Class X Session 2024-25
Subject - Science
Sample Question Paper - 4

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. The food items like cheese that is shown in the given below image become unfit for eating. This happens due to: **[1]**

a) Corrosion b) Rusting

c) Dusting d) Rancidity

2. Chemically rust is: **[1]**

a) Metal oxide b) Ferric oxide

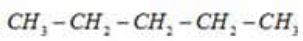
c) Ferrous oxide d) Hydrated ferric oxide

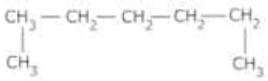
3. Bleaching powder is produced by the action of chlorine on **[1]**

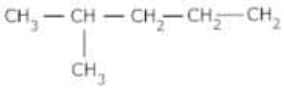
a) calcium chloride b) calcium hydroxide

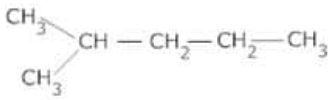
c) dry slaked lime d) moist slaked lime

4. Which of the following are not straight chain compounds? **[1]**

A 

B 

C 

D 

a) A, B and D

b) C and D

c) A and B

d) A and C

5. Aqueous solutions of zinc sulphate and iron sulphate were taken in test tubes I and II by four students A, B, C and D. Metal pieces of iron and zinc were dropped in the two solutions and observations made after several hours were recorded in the form of table as given below: **[1]**

Student	Metal	Solution	Colour change of solution	Deposit/Coating obtained
A	Fe	$ZnSO_4$	Turned green	Silvery grey coating
	Zn	$FeSO_4$	No change	No change
B	Fe	$ZnSO_4$	No change	Black deposit
	Zn	$FeSO_4$	Colour faded	Grey coating
C	Fe	$ZnSO_4$	No change	No change
	Zn	$FeSO_4$	Turned colourless	Black deposit
D	Fe	$ZnSO_4$	No change	Grey deposit
	Zn	$FeSO_4$	No change	Black deposit

The correct reporting has been made in observations:

a) Student A

b) Student C

c) Student D

d) Student B

6. Which of the following elements occurs in free state in nature? **[1]**

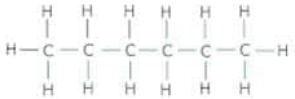
a) Fe

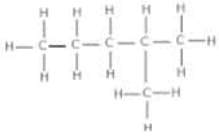
b) Ni

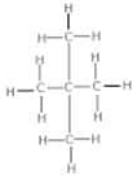
c) Pt

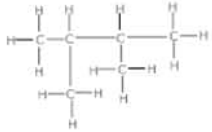
d) CO

7. Which of the following represent the formula C_6H_{14}? **[1]**

A 

B 

C 

D 

a) A, B and D

b) A and C

c) All of these

d) A and B

8. As compared to daytime, the amount of carbon dioxide released by the plants during night is more because: **[1]**

a) It is stored in the leaves of plants during daytime.

b) Plants do not respire during daytime.

c) It is not produced during daytime.

d) Major amount of carbon dioxide produced is used up for photosynthesis during

daytime.

9. The statement that correctly describes the characteristic(s) of a gene is: **[1]**

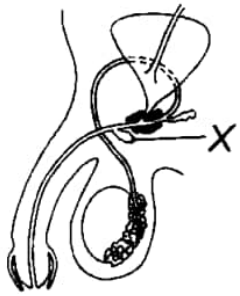
a) A gene is not the information source for making proteins in the cell.

b) In individuals of a given species, a specific gene is located on a particular chromosome.

c) All the inherited traits in human beings are not controlled by genes.

d) Each chromosome has only one gene located all along its length.

10. The diagram shows a section through the male reproductive system. What is the function of part X? **[1]**



i. The secretion of the gland neutralises acids from urine.

ii. It decreases the number of sperms damaged during ejaculation.

iii. It stimulates uterine contraction to help sperms move forward into the fallopian tube.

iv. Both (i) and (ii)

a) Statement (iv) is correct.

b) Statement (iii) is correct.

c) Statement (ii) is correct.

d) Statement (i) is correct.

11. In human males, all the chromosomes are paired perfectly except one. This/these unpaired chromosome is/are **[1]**

i. large chromosome

ii. small chromosome

iii. Y-chromosome

iv. X-chromosome

a) (iii) and (iv)

b) (i) and (ii)

c) (ii) and (iv)

d) (iii) only

12. In the experiment, to show CO_2 is given out during respiration. Atul put boil gram seeds in a conical flask. **[1]**

According to his observation, the water level in the bent tube:

a) Rises

b) Decreases

c) Rise or decreases in water level depends on the room temperature

d) Remains the same

13. A coil of many circular turn wrapped around a insulator forms a **[1]**

a) Solenoid

b) Bar magnet

c) Circular magnet

d) U-shaped magnet

14. Two LED bulbs of 10W and 5W are connected in series. If the current flowing through 5W bulb is 0.005A, the current flowing through 10W bulb is: **[1]**

a) 0.0025A

b) 0.005A

c) 0.02A d) 0.01A

15. How much of the net primary productivity of a terrestrial ecosystem is eaten and digested by herbivores? **[1]**

a) 0.1% b) 10%

c) 100% d) 1%

16. Exposure to ultraviolet radiation causes eye disease like: **[1]**

a) Conjunctivitis b) Cataract

c) Short-sightedness d) Colour blindness

17. **Assertion (A):** Corrosion of iron is commonly known as rusting. **[1]**
Reason (R): Corrosion of iron occurs in presence of moist 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.

18. **Assertion (A):** Vagina is also called a birth canal. **[1]**
Reason (R): During birth, the baby passes through the vagina.

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):** Deflection of the iron filings changes when current in the conductor varies. **[1]**
Reason (R): Magnitude of the magnetic field does not change with the magnitude of current.

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):** Flow of energy in a food chain is unidirectional. **[1]**
Reason (R): Energy captured by autotrophs does not revert back to the solar input and it passes to the herbivores.

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 is a covalent bond? What type of bond exists in (i) CCl_4 (ii) $CaCl_2$? **[2]**

22. Why are testes placed outside the abdominal cavity in the scrotal sac? **[2]**

23. What would be the consequence of a deficiency of haemoglobin in our body? **[2]**

OR

What is meant by circulation?

24. A 6 cm tall object is placed perpendicular to the principal axis of a concave mirror of focal length 30 cm. The distance of the object from the mirror is 45 cm. Use mirror formula to determine the position, nature and size of the image formed. Also draw labelled ray diagram to show the image formation in this case. **[2]**

25. Alisha digs a pit in her garden and puts the following items in it. **[2]**

- paper cups
- glass bowls
- fruit peels
- rubber slippers

She then covers the pit with soil. Which item will decompose first?

OR

Which of the following belong to the second trophic level?

i. Frog, butterfly, spider, rice weevil

ii. Parrot, frog, butterfly, spider.

26. In today's digital world, every human spends around a minimum eight hours with the digital electronic items which make their eyes to strain more and causes many eye problems. Still they undergo many exercises for their eyes during their working hours what would be your medical suggestion to reduce the stress and strain caused in the eyes? **[2]**

Section C

27. In a chemistry laboratory, students were instructed to set up three experiments, details of which are given below: **[3]**

Experiment No.	**Set up details**
1.	2 iron nails in a cork capped test tube + Tap water immersing the nails +
2.	2 iron nails in a cork capped test tube + Boiled water immersing the nails + Oil on top of water layer.
3.	2 iron nails In a cork capped test tube + Cotton wool on top of the iron nails + Granules of calcium chloride on cotton wool.

Indicate the changes observed in the nails kept in all the three setups, with reasons.

28. Give reasons for the following: **[3]**

i. Ionic compounds have higher melting and boiling points.

ii. Sodium is kept immersed in kerosene.

iii. Reaction of calcium with water is less violent.

iv. Prior to reduction the metal sulphides and carbonates must be converted into metal oxides for extracting metals.

OR

Explain the following

a. Reactivity of Al decreases if it is dipped in HNO_3

b. Carbon cannot reduce the oxides of Na or Mg

c. NaCl is not a conductor of electricity in solid state whereas it does conduct electricity in aqueous solution as well as in molten state

d. Iron articles are galvanised.

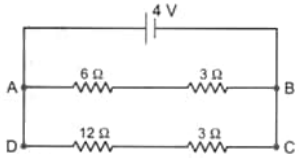
e. Metals like Na, K, Ca and Mg are never found in their free state in nature.

29. Explain the process of digestion of food in mouth, stomach and small intestine in human body. **[3]**

30. Name the plant Mendel used for his experiment. What type of progeny was obtained by Mendel in F_1 and F_2 generations when he crossed the tall and short plants? Write the ratio he obtained in F_2 generation plants. **[3]**

31. Sudha finds out that the sharp image of window pane of her science laboratory is formed at a distance of 15 cm from the lens. She now tries to focus the building visible of her outside the window instead of the window pane without disturbing the lens. In which direction will she move the screen to obtain a sharp image of the building? What is the approximate focal length of this lens? **[3]**

32. For the circuit shown in the given diagram: **[3]**



What is the value of

i. current through 6Ω resistor?

ii. potential difference across 12Ω resistor?

33. An electric geyser rated at 1500 W, 250 V is connected to a 250 V line mains. Solve **[3]**

i. the electric current drawn by it. and the energy consumed by it in 50 h.

ii. cost of energy consumed if each unit costs Rs 6.

Section D

34. What do you mean by multiple covalent bonding? Explain with the help of examples. **[5]**

OR

A compound **A** (molecular formula $C_3H_6O_2$) reacts with sodium metal to form compound **B** and evolves a gas which burns with a pop sound. The compound **A** on treatment with alcohol **C**, found in beer, in presence of concentrated sulphuric acid, forms a sweet smelling compound **D** (molecular formula $C_5H_{10}O_2$). On addition of NaOH to **A** it also gives **B** and water. **D** on treatment with NaOH gives back **B** and **C**. Identify **A**, **B**, **C** and **D** and write down the chemical equations of the reactions involved.

35. i. Name the mode of reproduction of the following organisms and state the important feature of each mode : **[5]**

a. Planaria

b. Hydra

c. Rhizopus

ii. We can develop new plants from the leaves of Bryophyllum. Comment.

iii. List two advantages of vegetative propagation over other modes of reproduction.

OR

Name various plant hormones. Also give their physiological effects on plant growth and development.

36. What are Cartesian sign conventions used in spherical mirror ? What is the mirror formula ? **[5]**

OR

A student has three concave mirrors A, B and C of focal lengths 20 cm, 15 cm and 10 cm, respectively. For each concave mirror, he performs the experiment of image formation for three values of object distance of 30 cm, 10 cm and 20 cm.

Give reasons for the following:

i. For the three object distances, identify the mirror which will form an image equal in size to that of object. Find at least one value of object distance.

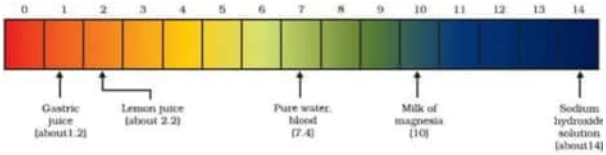
ii. Out of the three mirrors, identify the mirror which would be preferred to be used for shaving purpose.

iii. For the mirror B, draw ray diagram for image formation for any two given values of object distance.

Section E

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

The strength of acid and base depends on the number of H^+ and the number of OH^- respectively. If we take hydrochloric acid and acetic acid of the same concentration, say one molar, then these produce different amounts of hydrogen ions. Acids that give rise to more H^+ ions are said to be strong acids, and acids that give less H^+ ions are said to be weak acids. Can you now say what weak and strong bases are?



(a) Fresh milk has a pH of 6. How do you think the pH will change as it turns into curd?

(b) Is Gastric juice a weak acid?

OR

Milk of magnesia is an acid or base? For what purpose it can be used?

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

We have seen that the different parts of our body have specific functions. Our mouth waters when we see the food we like without our meaning to. Our heart's beat without our thinking about it. In fact, we cannot control these actions easily by thinking about them even if we wanted to. So, in between the simple reflex actions like change in the size of the pupil, and the thought out actions such as moving a chair, there is another set of muscle movements over which we do not have any thinking control. Many of these involuntary actions are controlled by the mid-brain and hind-brain. All these involuntary actions including blood pressure, salivation and vomiting are controlled by the medulla in the hind-brain. Think about activities like walking in a straight line, riding a bicycle, picking up a pencil. These are possible due to a part of the hind-brain called the cerebellum. It is responsible for the precision of voluntary actions and maintaining the posture and balance of the body. Imagine what would happen if each of these events failed to take place if we were not thinking about it.

(a) Identify the part of the nervous system which controls the reflex action.

(b) Does reflex action involve all parts of the voluntary nervous system?

(c) Identify the part of the autonomic nervous system which controls involuntary actions.

OR

Beating of heart muscles, which type of action is this? Out of voluntary and involuntary action which is slower?

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

A student fixes a sheet of white paper on a drawing board using some adhesive materials. She places a bar magnet in the centre of it and sprinkles some iron filings uniformly around the bar magnet using a salt sprinkler. On tapping the board gently , she observes that the iron filings have arranged themselves in a particular pattern.

(a) What makes iron filings arrange in a definite pattern?

(b) Draw a diagram to show this pattern of iron filings.

(c) How is the direction of magnetic field at a point determined using the field lines? Why do two magnetic field lines not cross each other?

OR

How are the magnetic field lines of a bar magnet drawn using a small compass needle? Draw one magnetic field line each on both sides of the magnet.

Solution

Section A

1. **(d)** Rancidity
   Explanation: Rancidity spoils the food materials prepared in fats and oils which have been kept for a considerable time and makes them unfit for eating. Hence, the cheese shown in the image becomes unfit for eating due to rancidity.

2. **(d)** Hydrated ferric oxide
   Explanation: Rust is an iron oxide, a usually red oxide formed by the redox reaction of iron and oxygen in the presence of water or air moisture. Chemically, rust is a hydrated ferric oxide (Fe_2O_3. H_2O).

3. **(c)** dry slaked lime
   Explanation: Bleaching powder is manufactured (prepared on a large scale) by passing chlorine gas over dry slaked lime:
   $Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + H_2O$

4. **(b)** C and D
   Explanation: A and B are straight chain compounds. A has a straight chain of 5 carbon atoms. B has a straight chain of 7 carbon atoms. C and D are not straight chain compounds.

5. **(b)** Student C
   Explanation: Fe + ZnSO4 → No reaction
   It is because iron is less reactive than Zinc.
   $Zn + FeSO_4 \rightarrow ZnSO_4 + Fe$
   The solution becomes colourless and black iron gets deposited.

6. **(c)** Pt
   Explanation: Pt

7. **(a)** A, B and D
   Explanation: A, B and D are isomers of hexane - they have the same molecular formula but different structural formulae. C represents an isomer of pentane C_5H_{12}

8. **(d)** Major amount of carbon dioxide produced is used up for photosynthesis during daytime.
   Explanation: Major amount of carbon dioxide produced is used up for photosynthesis during daytime.

9. **(b)** In individuals of a given species, a specific gene is located on a particular chromosome.
   Explanation: In individuals of a given species, a specific gene is located on a particular chromosome.

10. **(a)** Statement (iv) is correct.
    Explanation: Gland X is Cowper's gland that is present in males. It secretes an alkaline fluid.

11. **(a)** (iii) and (iv)
    Explanation: Males have two distinct sex chromosomes (XY) and are called the heterogametic sex (Chromosome-23). Females have two of the same kind of sex chromosome (XX)(Chromosome-23) and are called the homogametic sex. In human males, all the chromosomes (22- Autosomes) are paired perfectly except one (23^{rd}). These unpaired chromosomes are X and Y (Chromosome-23).

12. **(d)** Remains the same

Explanation: Remains the same because boiled gram seeds do not produce CO_2 gas.

13. **(a)** Solenoid
Explanation: A coil of many circular turn wrapped around a insulator forms a solenoid. It is mainly made of soft iron core as it loses the magnetism very easily on withdrawal of current.

14. **(b)** 0.005A
Explanation: The current in a circuit made up of a series of resistors is the same in every area of the circuit or is the same current flowing through every resistor.

15. **(b)** 10%
Explanation: 10%

16. **(b)** Cataract
Explanation: Exposure to ultraviolet (UV) radiation can cause eye diseases like cataract. A cataract is a clouding of the lens in the eye which leads to a decrease in vision.

17. **(b)** Both A and R are true but R is not the correct explanation of A.
Explanation: Both A and R are true but R is not the correct explanation of A.

18. **(a)** Both A and R are true and R is the correct explanation of A.
Explanation: Vagina is called as birth canal because the baby passes through the vagina during birth.

19. **(c)** A is true but R is false.
Explanation: Assertion is correct but the reason is wrong. As the current changes in the conductor, magnitude of the magnetic field produced also vanes which is the reason for a change in the deflection of the iron filings.

20. **(a)** Both A and R are true and R is the correct explanation of A.
Explanation: The flow of energy through different steps in the food chain is unidirectional. This means that energy captured by autotrophs does not revert back to the solar input and it passes to the herbivores.

Section B

21. The chemical bond formed (between two atoms) through the sharing of electrons is known as a **covalent bond**. The sharing of electrons between the two atoms takes place in such a way that both the atoms acquire stable electronic configurations of their nearest noble gas. The electron pairs shared by the two atoms are known as shared pairs.
(i) CCl_4: The type of bond in carbon tetra chloride is covalent bond.
(ii) $CaCl_2$: The type of bond in calcium chloride is ionic bond.

22. Testes are placed outside the body cavity in the scrotal sac because it requires a temperature $2^{\circ}C$ lower than the normal body temperature for production of sperms.

23. The deficiency of haemoglobin in the body is called anaemia. In anaemia, the blood is unable to carry the sufficient amount of oxygen required by the body. So, respiration would be less and less energy will be available to the body. A haemoglobin deficient person will feel weak, pale, lethargic and will be unable to perform heavy physical work.

OR

In order to transport the nutritive materials, waste materials, oxygen, carbon dioxide to the respective parts of the body, an extracellular fluid, blood circulates in our body. This process is called circulation.

24. Given, Height of the object = 6 cm
Focal length, f = - 30 cm
Object distance, u = - 45 cm
Image distance, v = ?
Height of image, h_i = ?
We have, $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$
$\frac{1}{-30} = \frac{1}{v} + \frac{1}{-45}$
$\frac{1}{-30} + \frac{1}{45} = \frac{1}{v}$
$\frac{1}{v} = \frac{-3+2}{90}$

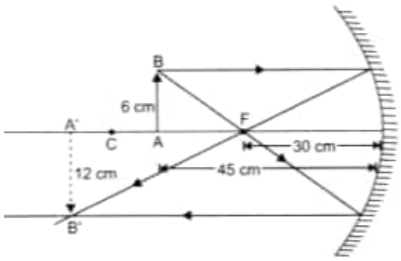
v = - 90 cm

Also, we have m = $\frac{h_i}{h_0} = \frac{-v}{u}$

$\frac{h_i}{6} = \frac{-(-90)}{-45}$

$\frac{h_i}{6}$ = - 2

h_i = -12



25. Fruit peels

OR

The second trophic level is marked by the organisms which feed directly on the producers, thus, folowing organisms lie at the second tropic level.

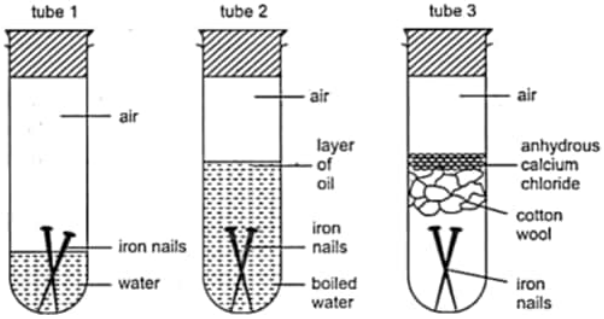
i. Butterfly, rice weevil.

ii. Butterfly, parrot.

26. In addition to the exercise for the strained eyes, my medical suggestion would be the usage of the anti-glare lens in their spectacles which reduces the impact of blue light emitted from digital items and artificial lighting. This would reduce the stress and strain caused. But still the exercise for eyes in repeated time interval should also be regularly followed.

Section C

27.



Test tube 1: Iron nails would get rusted that is corroded as they are exposed to moisture and air.

Test tube 2: Iron nails won't get rusted as they are exposed to water that is devoid of oxygen due to boiling and further the layer of oil is not letting oxygen come into contact with the water in which nails are immersed.

Test tube 3: Iron nails won't get rusted or corroded because they are not exposed to moisture and air.

28. i. Ionic compounds have high melting point and boiling point because in the ionic compounds the oppositely charged ions are held together by strong ionic bonds which require a lot of heat to break these bonds.

ii. Sodium is kept in kerosene because Sodium is highly reactive metal and it will instantly burn in the air so kerosene cuts off the contact of sodium with air.

iii. The reaction of Calcium with water is less violent because the heat evolved in this reaction is insufficient to burn hydrogen gas evolved during reaction.

iv. Metal Sulphides and carbonates must be converted to oxides prior to reduction because it is easier to reduce oxides than sulphides or carbonates.

OR

a. When aluminium (Al) is placed in nitric acid (HNO_3), a layer of aluminium oxide is formed on the metal. This happens because nitric acid is a strong oxidizing agent. The layer of aluminium oxide prevents further reaction of aluminium. This is the reason why the reactivity of aluminium decreases.

b. Sodium and magnesium have a tendency to react with oxygen rather than carbon because these are highly reactive metals. Hence, carbon cannot reduce the oxides of Na or Mg.

c. Ionic compounds do not conduct electricity in the solid-state but they conduct electricity in aqueous solution and in the molten state due to high concentration of free electrons. This property is shown by sodium chloride as it is an ionic compound.

d. Iron articles are galvanized to prevent them from rusting. After galvanization, the layer of zinc works as a protective layer. The most common type is hot-dip galvanizing. In this process, iron parts are submerged in a bath of molten zinc.

e. Metals such as Na, K, Ca and Mg are highly reactive metals and hence they are not found in their free state in nature.

29. Digestion of food occurs in the following steps:

i. **Mouth** (Buccal cavity): The mouth contains teeth, which crush the food into small particles. Salivary glands present in the mouth secrete saliva, which moistens the food. It also contains enzyme salivary amylase which gets mix with food and form bolus. From here, food travels to the esophagus or swallowing tube. The esophagus is a muscular tube extending from the pharynx to the stomach.

ii. **Stomach-** The stomach is a sac-like organ with strong muscular walls which acts like mixer and grinder. Gastric glands are present in the wall of the stomach which release following secretions:

a. **Hydrochloric acid** To make the medium acidic for the action of enzyme pepsin.
b. **Mucus** To protect the inner lining of the stomach from the action of an acid.
c. **Pepsin** A protein-digesting enzyme.

iii. **Small intestine** is made up of three segments, the duodenum, jejunum, and ileum. The small intestine is a long tube loosely coiled in the abdomen It is the site of complete digestion of carbohydrates, proteins, and fats. It receives secretions from liver and pancreas.

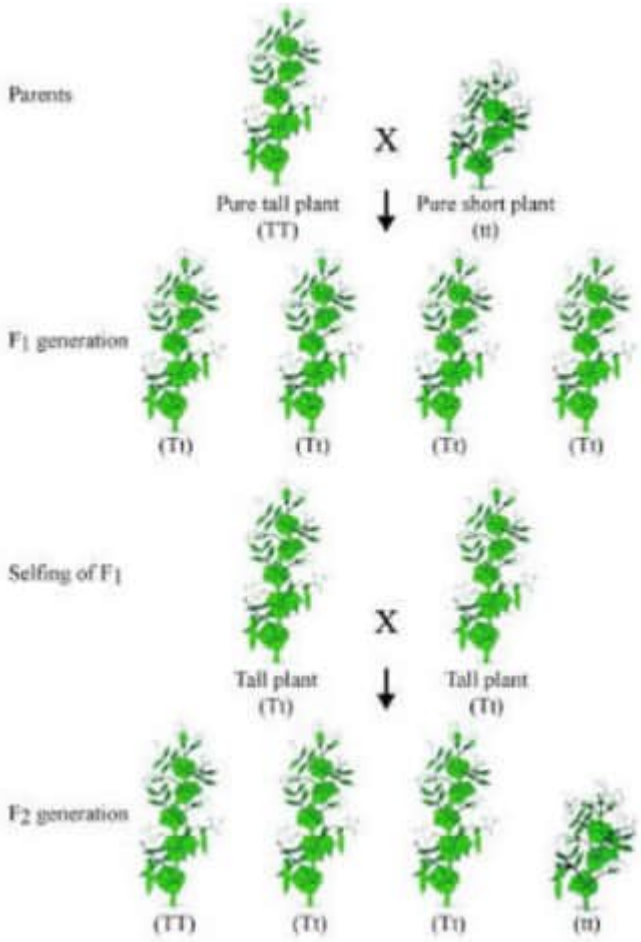
a. **Bile juice** It is secreted by the liver and performs the following functions:
It makes the medium alkaline for the pancreatic enzymes to act. It also breaks down large fat globules into smaller globules.
b. **Pancreatic juice** It is secreted by the pancreas. It contains enzymes like amylase for digesting starch, trypsin for digesting proteins and lipase for breaking down emulsified fats.
c. **Intestinal juice** It is secreted by the walls of the small intestine. It contains a number of enzymes such as maltase, lipase etc., for complete digestion

Colon - The final stage of the digestive system is the colon (large intestine) which absorbs water and salts before the remains are passed out of the rectum as faeces. The colon can also help to absorb remaining carbohydrate and some fats.

30. i. Plant used by Mendal is Garden Pea Plant (Pisum sativum).

ii. F_1 - All tall; F_2 - Tall and short

iii. The ratio in F_2 progeny is 3:1.



31. Let us assume that the window pane is between F2 and infinity from this lens and this is a convex lens. We know that when the object is between infinity and F_2, its inverted and real images is formed between 2F and $2F_2$.

    Now, the distant building is at infinity from the lens. Its image would be formed at 2F. So, the screen needs to be moved towards the lens in order to get a sharp image. Its approximate focal length is 10 cm (less than image distance in earlier case).

32. Let the current through the circuit be I which is divided into I_1 and I_2 in the arms AB and CD respectively, then we have

    $I = I_1 + I_2$

    In the arm AB, the total resistance is
    $R_1 = 6\Omega + 3\Omega = 9\Omega$

    and the total resistance in the arm CD is
    $R_2 = 12\Omega + 3\Omega = 15\Omega$

    i. Then current in the 6Q resistor i.e.,
    $I_1 = \frac{V}{R_1}$
    $= \frac{4}{9}$
    = 0.44 A

    ii. Now the current through CD is
    $I_2 = \frac{V}{R_2}$
    $= \frac{4}{15}$
    = 0.27 A

    The potential difference across 12Ω, resistor is
    $V_1 = I_2 \times 12\Omega$

    $V_1 = 0.27 \times 12$

    = 3.23 V

33. Given, power, P = 1500W, voltage, V = 230 V

    i. ∴ Electric down drawn,
    $I = \frac{P}{V} = \frac{1500}{250} = 6\text{A}$

    ii. ∴ Energy consumed, E = power × Time
    $= 1500 \times 50$
    $= 75000Wh$
    $= 75kWh$ [∵1 kW = 1000 W]
    $= 75\ unit$ [∵ 1 unit = 1 kWh]

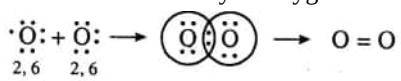
    iii. ∴ Cost of energy consumed $= 75 \times 6$
    $= Rs\ 450.$

Section D

34. Multiple covalent Bonding: We know that electron pair shared between two atoms is responsible for the formation of a covalent bond. This shared pair is also called bonding pair of electrons. The bonding atoms may share more than one pair of electrons also depending upon their requirement to complete the Octet. If the two atoms share one electron pair, bond is known as single covalent bond and is represented by one dash (-). If the two atoms share two electron pairs, bond is known as double covalent bond and is represented by two dashes (=). If the two atoms share three electron pairs, bond is known as triple covalent bond and is represented by three dashes (≡).

    In the case of H_2, Cl_2 and HCI molecules (given above) there are single bonds between the atoms.

    Formation of Double Bond: Two oxygen atoms combine to form an oxygen molecule by sharing two electron pairs. In the formation of oxygen molecule each oxygen atom has six electrons in the valence shell and require two electrons to complete the octet. Therefore, both the atoms contribute two electron pairs are shared and hence there is a double bond between the oxygen atoms. The covalency of oxygen is two.



    Formation of Triple Bond: In the formation of a nitrogen molecule, each of the bond nitrogen atoms having five electrons, provides three electrons to form three electrons pairs for sharing. Thus, a triple bond is formed between the two atoms. Here, covalency of nitrogen is three.

OR

Chemical equations of the reactions involved are:

A - C_2H_5COOH / CH_3CH_2COOH / An acid

B - CH_3CH_2COONa / C_2H_5COONa / a Sodium salt

C - C_2H_5OH / CH_3CH_2OH / an alcohol

D - $CH_3CH_2COOCH_2CH_3$ /$C_2H_5COOC_2H_5$ /an Ester

Equations:

$$\underset{(A)}{2CH_3CH_2COOH} + Na \rightarrow \underset{(B)}{2CH_3CH_2COONa} + H_2$$

$$\underset{(A)}{CH_3CH_2COOH} + \underset{(C)}{C_2H_5OH} \xrightarrow{Conc.\ H_2SO_4} \underset{D}{CH_3CH_2COOCH_2CH_3} + H_2O$$

$$\underset{(A)}{CH_3CH_2COOH} + NaOH \rightarrow `B' + H_2O$$

$$\underset{(D)}{CH_3CH_2COOCH_2CH_3} + NaOH \rightarrow \underset{(B)}{CH_3CH_2COONa} + \underset{(C)}{C_2H_5OH'}$$

35. i. a. **Planaria**: Fragmentation- occurs when an organism literally breaks off from itself. The broken fragments of the organism grow into individual separate organisms.
    b. **Hydra-budding**: In hydra, a bud develops as an outgrowth due to repeated cell division at one specific site. These buds develop into tiny individuals and, when fully mature, detach from the parent body and become new independent individuals.
    c. **Rhizopus**: spore formation occurs when a plant produces tiny spores and propagates through them. It burst open under favourable conditions giving rise to the new individual.

    ii. Occurs asexually through vegetative propagation by leaves. These buds arise at the margins of leaves giving rise to adventitious roots, shoots and small leaves. The new plants then detach from the leaves and develop into a mature plant after coming in contact with the soil.

    iii. a. offspring are clones of their parent plants.
    b. The plants that cannot produce viable seeds such as banana, seedless grapes and oranges, etc, can be easily grown by vegetative propagation.
    c. It is an easier, less expensive and a rapid method of propagation.

OR

Plants also perform chemical coordination for various activities with the help of hormones. These are the chemical compounds released by stimulated cells that diffuse to various locations in plants performing different functions. These hormones produced by plants are also called as phytohormones.

Different types of hormones produced by plants are: Auxin, Gibberellins, Cytokinins, Abscisic acid, Ethylene.

The physiological effect of each plant hormone (called phytohormone) is described in following table.

Plant Hormone	**Physiological Effect**
Auxin	◦ It is synthesised in the young tip of roots and shoots. ◦ It diffuses towards the shady side of the plant, which stimulates the cells to grow longer, resulting in bending of shoot towards the light ◦ It promotes cell elongation and division. ◦ It also plays important role in the formation of roots and seedless fruits.
Gibberellins	◦ These hormones helps in growth of stem and flower. ◦ These hormones also Help in germination of seed.
Cytokinins	◦ It promotes cell division and delay ageing in leaves. ◦ It reduces apical dominance and also stimulates the leaf expansion.
Abscisic acid	◦ It is a Growth inhibitor hormone that reverses the growth promoting effects of auxin and gibberellins. ◦ It causes the dormancy of seeds, wilting of leaves, closing of stomata and loss of proteins and chlorophyll.
Ethylene	◦ It promotes transverse growth, also promotes senescence and abscission of leaves. ◦ It acts as an essential hormone for the ripening of fruits.

36. **The modern Cartesian sign conventions are :**

(a) All the rays are drawn from left to right.

(b) All distances are measured from the pole of the spherical mirror.

(c) The distances measured in the direction of the incident light are taken as positive and those measured in a direction opposite to the direction of incident light are taken as negative.

(d) The heights measured upwards and perpendicular to the principal axis of the mirror are taken as positive and vice versa.

Since the object is always placed on the left of the mirror, *u* is always negative.

If *u* is the distance of object and *v* the distance of image from pole of the mirror, then

$\frac{2}{R} = \frac{1}{v} + \frac{1}{u}$ or $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$

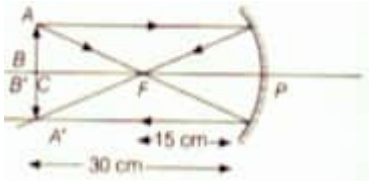
OR

i. When an object is placed at the centre of curvature of concave mirror, the image formed is equal in size to that of object. So, for object distance 20 cm, the mirror C with focal length 10 cm is used as

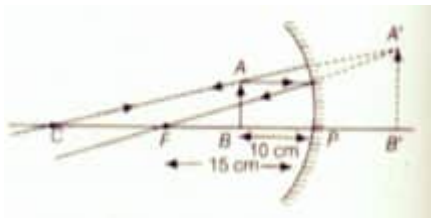
$u = R = 2f = 2 \times 10cm = 20cm.$

ii. For shaving purpose, mirror B (f = 15 cm) would be preferred (object distance is 10 cm) Also mirror A(f=20 cm) would be used (object distance is10 cm) .

iii. a. For u = 30 cm



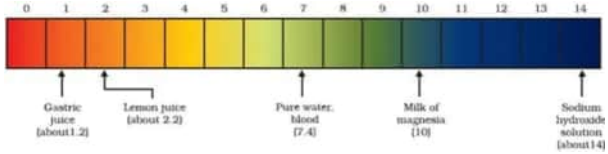
b. For u = 10 cm



Section E

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

The strength of acid and base depends on the number of H^+ and the number of OH^- respectively. If we take hydrochloric acid and acetic acid of the same concentration, say one molar, then these produce different amounts of hydrogen ions. Acids that give rise to more H^+ ions are said to be strong acids, and acids that give less H^+ ions are said to be weak acids. Can you now say what weak and strong bases are?



(i) The pH of milk is 6. As it changes to curd, the pH will reduce because curd is acidic in nature. The acids present in it decrease the pH.

(ii) No, gastric juice is a strong acid.

OR

Milk of magnesia is a base and it can be used as an antacid.

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

We have seen that the different parts of our body have specific functions. Our mouth waters when we see the food we like without our meaning to. Our heart's beat without our thinking about it. In fact, we cannot control these actions easily by thinking about them even if we wanted to. So, in between the simple reflex actions like change in the size of the pupil, and the thought out actions such as moving a chair, there is another set of muscle movements over which we do not have any thinking control. Many of these involuntary actions are controlled by the mid-brain and hind-brain. All these involuntary actions including blood pressure, salivation and vomiting are controlled by the medulla in the hind-brain. Think about activities like walking in a straight line, riding a bicycle, picking up a pencil. These are possible due to a part of the hind-brain called the cerebellum. It is responsible for the precision of voluntary actions and maintaining the posture and balance of the body. Imagine what would happen if each of

these events failed to take place if we were not thinking about it.

(i) Reflex Action is an unconscious, automatic and involuntary response of efforts, i.e., muscles and glands, to a stimulus, which is monitored through the spinal cord. Reflex action is controlled by the spinal cord.

(ii) Yes, reflex action involves all parts of the voluntary nervous system.

(iii) The part of the autonomic nervous system that controls involuntary actions are controlled or regulated by medulla (hindbrain).

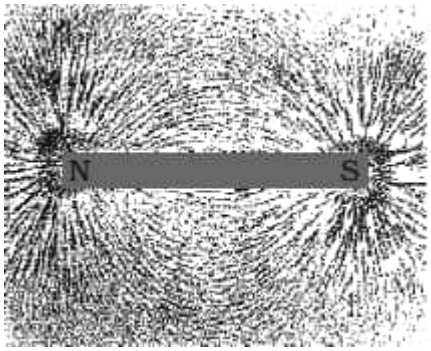
OR

'Beating of heart muscle' is an example of involuntary action. Involuntary actions are slower than reflex actions.

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

A student fixes a sheet of white paper on a drawing board using some adhesive materials. She places a bar magnet in the centre of it and sprinkles some iron filings uniformly around the bar magnet using a salt sprinkler. On tapping the board gently , she observes that the iron filings have arranged themselves in a particular pattern.

(i) The bar magnet kept at the centre of board has its magnetic field around it. The iron filings sprinkled on the board experience a force on them due to the magnetic field of bar magnet. So, when the student taps the board the iron filings align themselves according to the magnetic field lines of the bar magnet.

(ii) 

(iii) The direction of a magnetic field at a point is determined by placing a small compass needle. The N - pole of compass indicates the direction of magnetic field at that point.

Two magnetic field lines do not intersect each other because if there was point of intersection, The compass needle would point towards 2 directions.

OR