Class X Session 2023-24
Subject - Science
Sample Question Paper - 5

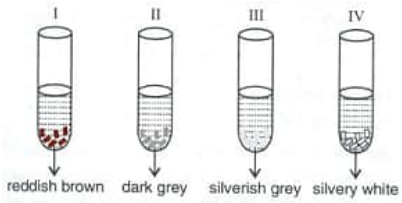
Time Allowed: 3 hours **Maximum Marks: 80**

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. A student took Cu, Al, Fe and Zn strips separately in four test tubes labelled I, II, III and IV. He added 10 mL of freshly prepared ferrous sulphate solution to each test tube as shown below: **[1]**



Black residue would be obtained in test tubes

a) II and IV
b) I, II and IV
c) II and III
d) III and IV

2. What is the colour of the residue left in the test tube after thermal decomposition of ferrous sulphate? **[1]**

a) Green
b) Black
c) Brownish black
d) White

3. Which one of the following types of medicines is used for treating indigestion? **[1]**

a) Antacid
b) Antiseptic
c) Antibiotics
d) Analgesic

4. Which of the following compounds contain carboxylic group? **[1]**

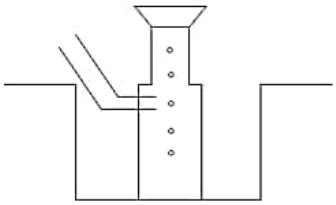
a) CH_3 - CH_2 - CH_3

b) CH_3CH_2COOH

c) $CH_3COOC_2H_5$

d) CH_3CH_2OH

5. A metal is heated with dil H_2SO_4. The gas evolved is collected by the method shown in the figure. Answer the following questions based on it: **[1]**



Name the method used for the collection of gas.

a) Upward displacement method

b) Downward replacement method

c) Downward displacement method

d) Upward replacement method

6. What happen when calcium is treated with water? **[1]**

a. It does not react with water.

b. It reacts violently with water.

c. It reacts less violently with water.

d. Bubbles of hydrogen gas formed during the reaction stick to the surface of calcium.

a) All of these

b) B and C

c) A, B and D

d) C and D

7. Functional group -COOH is present in which of the following? **[1]**

a) Carboxylic acid

b) Alcohol

c) Ketone

d) Aldehyde

8. The digestion of which food component begins in the stomach? **[1]**

a) Starch

b) Fats

c) Proteins

d) None of these

9. Alternative forms of a gene are called **[1]**

a) Chromosomes

b) Multiples

c) Loci

d) Alleles

10. Length of pollen tube depends on the distance between **[1]**

a) pollen grain and upper surface of stigma

b) upper surface of stigma and lower part of style

c) pollen grain in anther and upper surface of stigma

d) pollen grain on upper surface of stigma and ovule

11. The component of a chromosome that controls heredity is **[1]**

a) Histones

b) Proteins

c) RNA

d) DNA

12. A well-stained leaf peel mount when observing under the high power of a microscope shows nuclei in **[1]**

a) only epidermal cells
b) guard cells and epidermal cells
c) guard cells, epidermal cells and stoma.
d) only guard cells

13. At the time of short circuit, the current in the circuit **[1]**

a) vary continuously
b) reduced considerably
c) does not change
d) increases heavily

14. Two conducting wires of the same material and of equal lengths and equal diameters are first connected in series and then parallel in a circuit across the same potential difference. The ratio of heat produced in series and parallel combinations would be- **[1]**

a) 1 : 2
b) 4 : 1
c) 2 : 1
d) 1 : 4

15. Greenhouse gases: **[1]**

a) Gases used in house for cooking
b) Green in colour
c) None of these
d) Trap solar radiations and increase temperature

16. Which of the following belong only to the second trophic level? **[1]**

A. Protozoa
B. Small fish
C. Grasshopper
D. Snake

a) A, B and C
b) A and C
c) All of these
d) B and C

17. **Assertion (A):** Silver articles become black after sometime when exposed to sunlight. **[1]**
Reason (R): It is because silver reacts with carbonates present in the 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):** Double fertilisation is unique to angiosperms. **[1]**
Reason (R): Triple fusion occurs in both fertilization.

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

19. **Assertion (A):** A solenoid tends to expand, when a current passes through it. **[1]**
Reason (R): Two straight parallel metallic wires carrying current in same direction attract each other.

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):** Man is a herbivore. **[1]**

Reason (R): Omnivores eat both plant food and meat of animals.

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. Explain the combustion reaction with the examples. **[2]**

22. Differentiate sepal and petal. **[2]**

23. **All plants give out oxygen during day and carbon dioxide during night**. Do you agree with this statement? Give reason. **[2]**

OR

Organisms are classified on the basis of nitrogenous waste excreted by them. Explain.

24. A convex mirror used on a bus has a focal length of 200 cm. If a scooter is located at 100 cm. from this mirror find the position, nature and magnification of the image formed in the mirror. **[2]**

25. What are phytoplanktons? Give one example. **[2]**

OR

What is the dam? Why do we seek to build large dams? While building large dams, which three main problems should particularly be addressed to maintain peace among local people? Mention them.

26. What is name of defect of eye due to loss of elasticity of eye-lens ? How is it corrected ? **[2]**

Section C

27. What would happen to copper vessel if it is left for a few days in humid atmosphere without being cleaned? **[3]**

28. i. An ore, on heating in air, give sulphur dioxide gas. Name the method in each metallurgical step, that will be required to extract this metal from its ore. **[3]**

ii. State which of the following reactions will take place or which will not, giving suitable reason for each?

a. $Zn(s) + CuSo_4\,(aq) \rightarrow ZnSO_4\,(aq) + Cu(s)$

b. $Fe(s) + ZnSO_4(aq) \rightarrow FeSO_4(aq) + Zn(s)$

OR

i. Give differences between roasting and calcination with suitable examples.

ii. Explain how the following metals are obtained from their compounds by the reduction process. Give one example of each type.

a. Metal M which is in the middle of the reactivity series.

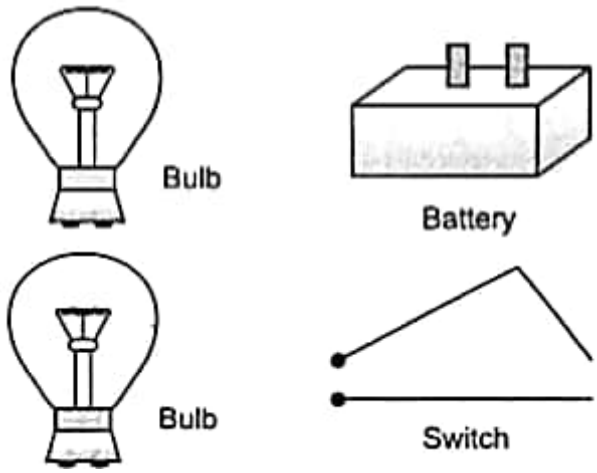
b. Metal N which is high up in the reactivity series.

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

30. A man with type A blood has a wife with type B. They have a child with type O blood. Give the genotype of all the three. What other blood groups can be expected in the future offspring of this couple? **[3]**

31. Distinguish between a convex lens and a concave lens. **[3]**

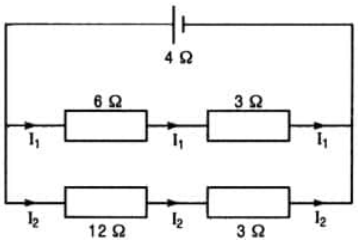
32. The given figure shows a battery, a switch and two bulbs. Complete the diagram to show the electric connections of the bulbs to the battery. How have you joined the bulbs? Give a reason. **[3]**



33. For the circuit shown in fig. what is the value of **[3]**

a. total resistance and current through 6W resistor

b. potential difference across 12 Wresistor?



Section D

34. Draw the structures for the following compounds. **[5]**

i. Ethanoic acid

ii. Bromopentane*

iii. Butanone

iv. Hexanal.

*Are structural isomers possible for bromopentane?

OR

i. How is vinegar made?

ii. What is glacial acetic acid? What is its melting point?

iii. Why is butanoic acid a weak acid?

iv. Write the name and the formula of the two compounds formed when the ester, $CH_3COOC_2H_5$ undergoes saponification.

35. i. In the female reproductive system of human beings, state the funtions of **[5]**

a. ovary

b. oviduct

ii. Mention the changes which the uterus undergoes, when

a. it has to receive a zygote.

b. no fertilization takes place.

iii. State the function of placenta.

OR

Draw the structure of a neuron and describe its function.

36. A thin converging lens form a real magnified image and virtual magnified image of an object in front of it. **[5]**

i. Write the positions of the objects in each case.

ii. Draw ray diagrams to show the image formation in each case.

iii. How will the following be affected on cutting this lens into two halves along the principal axis?

a. Focal length

b. Intensity of the image formed by half lens.

OR

Rishi went to a palmist to show his palm. The palmist used a special lens for this purpose.

i. State the nature of the lens and the reason for its use.

ii. Where should the palmist place/hold the lens so as to have a real and magnified image of an object?

iii. If the focal length of this lens is 10 cm and the lens is held at a distance of 5 cm from the palm, use lens formula to find the position and size of the image.

Section E

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

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

(i) If given acids are phosphoric acid, carbonic acid, hydrochloric acid and sulphuric acid, then which acid does not form an acidic salt?

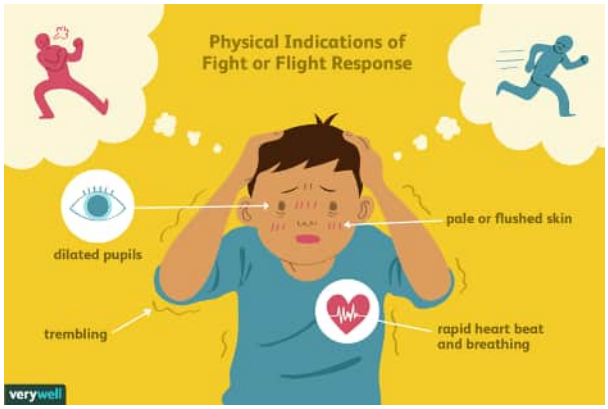
(ii) What is the formula of baking soda?

OR

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

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

Adrenaline is secreted directly into the blood and carried to different parts of the body. The target organs or the specific tissues on which it acts include the heart. As a result, the heart beats faster, resulting in the supply of more oxygen to our muscles. The blood to the digestive system and skin is reduced due to contraction of muscles around small arteries in these organs. This diverts the blood to our skeletal muscles. The breathing rate also increases because of the contractions of the diaphragm and the rib muscles. All these responses together enable the animal body to be ready to deal with the situation. Such animal hormones are part of the endocrine system which constitutes the second way of control and coordination in our body.



(i) How does chemical coordination take place in animals ?

(ii) Which hormone is called an emergency hormone?

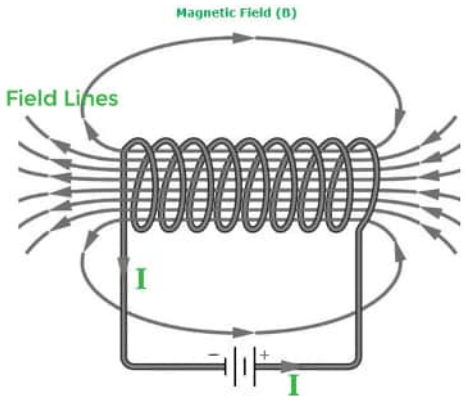
(iii) Where are the adrenal gland present in our body?

OR

How does our body respond when adrenaline is secreted into the blood ?

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

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



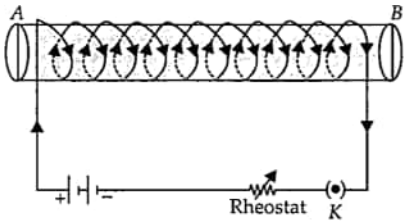
(i) What would be the strength of the magnetic field inside a long current-carrying straight solenoid?

(ii) Which end is north and which end is south pole when current flows through a solenoid?

(iii) A long solenoid carrying a current produces a magnetic field B along its axis. If the current is double and the number of turns per cm is halved, then what will be the new value of the magnetic field?

OR

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



Solution

Section A

1. **(a)** II and IV
   Explanation: Black residue would be obtained in test tubes II and IV because Al and Zn will displace iron from $FeSO_4$ to form black residue as these are more reactive than iron.
   $2Al + 3FeSO_4 \rightarrow Al_2(SO_4)_3 + 3Fe$
   $Zn + FeSO_4 \rightarrow ZnSO_4 + Fe$

2. **(c)** Brownish black
   Explanation: Brownish black

3. **(a)** Antacid
   Explanation: Antacids are mild bases which are given to a person suffering from acidity as acids reacts with bases to form salt and water. The excess acid present in the stomach is neutralised by the bases present in antacids and relieve indigestion.

4. **(b)** CH_3CH_2COOH
   Explanation: CH_3CH_2COOH contains a carboxylic group. CH_3CH_2OH contains an alcoholic group. $CH_3COOC_2H_5$ contains the ester group. CH_3 - CH_2 - CH_3 is an alkane.

5. **(c)** Downward displacement method
   Explanation: Using downward displacement method, hydrogen gas is collected over water.

6. **(d)** C and D
   Explanation:
   Calcium reacts with cold water (less violently as compared to the reaction of sodium with water) to form calcium hydroxide and hydrogen gas. Bubbles of hydrogen gas formed during the reaction stick to the surface of calcium and calcium pieces start floating in the water.

7. **(a)** Carboxylic acid
   Explanation: Carboxylic acid

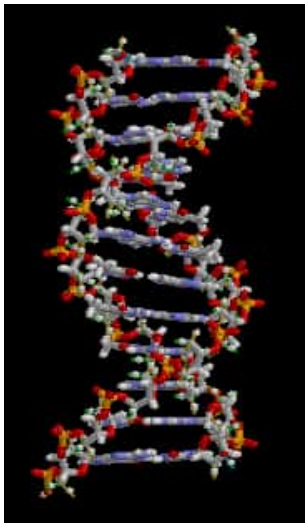
8. **(c)** Proteins
   Explanation: Protein digestion starts in the stomach. Protein digestion occurs in the stomach and duodenum in which 3 main enzymes, pepsin secreted by the stomach and trypsin and chymotrypsin secreted by the pancreas, break down food proteins into polypeptides that are then broken down by various exopeptidases and dipeptidases into amino acids.

9. **(d)** Alleles
   Explanation: An alternative form of a gene is known as an allele. Alleles vary in their sequence which may or may not result in a variant phenotype of a particular trait. Alleles represent variations of a gene that is responsible for a particular trait.

10. **(d)** pollen grain on upper surface of stigma and ovule
    Explanation: The **length** of the **pollen tube depends on the distance between** the upper surface of the stigma and the ovule.

11. **(d)** DNA
    Explanation: Heredity is the passing on of traits from parents to their offspring, either through asexual reproduction or sexual reproduction; the offspring cells or organisms acquire the genetic information of their parents.

Heritable traits are known to be passed from one generation to the next via DNA, a molecule that encodes genetic information.



12.

(b) guard cells and epidermal cells

Explanation: The nucleus is present in both guard cells and epidermal cells.

13.

(d) increases heavily

Explanation: A **short circuit** is simply a low resistance connection between the two conductors supplying electrical power to any **circuit**. This results in excessive current flow in the power source through the '**short**,' and may even cause the power source to be destroyed.

14.

(d) 1 **:** 4

Explanation: Since the two conducting wires of the same material $(\text{same } \rho)$ and of equal lengths (same l) and equal diameters (same A), they will have the same resistance R. $R = \rho\frac{l}{A}$

The effective resistance of the series combination will be $R_S = R + R$ or $R_S = 2R$. Current drawn by the series combination will be $I_S = \frac{V}{2R}$

The effective resistance of the parallel combination will be $R_P = \frac{R \times R}{R + R}$ or $R_P = \frac{R}{2}$. Current drawn by the parallel combination will be $I_P = \frac{2V}{R}$

Therefore, at a given voltage, the ratio of the resistances will be R_S **:** R_P = 4 **:** 1 and the ratio of the currents will be I_S **:** I_P = 1 **:** 4

The ratio of heat produced in the series and the parallel combination would be**:**

$\frac{H_S}{H_P} = \frac{{I_S}^2 \times R_S \times t}{{I_P}^2 \times R_P \times t}$ **or** $\frac{H_S}{H_P} = (\frac{I_S}{I_P})^2 \times (\frac{R_S}{R_P})$ **or** $\frac{H_S}{H_P} = \frac{1}{4}$

15.

(d) Trap solar radiations and increase temperature

Explanation: Greenhouse gases (GHG) are gases in the atmosphere that absorb and emit radiation within the thermal infrared range. This process is the fundamental cause of the greenhouse effect. Greenhouse gases trap solar radiation and increase the temperature of the Earth.

16.

(d) B and C

Explanation: The second trophic level is of the primary consumers (herbivores). Small fish and grasshopper belong to this level. A snake is not a primary consumer. Free-living protozoa occupy a range of trophic levels.

17.

(c) A is true but R is false.

Explanation: Silver reacts with sulphur present in the air and forms a layer of silver sulphide, therefore, silver articles get tarnished. Thus assertion is true, but reason is false.

18.

(c) A is true but R is false.

Explanation: Double fertilization is a characteristic feature of flowering plants. In this process, out of the two sperm nuclei, one sperm nucleus fuses with the egg nucleus to form an embryo (the process is called syngamy), and another fuse with the secondary nucleus to form endosperm (the process is called triple fusion). Because two kinds of fusion-syngamy and triple fusion take place, the process is known as double fertilization.

19. **(d)** A is false but R is true.
Explanation: When current flows through a solenoid, the currents in the various turns of the solenoid are parallel and in the same direction. Since the current flowing through parallel wires in the same direction lead to force of attraction between them, the turns of the solenoid will also attract each other and as a result the solenoid tends to contract.

20. **(d)** A is false but R is true.
Explanation: A is false but R is true.

Section B

21. When a substance burns in the presence of oxygen, the reaction is called combustion. An example of a combustion reaction is given as
$CH_4 + O_2 \longrightarrow CO_2 + H_2O$ + heat and light

22.

Sepal	Petal
1) It is the green coloured lowermost structure of the flower.	1) It is the brightly coloured structure next to sepal.
2) A group of sepals is called calyx	2) A group of petals is called corolla.
3) Its function is to protect the inner membranes and also does photosynthesis.	3) Its function is to protect the inner membranes and also attract pollinating agents.
4) If the sepals are absent the condition is known as asepalous.	4) If the petals are absent the condition is known as apetalous.
5) Calyx protects the inner whorls in bud condition.	5) Corolla attracts the agents of pollination.

23. Yes, we agree with the given statement.
Plants respire throughout the day, while photosynthesis takes place only in the presence of the sunlight. In the daytime, CO_2 produced during respiration is used by the plants in photosynthesis. So, CO_2 is not released into the environment. The oxygen produced during photosynthesis is released into the air through stomata.
At night, when there is no photosynthesis, no oxygen is released. Also, CO_2 produced during respiration is not uses by the plants. So, it is released in the air.

OR

The production of the nitrogen waste in humans and other organisms form ammonia inside the body. On the basis of nitrogenous waste products excreted by organisms, they are classified as **Ammonotelic** organisms which secrete ammonia, **ureotelic** organisms that secrete urea, whereas **uricotelic** organisms which secrete uric acid as the major excretory waste.

24. Focal length, f = +200cm
Object distance, u = -100cm
$\frac{1}{f} = \frac{1}{v} + \frac{1}{V}$
$\frac{1}{v} = \frac{1}{f} - \frac{1}{V}$
$\frac{1}{v} = \frac{1}{200} + \frac{1}{100}$
$\frac{1}{v} = \frac{3}{200}$
$v = \frac{200}{3} = 66.67cm$
$m = \frac{-v}{V} = \frac{-66.67}{-100}$
m = 0.666
As v is +ve so image is Virtual and is formed behind the mirror.

25. Phytoplanktons are microscopic aquatic plants which float on the surface of water in a pond, lake, river, etc.
For example : Algae

OR

The dam is a barrier that is built across a river or a stream for storage of water.
We seek to build large dams because it can ensure the storage of an adequate amount of water for irrigation and also for generating electricity.
The three main problems are an economical problem, environmental problem, and ecosystem problem.

26. It is called presbyopia. It can be corrected by using two separate lenses, one for near vision and the other for distant vision.

Section C

27. Copper is not affected by dry air at ordinary temperature. On exposure to moist air, it gets covered with a beautiful green coating of either basic carbonate or basic sulphate.

    $2Cu + H_2O + CO_2 + O_2 \rightarrow CuCO_3.Cu(OH)_2$

    $8Cu + 6H_2 + 2SO_2 + 5O_2 \rightarrow 2[CuSO_4.3Cu(OH)_2]$

    Copper present in bronze or in utensils is corroded by moist air containing acidic oxides like carbon dioxide, sulphur dioxide etc. The greenish layer formed is of basic copper carbonate or basic copper sulphate. This phenomenon is called 'corrosion of metals'.

28. i) The ore is Cinnabar (Hg_2S)

    Cinnabar is the ore of mercury (Hg) which has low reactivity and can be reduced to mercury by heating alone. So to obtain mercury from cinnabar the only step required is heating strongly in the presence of oxygen called "Roasting". In the first step, cinnabar gets converted to mercuric oxide which on further heating is reduced to mercury.

    $2HgS\ (s) + 3\ O_{2\ (g)} + Heat \rightarrow 2\ HgO(s) + 2\ SO_2\ (g)$

    $2\ HgO + Heat \rightarrow 2\ Hg\ (l) + O_2\ (g)$

    ii) a. This reaction will take place as Zn is more reactive than Cu, so Zn will displace Cu from its salt $CuSO_4$ and will form colourless $ZnSO_4$ solution and reddish brown particles Cu.

    b. This reaction will not occur as Fe is less reactive than Zn, so it will not be able to displace Zn from $ZnSO_4$.

    OR

i.

Roasting	Calcination
Ore is heated in the excess supply of air(oxygen)	Ore is heated in the absence or limited supply of air (oxygen)
Roasting is done for sulphide ores.	Calcination is done for carbonate ores.
SO_2 is produced along with metal oxide.	CO_2 is produced along with metal oxide.
e.g. $2ZnS(s) + 3O_2\ (g) \xrightarrow{\Delta} 2ZnO(s) + 2SO_2\ (g)$	e.g. $ZnCO_3\ (s) \xrightarrow{\Delta} ZnO(s) + CO_2\ (g)$

ii. a. The metal M which is in the middle of the reactivity series (such as iron, zinc, etc) is moderately reactive. Their sulphide and carbonate ore is first converted into their oxides by the process of roasting and calcination, respectively. The metal oxides (MO) are then reduced to the corresponding metals by using suitable reducing agents such as carbon, e.g. zinc metal can be obtained from its oxide as follows:

$$\underset{Zinc\ oxide}{ZnO(s)} + \underset{Carbon}{C(s)} \rightarrow \underset{Zinc}{Zn(s)} + \underset{Carbon\ monoxide}{CO(g)}$$

b. The metal N which is high up in the reactivity series (such as sodium, magnesium, etc) is very reactive and can be obtained by electrolysis of their molten salt and not the aqueous\ solution. These metals cannot be obtained by heating their ore alone. e.g. sodium is obtained by the electrolysis of molten sodium chloride (NaCl).

c. **At cathode:** $Na^+ + e^- \rightarrow Na$

At anode: $2CI^- \rightarrow CI_2 + 2e^-$

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

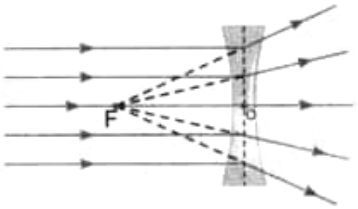
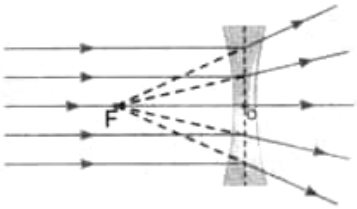
Colon - The final stage of the digestive system is the colon (large intestine) which absorbs water and salts before the remains are passed out of the rectum as faeces. The colon can also help to absorb remaining carbohydrate and some fats.

30. a. Genotypes. Man ($I^A I^O$) Mother $I^B I^O$ and child $I^O I^O$.

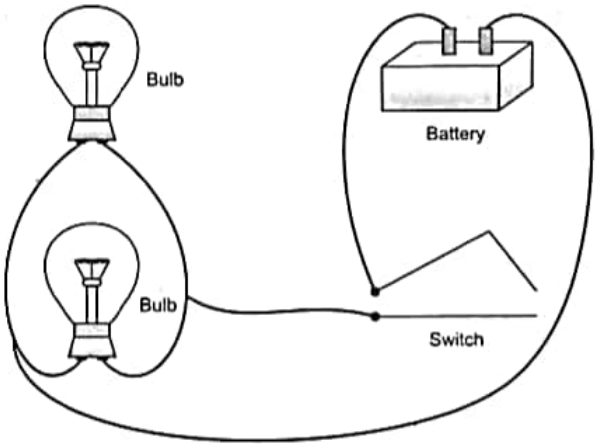
b. Blood group of the future offspring. A type, B type, O type and AB type. It is based on the following cross:

♀ \ ♂	I^A	I^O
I^B	$I^A I^B$	$I^B I^O$
I^O	$I^A I^O$	$I^O I^O$

31.

Convex Lens	Concave Lens
1. It is a thicker at the center than at the edges. 2. Is has real Focus. 3. It converges a parallel beam of light on reflection through it. 4. 	1. It is thinner at the center than at the edges. 2. It has virtual focus. 3. It diverges a parallel beam of light on refraction through it. 4. 

32. The two bulbs are connected in parallel and the complete circuit diagram is drawn below:



The reason for connecting the two bulbs in parallel is that (i) both the bulbs glow at the same voltage, and (ii) if one bulb stops glowing, the other bulb remains unaffected.

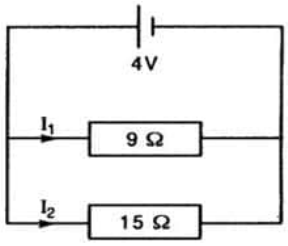
33. Resistor of 6Ω and 3Ωare in series therefore, combined resistance of these two is

$R_1 = 6 + 3 = 9\Omega$

Again 12W and 3W are in series. The combined resistance of these two is

$R_2 = 12 + 3 = 15\Omega$

Now 9Ω and 15Ω are in parallel to each other. Fig. (a) is the equivalent circuit.



Therefore, the combined resistance of full circuit is

$\frac{1}{R} = \frac{1}{9} + \frac{1}{5} = \frac{5+3}{45} = \frac{8}{45}$ or $R = \frac{45}{8} = 5.6\Omega$ $\ldots\ldots\ldots (i)$

V = 4 volt

∴ P.D. across 9 Ω as well as across 15 Ω is 4 V

Current along 9Ω resistor (and hence through 6Ω resistor)

$I_1 = \frac{V}{R_1} = \frac{4}{9}\ A = 0.44\ A \ldots\ldots\ldots (ii)$

Current along 15Ω resistor (and hence through 12Ω resistor)

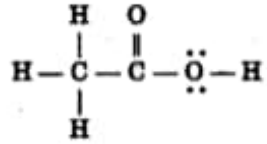
$I_2 = \frac{V}{R_2} = \frac{4}{15}\ A$

Potential difference across 12Ω wire = $12I_2$

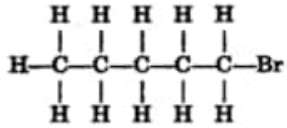
$= 12 \times \frac{4}{15} = \frac{16}{5} = 3.2V \ldots\ldots\ldots\ldots (iii)$

Section D

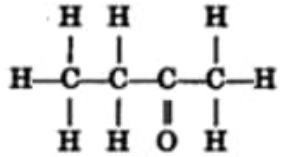
34. i. The structure of Ethanoic acid is given as



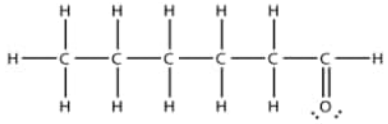
ii. The structure of Bromopentane is given as



The structure of Butanone is given as

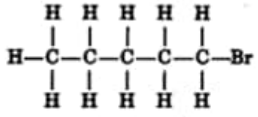
iii. 

iv. Hexanal:

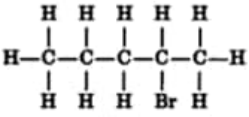


Structural isomers for bromopentane: There are three structural isomers for bromopentane depending on the position of Br at carbon 1, 2, 3. Position 4 and 5 are the same as 1, 2.

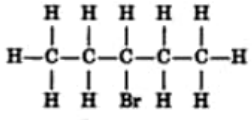
Yes, an isomer of bromopentane is possible. The structure of one of the isomers of bromopentane is given below-



1, Bromopentane



2, Bromopentane



3, Bromopentane

OR

i. vinegar is made by adding 5-8 percent of water in acetic acid.

ii. Pure ethanoic acid is called glacial acetic acid because it form crystals at low temperature. It is a strong acid.

iii. Butanoic acid is a weak acid because it does not ionise completely.

iv. It is a reaction in which ester is heated in presence of a base (mainly NaOH) to give out ethanol & ethanoic acid, this process is used in making of soap.

$CH_3COOC_2H_5 \xrightarrow{NaOH} CH_3COOH + C_2H_5OH$

Ethyl Ethanoate Ethanoic acid Ethanol

35. i. a. Function of ovary are:
- The female germ-cells or eggs are made in the ovaries.
- It produces one egg every month.
- They are also responsible for the production of some hormones.

b. Function of oviduct are:
- Carries egg to the womb/ uterus through a thin oviduct or fallopian tube.

ii. Changes in the uterus are as follows:

a. If the uterus receives the zygote, the female becomes pregnant. The embryonic development of the zygote starts immediately. The embryo moves down into the uterus forming a thick and soft lining of blood vessels around itself. This process is called implantation. After implantation, a special tissue develops between the uterine wall and the embryo called the placenta, where the exchange of nutrients, oxygen and waste products takes place.

b. If the egg released by the ovary is not fertilized and the zygote is not formed, then the thick lining of the uterus breaks down and comes out through the vagina in the form of blood and mucous. This is called menstruation or menstrual cycle.

iii. In mammals, the placenta performs the following functions:

a. It helps in providing nutrition to the embryo as the nutrients like amino acids, vitamins etc, diffuse from maternal blood into foetal blood through the placenta. It also helps in the exchange of gases and the excretion of wastes.

b. It also acts as an endocrine gland as it secretes certain hormones like estrogen, relaxin, progesterone and Human Chorionic Gonadotropin (HCG).

c. It also acts as an effective barrier for certain toxic chemicals like histamine.

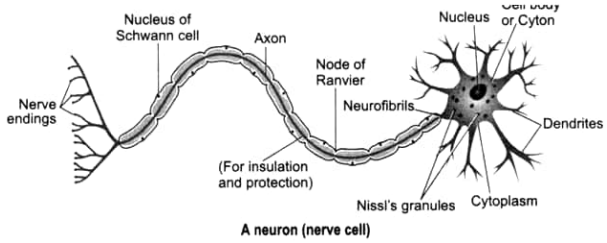
OR

Neuron or nerve cell is a structural and functional unit of the nervous system that is specialised to receive, conduct and transmit nerve impulses. A neuron (nerve cell) has three components:

i. Cell body (cyton)

ii. Dendrites

iii. Axon



A neuron (nerve cell)

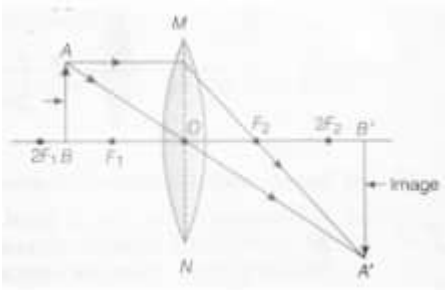
Functions: The information acquired at the end of the dendritic tip of a neuron sets off a chemical reaction which creates an electrical impulse. This impulse travels from die dendrite to the cyton along the axon of its end. At the end of axon, the electrical impulse sets off the release of some chemicals, which cross the synapse and start a similar electrical impulse in a dendrite of the next neuron. In this way nerve impulses travel in the body, from one neuron to another till it reaches the brain or the target organ. Thus, a nervous tissue is made up of an organised network of nerve cells or neurons which are specialised in conducting information via electrical impulse from one part of the body to another.

36. i. a. Object is placed between F and 2F of thin converging lens .

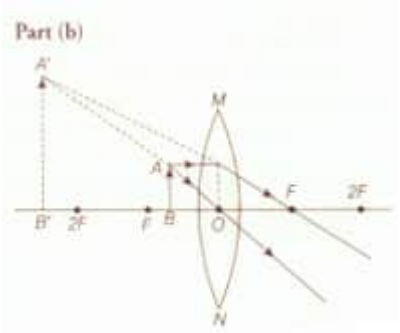
b. Object is placed between optical centre and F.

ii. The ray diagrams for real magnified and virtual magnified images are as follows:

Part (a)



Part (b)



iii. a. There will be no change in focal length of converging lens.
b. Intensity will become one-fourth and brightness of lens will be less .

OR

i. Palmists use a convex lens because it shows an enlarged, virtual and erect image when the object is between F and O of a convex lens.

ii. If the palmist wants a real and magnified image, he should put an object between F_1 and F_2 or on F. But in that case, he will have to use a screen to see the image. So, for convenience, palmists.

iii. Given, f = 10 cm, u = -5 cm

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

Or $\frac{1}{v} + \frac{1}{5} = \frac{1}{10}$

Or, $\frac{1}{v} = \frac{1}{10} - \frac{1}{5}$

Or $\frac{1}{v} = \frac{1-2}{10} = -\frac{1}{10}$

Or, v = -10 cm

The image is formed at 10 cm on the same side of the lens. It is erect and virtual.

Image size = $\frac{v}{u} = \frac{10}{5}$ = 2

Image is twice as big as object.

Section E

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

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

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

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

OR

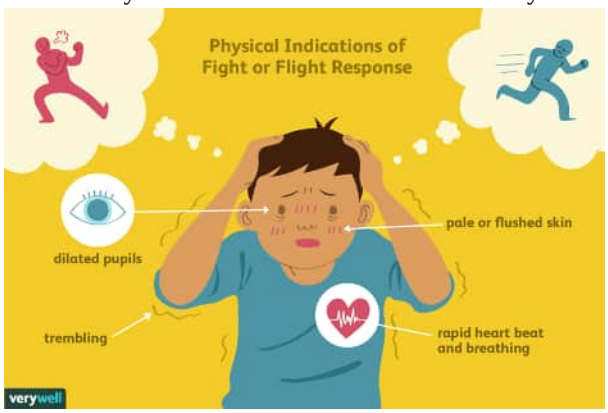
$Ca(OH)_2$ treatment with chlorine to obtain bleaching powder.

$Ca(OH)_2 + Cl_2 \longrightarrow CaOCl_2 + H_2O$

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

Adrenaline is secreted directly into the blood and carried to different parts of the body. The target organs or the specific tissues on which it acts include the heart. As a result, the heart beats faster, resulting in the supply of more oxygen to our muscles. The blood to the digestive system and skin is reduced due to contraction of muscles around small arteries in these organs. This diverts the blood to our skeletal muscles. The breathing rate also increases because of the contractions of the diaphragm and the rib muscles. All these responses together enable the animal body to be ready to deal with the situation. Such animal hormones are part of the

endocrine system which constitutes the second way of control and coordination in our body.



(i) In animals, chemical coordination is achieved through the agency of hormones which function as chemical messengers. Different plant hormones help to coordinate growth, development, and responses to the environment.

(ii) Adrenaline hormone is called an emergency hormone. Adrenaline hormone is released into the blood from the adrenal gland during stimulation of the nervous system.

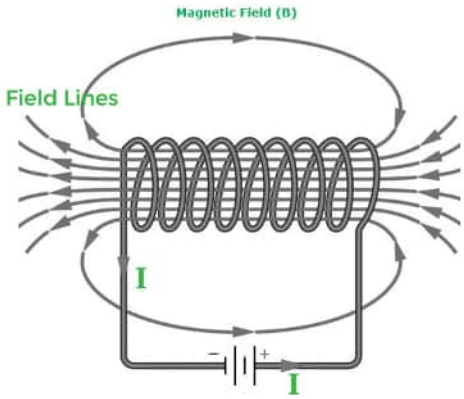
(iii) The adrenal gland is present on the upper side of each kidney in our body.

OR

Adrenaline hormone is secreted in small amounts all the time. But in large amounts, it is secreted when a person is frightened. It increases the rate of heartbeat and breathing, raises blood pressure and allows more glucose go into the blood to give us a lot of energy so as to quickly fight or run away from the frightening situation.

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

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



(i) Magnetic field inside the infinite solenoid is uniform. Hence it is the same at all points.

(ii) The end of the current carrying solenoid at which the current flows anti-clockwise behaves as a north pole while that end at which the direction of current clockwise behaves as a south pole and this is according to clock wise.

(iii) For a long solenoid, magnetic field $B \propto In$; where I is the flowing current and n is number of turns per unit length in the solenoid. Therefore, in the given case magnetic field will remain unchanged.

OR

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