. Since the physical conditions of the earth's atmosphere are not constant, the light from stars appears to come from different directions. This results in fluctuation of apparent position of star. The amount of light coming from stars also vary due to changing refractive index of atmosphere. The star appears bright when more light from star reaches our eyes and the same star appears dull when less amount of light reaches our eyes. All these effects are responsible for twinkling of stars.



26. (a) What do you call the functional unit of environment which comprises both living and non-living components?

(b) What will be the impact on ecosystem if microorganisms are removed from the environment?

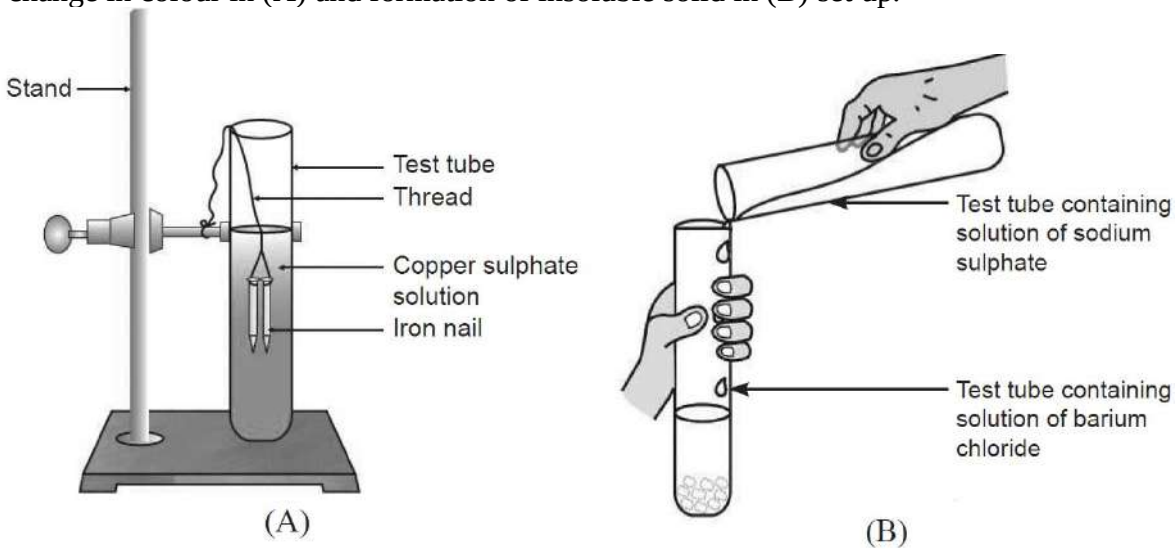
Ans. (a) The functional unit of environment which comprises both living and non-living components is called ecosystem.

(b) Microorganisms like bacteria and fungi break down the complex material to simpler material. If microorganisms are removed from the ecosystem, there will be no break down of complex material, so no replenishment of the soil will take place.

SECTION – C

Questions 27 to 33 carry 3 marks each.

27. A student observes the reactions taking place in (A) and (B). Among other changes, he observed the change in colour in (A) and formation of insoluble solid in (B) set up.



(a) How will you differentiate between these reactions in the set up (A) and (B)?

(b) Write one more example of each only in the form of a chemical equation.

Ans. (a) Set up (A) shows single displacement reaction.

Set up (B) shows double displacement reaction.

Single displacement reaction. More reactive element displaces less reactive element from its salt solution.

$Fe(s) + CuSO_4(aq) \longrightarrow FeSO_4(aq) + Cu(s)$

Tron nail becomes brownish in colour and the blue colour of copper sulphate solution fades.

Double displacement reaction. Reaction in which there is an exchange of ions between the reactants.

$Na_2SO_4(aq) + BaCl_2(aq) \longrightarrow BaSO_4(s) + 2NaCl(aq)$

In this reaction a white precipitate of barium sulphate is formed along with sodium chloride solution.

(b) Example of single displacement reaction:

$$\underset{\text{Copper}}{Cu(s)} + 2\underset{\text{Silver nitrate}}{AgNO_3(aq)} \longrightarrow \underset{\text{Copper nitrate}}{Cu(NO_3)_2(aq)} + 2\underset{\text{Silver}}{Ag(s)}$$

Example of double displacement reaction:

$$\underset{\text{Silver nitrare}}{AgNO_3(aq)} + \underset{\text{chloride}}{\underset{\text{Sodium}}{NaCl(aq)}} \longrightarrow \underset{\text{Silver chloride}}{AgCl(s)} + \underset{\text{Sodium nitrate}}{NaNO_3(aq)}$$

28. What happens when 'X' reacts with H2 in presence of Ni or Pd to form 'Y'? 'Y' on reaction with chlorine in presence of sunlight gives 'Z'. Identify X, Y and Z. What type of reaction is Y to 'Z'?

Ans. X' is $CH_2 = CH_2$ (Ethene) Y' is Ethane and "Z' is Chloroethane.

$$\underset{\text{'X'}}{CH_2=CH_2} + H_2 \xrightarrow[\text{or Pd}]{\text{Ni}} \underset{\text{Ethane (Y)}}{CH_3—CH_3}$$

$$\underset{\text{'Y'}}{CH_3—CH_3} + Cl_2 \xrightarrow{\text{Sunlight}} \underset{\text{Chloroethane 'Z'}}{C_2H_5Cl} + HCl$$

29. Various events take place during the process of photosynthesis. Do these events take place one after the other immediately? Write the events which occur during this process.

Ans. The events which occur during the process of photosynthesis are:

(i) Absorption of light energy by chlorophyll.

(i) Conversion of light energy to chemical energy and splitting of water molecules into hydrogen and oxygen.

(iii) Reduction of carbon dioxide to carbohydrates.

These events do not take place one after the other immediately. For example, desert plants take up carbon dioxide at night and prepare an intermediate which is acted upon by the energy absorbed by the chlorophyll during the day.

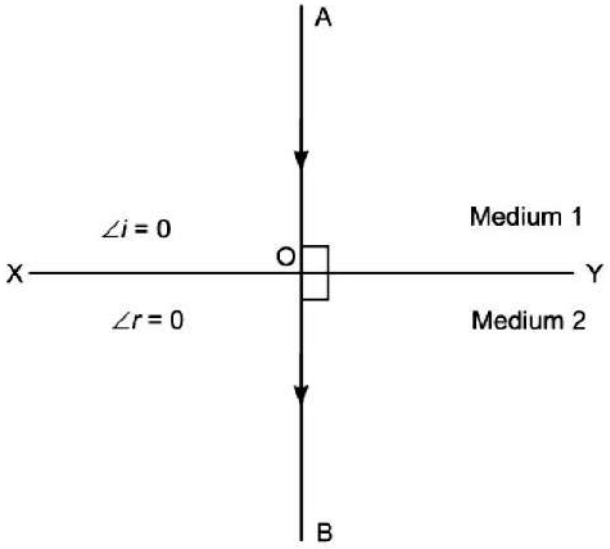
30. (a) What is the basic cause of refraction of light?

(b) State two situations where no refraction occurs.

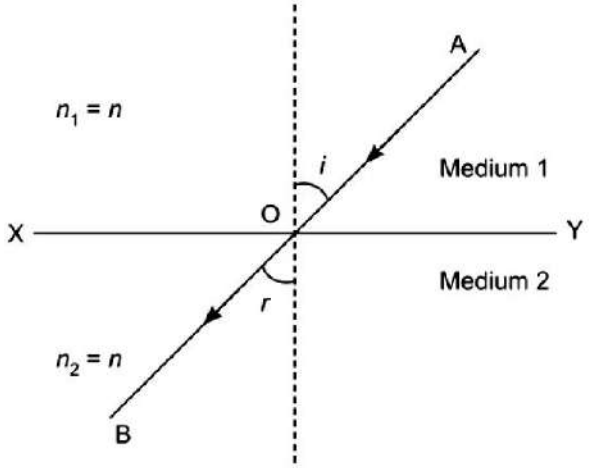
(c) Draw a diagram showing two refractions through a rectangular glass slab.

Ans. (a) Refraction of light is the phenomenon of change in the path of light in going from one medium to another. The basic cause of refraction of light is the change in speed of light going from one medium to another.

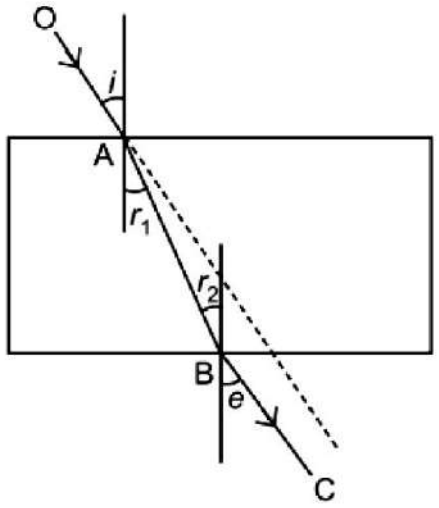
(b) No refraction occurs, when (i) Light is incident normally on a boundary.



(ii) Refractive indices of two media in contact are equal.



(c) Refraction of light through a glass slab showing two refractions at the two parallel faces of it.



31. (a) Priya is unable to read the letters written in doctor's room beyond 80 cm. What is the reason for this?

(b) What is nature and power of the lens required to correct the problem?

Ans. (a) Priya is unable to see or read beyond 80 cm because her far point of eye is 80 cm but it should be is infinity.

(b) u = ∞,v = -80cm, f = ?

Using the lens formula, $\frac{1}{f}=\frac{1}{v}-\frac{1}{u}=\frac{1}{-80}-\frac{1}{\infty}=\frac{1}{-80}-0=\frac{1}{-80}$

$\Rightarrow f=-80cm$ or -0.8 m

Applying power formula, $P=\frac{1}{f}=\frac{1}{-0.8}=-1.25D$

Concave lens is required to correct Priya's problem.

32. (a) Describe activity with labelled diagram to show that a current carrying conductor experience a force in a magnetic field.

(b) State the rule to determine the direction of force.

Ans. (a) **Aim:** To show that on a current carrying conductor placed in a magnetic field experiences force.

Apparatus Required: Aluminium rod, a clamp stand, two horse shoe magnet of different intensity, cell, key and connecting wires.

Procedure:

1. Arrange the experimental set-up as shown in figure.
2. Plug the key, for the given set-up current will flow through the rod from Q to P and observe the displacement of rod.

3. Now unplug the key and remove the first horse shoe magnet and place the second horse shoe magnet of higher magnetic field strength in a similar manner to that of first.
4. Plug the key, the current again flow through the rod from Q to P. Again observe the deflection of rod.
5. Now bring both the magnets closer together (to ensure greater magnetic field than that of previous case). Again observe the motion of rod.

Observations:

In each time, conductor moves faster than that of previous one. It is possible only when conductor gets accelerated more each time which required more force. (F = ma)

Thus, if the magnetic field strength is increased, the rod will experience a greater force and move even faster.

Conclusion: A current carrying conductor placed in a magnetic field experiences force.

(b) Direction of force experienced by a current-carrying straight conductor placed in a magnetic field which is perpendicular to it, is given by Fleming's left hand rule.

Fleming's Left-Hand Rule: Stretch the thumb, forefinger and middle finger of the left hand such that they are mutually perpendicular to each other. If the forefinger pointed towards the direction of magnetic field and middle finger in the direction of current, then the thumb will indicate the direction of motion or force experienced by the conductor. It is to be applied only when the current and magnetic field, both are perpendicular to each other.

OR

What is short circuiting? State one factor/condition that can lead to it. Name a device in the household that acts as a safety measure for it. State the principle of its working.

Ans. **Short circuiting :** When electric circuit offers very low resistance to the flow of current through it, the current increases heavily and the circuit is said to be short circuited. It occurs when live wire touches the neutral wire. This happens due to the damage in insulation of the power lines.

Safty measure device: Fuse.

Working principle of fuse : It works on the heating effect of electric current or Joule's law of heating.

According to this law, the heat produced in a resistor is directly proportional to the

(i) square of current for a given resistance ($H \propto I^2$).

(ii) resistance for a given current ($H \propto R$) and

(iii) time for which the current flows through the resistor ($H \propto I$).

Therefore, heat produced, $H = I^2Rt$

33. (a) What will happen to the dead plants, animals and the garbage in the absence of decomposers?

(b) Will the natural replenishment of the soil take place even if micro-organisms are not there.

Ans. (a) In the absence of decomposers, the dead plants, animals and garbage get accumulated and will become a big pile. This big pile becomes a breeding ground for insects and pathogens. Since this pile contains biodegradable substances, stink will start emanating from the big heap and the heap does not even look good to the eyes.

(b) No, the natural replenishment of the soil will not take place even if microbes are absent. As decomposers break down the complex organic substances into simple in organic substance that go into the soil and are used up once more by plants.

SECTION – D

Questions 34 to 36 carry 5 marks each.

34. (a) Your mother prepared a cake for you but you found that the cake was bitter in taste. Which ingredient has she added which made the cake bitter? Suggest what she would have added in the dough of the cake. Give reason. Write one more use of this compound.

(b) A student observes that a young child while playing on the swing is stung by a wasp. She started crying. Her teacher immediately applied some white paste on the stung area. Name the white substance and why did her teacher apply it on the affected area?

(c) Identify the acid and the base whose combination forms the common salt that you use in your food. Write its formula and chemical name. What will be the pH of this salt?

Ans. (a) The substance that makes the cake bitter is Na_2CO_3 formed on heating $NaHCO_3$ (baking soda) because it is basic in nature and bases are bitter in taste.

She would have added baking powder instead of baking soda in the dough. Baking powder is a mixture of baking soda and tartaric acid. When dough is baked, the acid neutralises the base.

$$NaHCO_3 + H^+ \longrightarrow CO_2 + H_2O + \text{sodium salt of acid}$$
(from any edible acid)

CO_2 produced in the reaction makes the cake soft and fluffy.

Uses of baking soda

(i) Baking soda neutralises excess acid in the stomach and provides relief.

(ii) It is also used in soda-acid fire extinguisher. (any one)

'Wasp sting contains formic acid. The white paste applied on the affected area is a paste of baking soda which neutralises the effect of formic acid and gives relief.

The chemical name of common salt is sodium chloride and its formula is NaCl.

It is formed when hydrochloric acid reacts with solution of sodium hydroxide.

HCI (ag) + NaOH (ag) — NaCl (aq) + $H_2O(l)$

The acid is hydrochloric acid (HCI) and the base is sodium hydroxide (NaOH).

Sodium chloride (NaCl) is formed by a strong acid (HCI) and strong base (NaOH), so the salt solution will be neutral with pH close to 7.

OR

(a) Identify the substance that is used to prepare false ceilings and used by doctors for setting fractured bones. How is this substance prepared? What happens when it is mixed with water and allowed to stand?

(b) Fresh milk has a pH of 6. How do you think the pH will change as it becomes sour? Explain. Why sour substances should not be kept in brass and copper vessels?

(c) The colour of copper sulphate crystals changes on heating. Explain why?

Ans. The substance which is used to prepare false ceilings and used by doctors for setting fractured bones is Plaster of Paris ($CaSO_4.\ \frac{1}{2}H_2O$)

It is prepared by heating gypsum at 373 K

$$CaSO_4 \cdot 2H_2O \xrightarrow{373K} CaSO_4 \cdot \frac{1}{2}H_2O + 1\frac{1}{2}H_2O$$
Gypsum Paster of Paris

'When Plaster of Paris is mixed with water and allowed to cool, a hard solid mass (gypsum) is obtained.

$$CaSO_4 \cdot \frac{1}{2}H_2O + 1\frac{1}{2}H_2O \longrightarrow CaSO_4 \cdot 2H_2O$$
(Plaster of Paris) Gypsum

(b) pH will decrease from 6. Milk becomes sour due to the formation of lactic acid. Its pH changes and becomes less than 6.

Sour substances should not be kept in the brass and copper vessels because sour substances contain acids which react with brass and copper and form compounds which are poisonous in nature.

(c) Copper sulphate crystals contain five molecules of water as water of crystallisation.

Its chemical formula is CuS04 • 5H20. This hydrated salt which is blue in colour. When it is heated, it loses its five molecules of water of crystallisation and hence colour changes to white.

$$CuSO_4 \cdot 5H_2O \xrightarrow{Heat} CuSO_4 + 5H_2O$$
(Blue) (White)

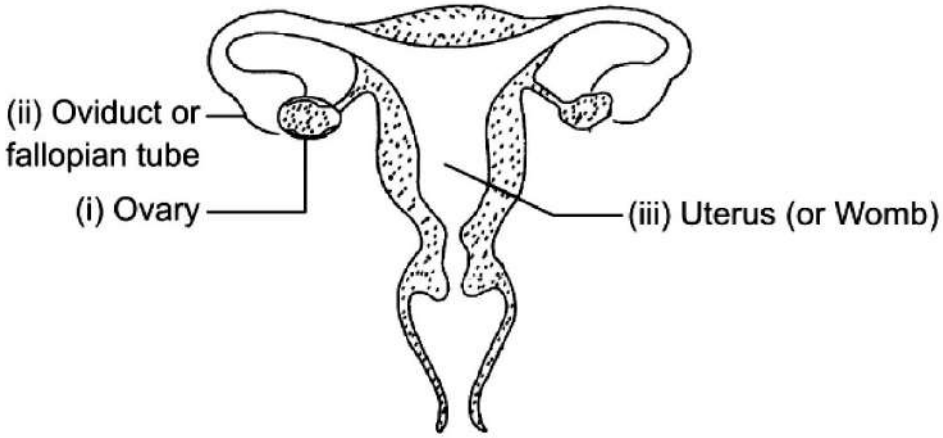
35. (a) Draw a sectional view of human female reproductive system and label the parts where:

(i) eggs develop.

(ii) fertilization takes place

(iii) fertilized egg gets implanted.

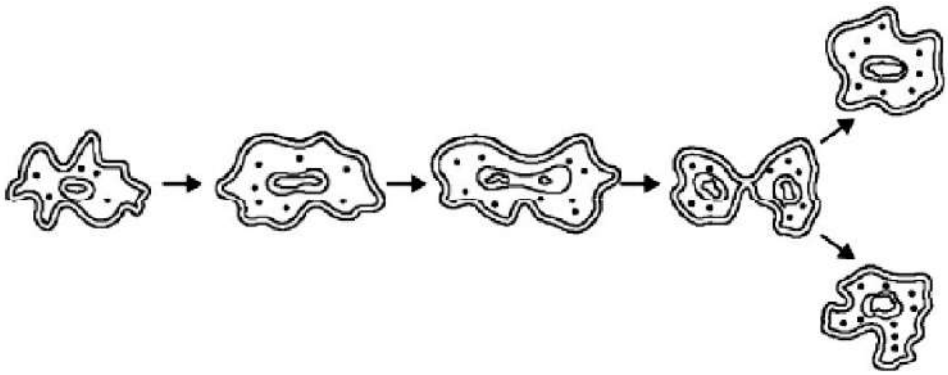
(b) Describe, in brief, the changes that the uterus undergoes:
(i) to receive the zygote
(ii) if zygote is not formed.
Ans. (a)



(b) The changes that the uterus undergoes are:
(i) The inner wall of uterus gets thickened and spongy to receive the egg.
(ii) If zygote is not formed then thickened inner wall breaks down to release mass of uterine tissues and blood and thus menstruation occurs.

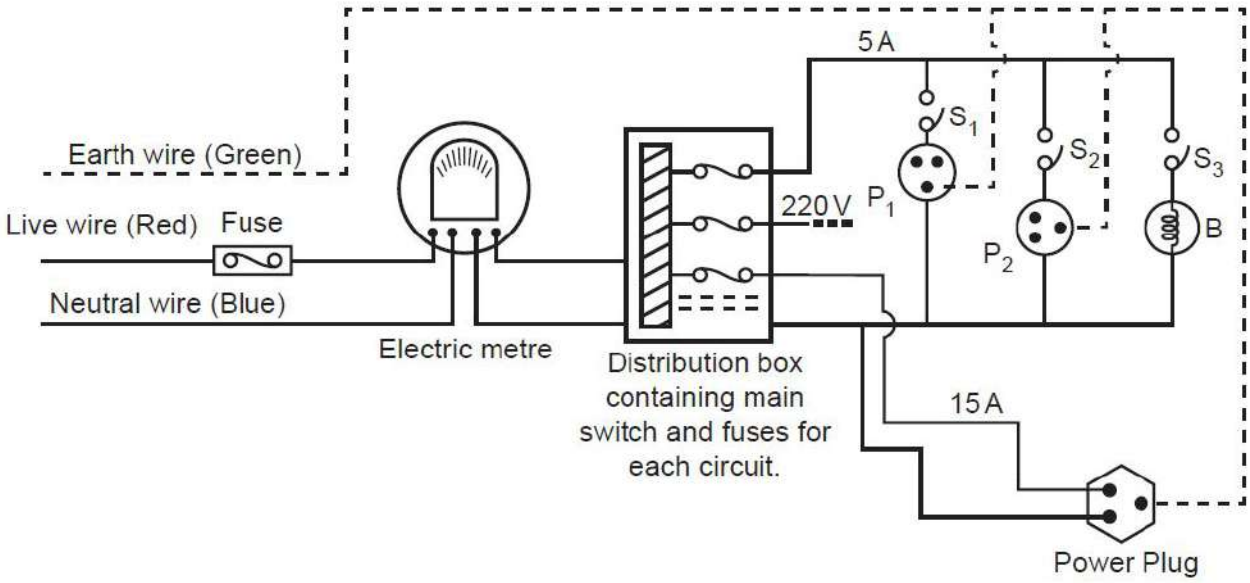
OR

Answer the following:
(a) Name any four asexual methods of reproduction.
(b) Explain the diagram by which an Amoeba reproduces.
(c) Give one difference between fission and fragmentation.
Ans. (a) (i) Fission (ii) Fragmentation (iii) Regeneration (iv) Budding (v) Spore formation (vi) Vegetative propagation (vii) Tissue culture.
(b) Amoeba divides by binary fission where the organisms divides equally into two daughter cells.



During binary fission, the nuclear division is followed by appearance of a constriction in the cell membrane. Constriction deepens and two cells separate having cytoplasm and nucleus in each cell (daughter cells).
(c) **Fission:** It takes place in unicellular organism.
Fragmentation: It takes place in multicellular organism.

36. Study the schematic diagram of one of the common domestic circuits given below:



(a) What is the potential difference between live and neutral wire?
(b) The domestic appliances are connected across the line and neutral wires. These appliances are connected parallel to each other. Explain.
(c) If an electric kettle connected to 5A switch consumes 2 kW when operated at 220 V, what will happen?
(d) Meenal uses the following electric appliances at home.
(i) Refrigerator of rating 400 W for 24 hours.
(ii) Two electric fans at rating 80 W each for 8 hours every day.
(iii) Three electric tubes of rating 18 W for 8 hours everyday.
Calculate the electricity bill of Meenal's house for the month of September if the cost of electric energy per unit is Rs. 4.
Ans. (a) The potential difference between the live and neutral wire is 220V.
(b) They are connected in parallel so that they have at the same potential difference.
The total resistance in a parallel circuit is decreased.
(c) I = 35A, P = 2kW or 2000W, V = 220V

$$I = \frac{P}{V} = \frac{2000}{220} = 9.09A$$

The fuse will blow off and the circuit will break. Thus a 10A or 15A fuse is needed to operate electric kettle of 2 kW.
(d) Total energy consumed by appliances in one day = $400 \times 24 + 2 \times 80 \times 8 + 3 \times 18 \times 8$
= 11312Wh = 11312Wh /1000 = 11.312 kWh
Total energy consumed in one month = 11.312 X 30 = 339.36 kWh
Cost of 1 unit (kWh) = Rs. 4
Cost of 339.36 units = Rs. 339.36 x 4 = Rs. 1357.44

OR

(a) What happens to the force acting on current carrying conductor placed in magnetic field when:
(i) Direction of magnetic field is reversed without changing the direction of current.
(ii) Direction of the current is reversed without changing the direction of magnetic field.
(iii) Direction of both the current and the magnetic field is reversed.
(b) What does the divergence of magnetic field lines near the ends of a current carrying straight solenoid indicate?
Ans. (a) Force acting on a current carrying conductor placed in a magnetic field will
(i) act in opposite direction to that of previous direction.
(ii) act in opposite direction to that of previous direction.
(iii) remains in the same direction.
(b) The divergence of magnetic field lines near the ends of a current carrying straight solenoid indicate the decrease in strength of magnetic field near and beyond the ends of the solenoid.

SECTION – E(Case Study Based Questions)

Questions 37 to 39 carry 4 marks each.

37. The metal activity series lists metals according to their reactivity. The more reactive metals are placed at the top of the list. While the less reactive metals are placed near the bottom of the series. Less reactive metals like silver, gold platinum occur in their native form along with the earthy impurities. Element or compounds which occur naturally in the earth's crust are known as minerals. Minerals from which metals can be extracted are known as ores. Different techniques are used for obtaining metals falling in metals of low reactivity, metals of medium reactivity and metals of high reactivity.

(a) Why is it necessary to remove the impurities from ore before processing?

(b) Name an ore of mercury and copper.

(c) Which reduction process is used to obtain the following metals from their compounds? Explain.

(i) Metal X which is low in reactivity series

(ii) Metal Y which is in the middle of reactivity series

(iii) Metal Z which is high in the reactivity series

OR

(c) During extraction of metals, electrolytic refining is used to obtain pure metals. Draw a well labelled diagram to show electrolytic refining of copper. Also write the reactions taking place at cathode and anode.

Ans. (a) The process of removing impurities like sand and soil present in an ore is called concentration or enrichment of the ore.

(b) Ore of mercury — Cinnabar (HgS)

Ore of copper — Copper Pyrite (CuS)

(c) (i) Metal Xis obtained simply by heating its oxide. For example, mercury can be obtained by heating mercuric oxide.

$2HgO(s) \xrightarrow{heat} 2Hg(l) + O2\ (g)$

(if) Metal Y in the middle of reactivity series can be obtained by reduction of their oxides by carbon. For example,

$ZnO(s) + C(s) \xrightarrow{heat} Zn(s) + CO(g)$

(iii) Metal Z which is high in the reactivity series can be obtained by electrolytic reduction of mol-ten chlorides.

At cathode: $Na^+ + e^- \longrightarrow Na$

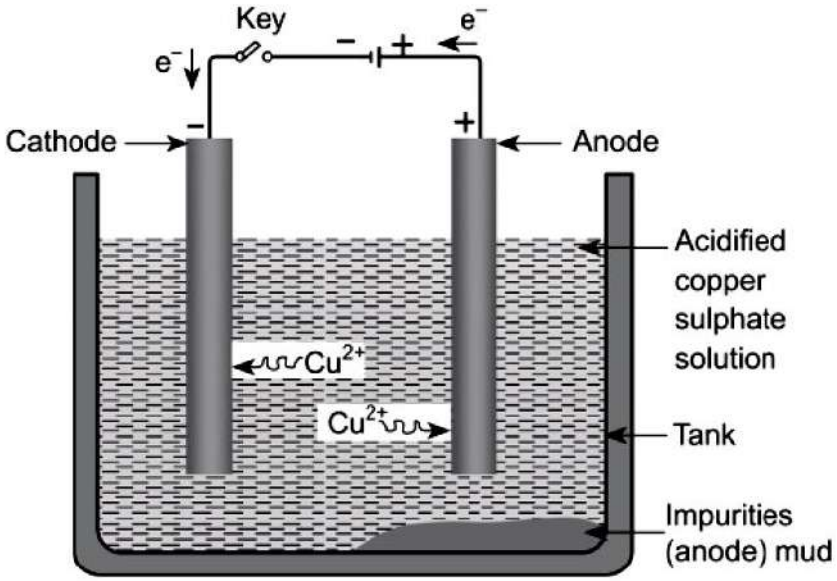
At Anode: $2Cl^- \longrightarrow Cl_2 + 2e^-$

OR

(c) At cathode: $Cu^{2+} + 2e^- \longrightarrow Cu$

At anode: $Cu \longrightarrow Cu^{2+} + 2e^-$

The insoluble impurities settle down at the bottom of the anode and are known as anode mud.



38. Reetu knows that DNA is the carrier of the genetic information from one generation to generation. Reetu studied that in sexual reproduction, male and female gametes fuse during fertilization to form a zygote. This zygote then develops into male or female offspring. But how the sex of the offspring is determined. We know that both the parents contribute equally to the DNA.

(a) "We cannot pass on to our progeny the experiences and skills like dancing, singing etc. acquired during our life time." Justify the statement giving reason and example.

(b) How do variations occur in an offspring?

(c) 'Different species use different strategies to determine sex of a newborn individual. It can be environmental cues or genetically determined'. Explain the statement by giving examples for each strategy.

OR

(c) Transmission of genetic characteristic from one generation to the next is termed as inheritance. Give the basic features of mechanism of inheritance.

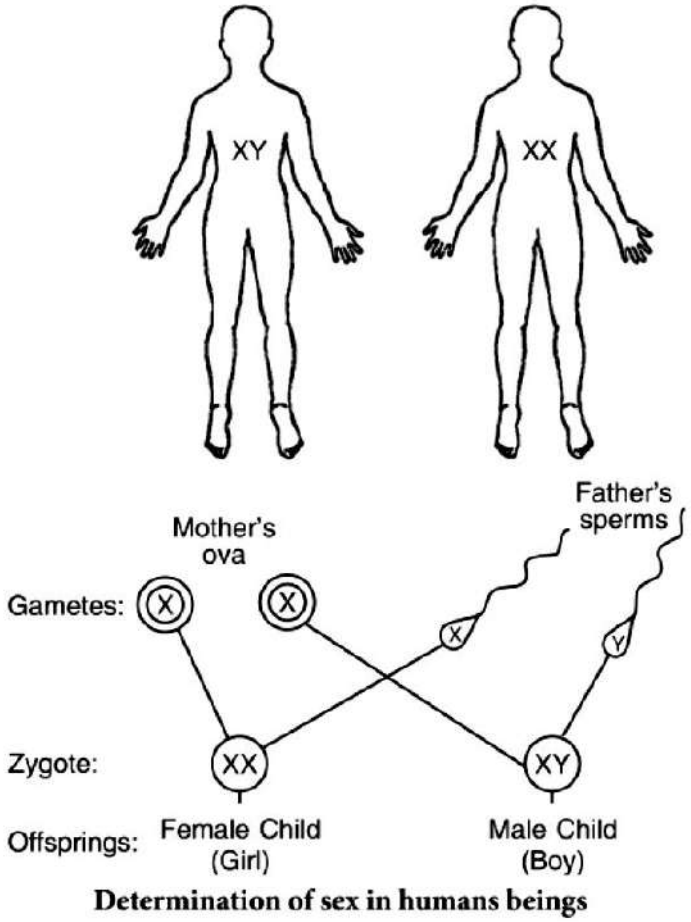
Ans. (a) Characters which appear in our life time but cannot be transmitted to the progeny or next generation are acquired characters. Acquired traits do not produce any change in the DNA of germ cells, so they cannot be inherited. For example, if we breed a group of mice, all their progeny will have tails. If the tails of these mice are removed by surgery in each generation, these tailless mice will not have tailless progeny. As the removal of the tails cannot change the genes of the germ cells of the mice.

(b) The differences in traits shown by the individuals of a species and also by the offsprings of the same parent are variations. Variations occur due to sex chromosomes. Variations arising in the genes of the organisms are inheritable. Mother and father contribute equally to the gene pattern of the offsprings through their chromosomes, in which recombination occurs at the time of gametogenesis. In zygote formation, gene pattern of both parents come together, that causes some variations between offsprings and parents and also among the siblings.

(c) Different species use different strategies to determine sex of a new born individual.

Environmental cue: In some animals, the temperature at which fertilised eggs are kept determines whether the animals developing in the eggs will be a male or female. In some other animals such as snails, individuals can change sex, indicating that sex is not genetically determined.

Genetical cue: In human beings, the sex of the individual is largely genetically determined. It means that the genes inherited from our parents decide whether the child born will be a boy or girl. A child who inherits an 'X' chromosome from the father will be a girl and the one who inherits a 'Y' chromosome from the father will be a boy. There is an equal probability of fertilization of the ovum with the sperm carrying either 'X' chromosomes or 'Y' chromosomes.



Determination of sex in humans beings

OR

(c) The basic features of inheritance are:
• Traits are controlled by genes present on chromosomes
• Each gene controls one character
• There may be two or more forms of the gene.
• One form of gene may be dominant over the other.
• Individual genes exist in two forms;
They may be similar or dissimilar

39. The below images are of optical instruments. These instruments use a combination of lenses which increases the sharpness of the image. The image produced by using a combination of lenses is also free from many defects which otherwise occur while using a single lens.

(a) Alankrita was not able to see clearly so she went to an optician. The optician prescribes the corrective lens +2.0 D and +2.5 D for the left and right eye respectively. Find the focal length of each lens. Are the prescribed lenses diverging or converging?
(b) If the image formed by a lens for all positions of the object placed in front of it is always virtual, erect and diminished, state the type of the lens. When a convex lens of power + 5D is placed in contact with a concave lens of power –2D, what is the power of combination?
(c) At what distance from a concave lens of focal length 30 cm, a 5 cm tall object be placed so as to obtain its image at 20 cm from the lens? Also calculate the size of the image formed.

OR

(c) A converging lens can form a magnified inverted image of an object as well as magnified erect image of an object placed infront of it. Draw ray diagrams to justify this statement stating the position of the object with respect to the lens in each case.

Ans. (a) For left eye, P = +2.0 D, f = ?, $P = \frac{1}{f} \Rightarrow f = \frac{1}{P} = \frac{100}{+2.0} = +50cm$

For right eye, P = +2.5 D, f = ?, $P = \frac{1}{f} \Rightarrow f = \frac{1}{P} = \frac{100}{+2.5} = +40cm$

The prescribed lenses for both the eyes are converging or convex as their power is positive.

(b) The lens is concave lens or diverging lens as the image formed is virtual, erect and magnitude.

$P_1 = +5D$, $P_2 = -2D$

$\Rightarrow P = P_1 + P_2 = +5D + (-2D) = +3D$

Thus, this combination would behave as a convex lens of power +3D.

(c) f = –30cm, v = –20cm, h_o = 5cm

Applying Lens formula, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$ we get

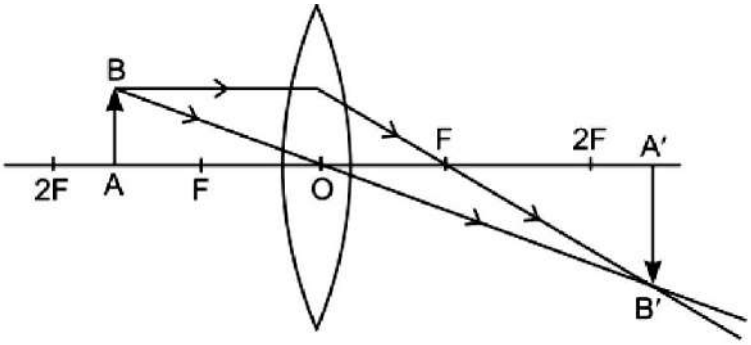
$$\Rightarrow \frac{1}{u} = \frac{1}{v} - \frac{1}{f} = \frac{1}{-20} - \frac{1}{-30} = \frac{1}{-20} + \frac{1}{30} = \frac{-3+2}{60} = \frac{-1}{60} \Rightarrow u = -60cm$$

$$m = \frac{v}{u} = \frac{h_i}{h_o} \Rightarrow h_i = \frac{v \times h_o}{u} = \frac{-20 \times 5}{-60} = 1.67cm$$

Image formed is diminished and erect.

OR

(c) For magnified inverted image of an object—Position of object is between F and 2F of a convex lens.



For magnified erect image of an object-Position of object is between the optical centre and principal focus of a convex lens.