

**Class X Session 2024-25**  
**Subject - Science**  
**Sample Question Paper - 9**

**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**

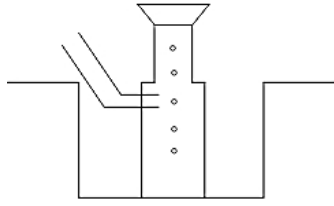
1. The chips packet is flushed with a gas **X** to prevent rancidity. Identify **X**. [1]



- |             |                   |
|-------------|-------------------|
| a) Oxygen   | b) Carbon dioxide |
| c) Nitrogen | d) Water vapour   |
2. Which metal is displaced when zinc metal is put in the solution of copper sulphate? [1]
- |           |                 |
|-----------|-----------------|
| a) Zinc   | b) All of these |
| c) Copper | d) Sulphate     |
3. An acid can react with [1]
- |                             |                             |
|-----------------------------|-----------------------------|
| a) $\text{PbSO}_4$          | b) $\text{AgCl}$            |
| c) $\text{Na}_2\text{SO}_4$ | d) $\text{Na}_2\text{CO}_3$ |
4. While cooking if the bottom of the vessel is getting blackened on the outside, it means that: [1]

- a) The fuel is burning completely.                      b) The food is not cooked completely.  
c) The fuel is not burning completely.                d) The fuel is wet.

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 gas evolved.

- a)  $H_2$  gas                                                              b)  $O_2$  gas  
c) CO gas                                                              d)  $CO_2$  gas
6. A metal **X** is used in thermite process. When **X** is burnt in air it gives an amphoteric oxide **Y**. **X** and **Y** are respectively: [1]  
a) Fe and  $Fe_3O_4$                                                               b) Al and  $Al_3O_4$   
c) Fe and  $Fe_2O_3$                                                               d) Al and  $Al_2O_3$
7. When acetic acid reacts with ethyl alcohol, we add conc.  $H_2SO_4$ . It acts as \_\_\_\_\_ and the process is called \_\_\_\_\_. [1]  
a) Reducing agent, Esterification                                                              b) Oxidizing agent, Saponification  
c) Acid, Esterification                                                              d) Dehydrating agent, Esterification
8. One of the events that does not occur during photosynthesis is: [1]  
a) Chlorophyll absorbs solar energy.                                                              b) Carbon dioxide is released during the process.  
c) Oxygen is released during the process.                                                              d) Carbon dioxide is absorbed during the process.
9. Two pink colored flowers on crossing resulted in 1 red, 2 pink, and 1 white flower progeny. The nature of the cross will be [1]  
a) self pollination                                                              b) double fertilisation  
c) no fertilisation                                                              d) cross fertilisation
10. Syphilis is caused by [1]  
a) Mosquito                                                              b) Virus  
c) Parasite                                                              d) Bacteria
11. Name the chromosomes that possess the gene for maleness and femaleness in humans. [1]  
a) Sex chromosomes                                                              b) body cell chromosomes  
c) Somatic ctromosomes                                                              d) Autosomes
12. To prepare a temporary mount of leaf peel, one should take [1]  
a) All of these                                                              b) freshly plucked leaf

- c) leaf placed in sunlight for 48 hours                      d) dried and preserved leaf
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. If the potential difference between the end of a wire of fixed resistance is doubled, by how much does the electric power increase? [1]
- a)  $\frac{4V}{R}$                                                                       b)  $\frac{3V}{R}$
- c)  $\frac{6V}{R}$                                                                       d)  $\frac{5V}{R}$
15. Depletion of ozone is mainly due to [1]
- a) Carbon Dioxide                                                b) Methane
- c) ChloroFloroCarbons                                        d) Nitrogen
16. Which of the following are environment-friendly practices? [1]
- a) Carrying cloth-bag to put purchases in while shopping                      b) Walking to school instead of getting your mother to drop you on her scooter
- c) Switching off unnecessary lights and fans              d) All of these
17. **Assertion (A):** Copper spoon is used to stir silver nitrate solution. [1]  
**Reason (R):** Copper is less reactive than silver.
- 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):** Sexual reproduction increases genetic diversities and plays a role in origin of new species. [1]  
**Reason (R):** Sexual reproduction involves the formation of gametes and fusion of gametes.
- 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 proton moves horizontally towards a vertical long conductor having an upward electric current. It will deflect vertically downward. [1]  
**Reason (R):** Seeing the proton and the conductor from the side of the proton, the magnetic field at the site of the proton will be towards the right. Hence the force  $\vec{F} = q\vec{v} \times \vec{B}$  will deflect the proton vertically downward.
- 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):** The energy which passes to the herbivores does not come back to autotrophs. [1]  
**Reason (R):** The flow of energy in a food chain is unidirectional.
- 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.



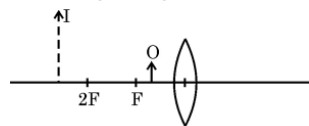
### Section B

21. Draw the electron dot structures for : ethanoic acid [2]
22. The sperms are tiny bodies that consist of mainly genetic material and a long tail [2]
- Where are the sperms produced and What is the role of the long tail?
  - How are the sperms delivered from the site of their production?
23. Write the role of  $\text{CO}_2$  for the process of photosynthesis. [2]

OR

Discuss the major steps involved in process of nutrition in human beings.

24. The diagram given below shows an object O and its image I. [2]



Without actually drawing the ray diagram, state the following:

- Type of lens (Converging/Diverging)
  - Name two optical instruments where such an image is obtained.
  - List three characteristics of the image formed if this lens is replaced by a concave mirror of focal length  $f$  and an object is placed at a distance  $\frac{f}{2}$  in front of the mirror.
25. What is biological magnification? Will the levels of this magnification be different at different levels of the ecosystem? [2]

OR

What are the characteristics of energy transfer in biosphere?

26. Is the position of a star as seen by us its true position? Justify your answer. [2]

### Section C

27. How can a layer of aluminium oxide on an aluminium object be made thicker? What is this process called? [3]
28. An alkali metal A gives a compound B (molecular mass = 40) on reacting with water. The compound B gives a soluble compound C on treatment with aluminium oxide. Identify A, B and C and give the reactions involved. [3]

OR

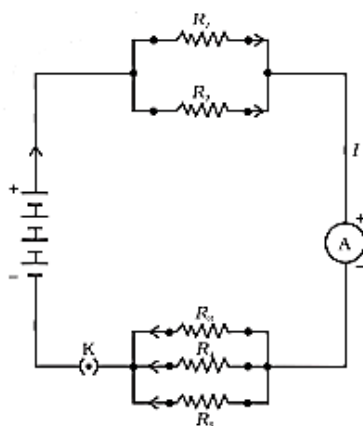
a. Name the following:

- Metal that can be cut by knife
- Lustrous non-metal
- Metal that exists in liquid state at room temperature
- Most malleable and ductile metal
- Metal that is best conductor of electricity
- Non-metal that can exist in different forms

b. How are alloys better than metals? Give composition of solder and amalgam.

29. Describe the alimentary canal of man. [3]
30. A pea plant with purple flowers were crossed with white flowers producing 40 plants with only purple flowers. On selfing, these plants produced 470 plants with purple flowers and 162 with white flowers. What genetic mechanism account for these results. [3]
31. A pencil when dipped in water in a glass tumbler appears to be bent at the interface of air and water. Will the pencil to be bent to the same extent, if instead of water we use liquids like, kerosene or turpentine? Support your answer with reasons. [3]

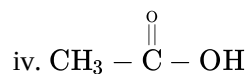
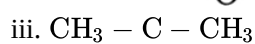
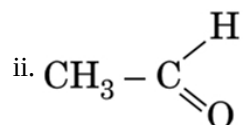
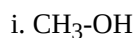
32. a. Two electric lamps rated 100 W, 220 V and 60 W, 220 V are connected in parallel to electric mains supply. Calculate the current drawn from the mains if the supply voltage is 220 V? [3]  
 b. A lamp consumes 50 W and is lighted 2 h daily in month of April. How many units of electric energy is consumed ?
33. If in figure,  $R_1 = 10\Omega$ ,  $R_2 = 40\Omega$ ,  $R_3 = 30\Omega$ ,  $R_4 = 20\Omega$ ,  $R_5 = 60\Omega$ , and a 12 V battery is connected to the arrangement. Calculate [3]



- a. the total resistance in the circuit, and  
 b. the total current flowing in the circuit.

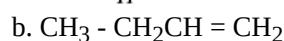
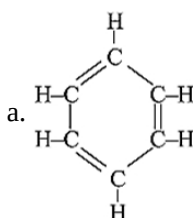
#### Section D

34. a. What is a hydrocarbon? Give its one example. [5]  
 b. Give the structural difference between saturated and unsaturated hydrocarbons with two examples each.  
 c. Name the following compounds:



OR

- i. Draw two structural isomers of butane.  
 ii. Draw the structures of propanol and propanone.  
 iii. Name the third homologue of:  
 a. alcohols  
 b. aldehydes  
 iv. Name the following:



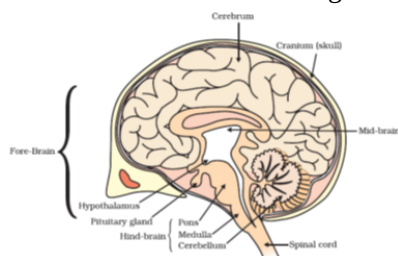
v. Show the covalent bond formation in nitrogen molecule.

35. Explain natural vegetative propagation by roots in plants.

[5]

OR

Given below is a labelled diagram of the human brain.



Using the given diagram, answer the following questions:

- Which part of the brain controls reflex movements of the head, neck, and trunk?
- Name the part of the human brain which contains a vital centre for controlling blood pressure.
- Which part of the hindbrain regulates respiration?
- How is the brain protected from injuries and shock?
- Which part of the human brain is the main thinking region?

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

[5]

- State the nature of the lens and the reason for its use.
- Where should the palmist place/hold the lens so as to have a real and magnified image of an object?
- 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.

OR

An object of height 4.0 cm is placed at a distance of 30 cm from optical centre **O** of a concave lens of focal length 20 cm. Draw a ray diagram to find the position and size of the image formed. Mark optical centre **O** and principal focus **F** on the diagram. Also, find the approximate ratio of size of the image to the size of the object.

### Section E

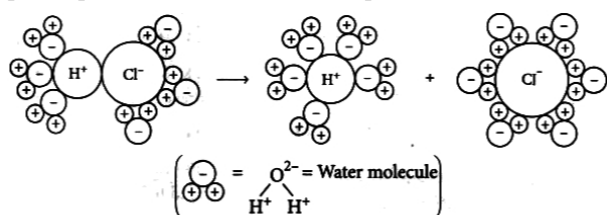
37. Read the text carefully and answer the questions:

[4]

The acidic behaviour of acids is due to the presence of hydrogen ( $H^+$ ) ions in them. They produce hydrogen ions in the presence of water. Water is a polar solvent and this property of water helps in weakening the bond between the ions and makes them soluble.

Hence, acids and bases produce ions in aqueous solutions. It may be noted that a dry HCl gas or a solution of hydrogen chloride in organic, non-polar solvents like toluene or benzene do not show acidic properties. This is because hydrogen chloride does not undergo ionization in toluene.

The reason why HCl splits into  $H^+$  and  $Cl^-$  ions in presence of water lies in the fact that water molecules, being polar, pull the  $H^+$  and  $Cl^-$  ions apart and thus, the bond in HCl is broken.



Dissociation of HCl into  $H^+$  and  $Cl^-$  ions in presence of water

- Which acids are present in bee sting?
- If the pH of a solution is 8, then find its  $[H^+]$  ion.

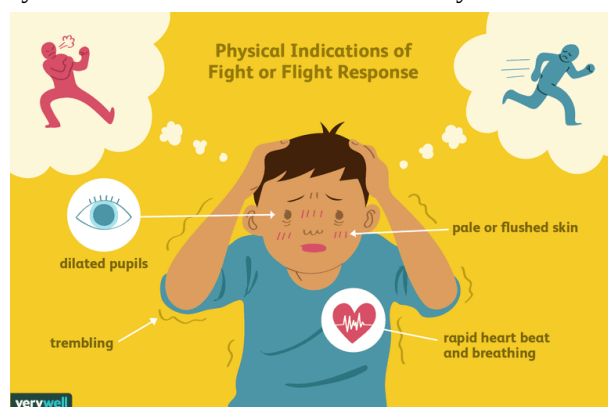
OR

If you are given water, Hydrochloric acid, and Acetic acid, then mention increasing the order of acid strength.

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.



- How does chemical coordination take place in animals ?
- Which hormone is called an emergency hormone?
- 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]

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.

- Draw a diagram to show this pattern of iron filings.
- Draw the magnetic field lines of a bar magnet showing the poles of the bar magnet as well as the direction of the magnetic field lines.
- 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

- (c) Nitrogen  
**Explanation:** Rancidity can be prevented by packaging fat and oil-containing foods in nitrogen gas as it is unreactive. Hence, the chips packets are flushed with nitrogen gas to prevent aerial oxidation of fats and oil containing chips.
- (c) Copper  
**Explanation:** Copper
- (d)  $\text{Na}_2\text{CO}_3$   
**Explanation:** Acids react with metal carbonates to evolve  $\text{CO}_2$  gas.
- (c) The fuel is not burning completely.  
**Explanation:** When the fuel does not burn completely, some carbon particles remain un-oxidised and form soot. The soot gets deposited to the bottom of the vessels and the vessels get blackened on the outside.
- (a)  $\text{H}_2$  gas  
**Explanation:**  $\text{H}_2$  gas is evolved.
- (d) Al and  $\text{Al}_2\text{O}_3$   
**Explanation:** Al and  $\text{Al}_2\text{O}_3$
- (d) Dehydrating agent, Esterification  
**Explanation:** The reaction in which a carboxylic acid combines with an alcohol to form an ester is called **esterification**. When acetic acid reacts with ethyl alcohol, an ester is formed along with water. Esterification is a reversible reaction. Concentrated sulphuric acid acts as a dehydrating agent and absorbs water from the product mix so that the reaction proceeds in the forward direction.

$$\text{CH}_3\text{COOH} + \text{C}_2\text{H}_5\text{OH} \xrightleftharpoons{\text{H}_2\text{SO}_4} \text{CH}_3\text{COOC}_2\text{H}_5 + \text{H}_2\text{O}$$
- (b) Carbon dioxide is released during the process.  
**Explanation:** During this process, the following things take place:

  - Chlorophyll's absorption of light energy.
  - Splitting of water molecules into hydrogen and oxygen and the conversion of light energy into chemical energy.
  - Carbon dioxide is converted to carbohydrates.
$$\underset{\text{carbon dioxide}}{6\text{CO}_2} + \underset{\text{water}}{6\text{H}_2\text{O}} \xrightarrow{\text{photosynthesis}} \underset{\text{glucose}}{\text{C}_6\text{H}_{12}\text{O}_6} + \underset{\text{oxygen}}{6\text{O}_2}$$
- (a) self pollination  
**Explanation:**

  - Incomplete dominance results in F1 generation plants with all pink flowers when plants with pure red and white blooms cross.
  - These plants on self-pollination or fertilization produce progenies (F2 generation) with red, pink, and white flowers in 1:2:1 ratio.
  - This is a monohybrid cross as only one character or trait is involved in crossing.
  - The relationship between two genetic variants is referred to as dominant.





- v. Each gene has two alleles that an individual inherits from each parent.
- vi. One allele of a gene, known as the dominant gene, will be expressed if the alleles are different.
- vii. The impact of the other allele, known as the recessive one, is concealed.

10. **(d) Bacteria**  
**Explanation:** Syphilis is a sexually transmitted infection caused by the bacterium *Treponema pallidum* subspecies *pallidum*. The signs and symptoms of syphilis vary depending on which of the four stages it presents (primary, secondary, latent, and tertiary).
11. **(a) Sex chromosomes**  
**Explanation:** Sex chromosomes possess the gene for maleness and femaleness in humans. In humans, the sex chromosomes comprise one pair of a total of 23 pairs of chromosomes. The other 22 pairs of chromosomes are called autosomes. Individuals having two X chromosomes (XX) are females; individuals having one X chromosome and one Y chromosome (XY) are males.
12. **(b) freshly plucked leaf**  
**Explanation:** A freshly plucked leaf will have living cells and the epidermis will be fully stretched, therefore we can observe the proper shape of the 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. **(a)  $\frac{4V}{R}$**   
**Explanation:** We know that,  

$$P = \frac{V^2}{R}$$
R is constant  
V is doubled  
Therefore,  $P = \frac{2(V^2)}{R}$   

$$P = \frac{4V}{R}$$
Therefore, when the resistance is doubled, power becomes four times the actual value.
15. **(c) ChloroFloroCarbons**  
**Explanation:** When CFCs reaches upper layers of the atmosphere, they cause depletion of ozone layer, and allow harmful UV radiations to reach the surface of the earth to create health hazards.
16. **(d) All of these**  
**Explanation:**  
All the given practices are environment-friendly practices. Carrying cloth-bag for shopping purchases is an alternative to polythene (which is a non-biodegradable plastic). Switching off lights and fans, when not in use, saves energy and helps to reduce carbon emissions. Reducing automobile emissions is another way to reduce carbon dioxide emissions.
17. **(c) A is true but R is false.**  
**Explanation:** Silver's reactivity according to the reactivity series is lesser than that of copper (Cu). So, we cannot stir the solution as the solution would be displaced by copper. We should instead use a glass for this. Thus assertion is true, but reason is false.
18. **(a) Both A and R are true and R is the correct explanation of A.**  
**Explanation:** Sexual reproduction involves two parents that result in offspring that are not identical to the parents. It causes variations; which are essential for evolution as well as the survival of species under unfavorable conditions.



19. (a) Both A and R are true and R is the correct explanation of A.

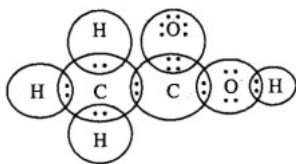
**Explanation:** Both A and R are true and R is the correct explanation of A.

20. (a) Both A and R are true and R is the correct explanation of A.

**Explanation:** The energy flow is unidirectional. The energy that autotrophs absorb from the Sun does not return, and the energy that goes to herbivores does not go back to the autotrophs. It is no longer accessible to the previous level as it progresses through the various trophic levels.

### Section B

21. Ethanoic acid :



22. i. Sperms are produced in seminiferous tubules present in testis of male reproductive system by process known as spermatogenesis.  
ii. Sperm consists of 2 main parts head and tail, both of which are connected by neck. The long tail also known as flagellum of sperms helps in quick movement or motility of sperms through the female reproductive tract through wave like motion.  
iii. Sperms are delivered from the site of their production by vas deferens, also known as sperm duct to the urethra in order to allow the passage of semen outside the body. Movement of sperm is facilitated by prostatic fluid.
23. Carbon dioxide: Carbon dioxide is present in low concentration and forms about 0.04% of the total atmosphere. Increased concentration of  $\text{CO}_2$  with other factors, not becoming limiting, rate of the process enhances. However very high conc. of  $\text{CO}_2$  becomes toxic to the plants. It is doubtful whether  $\text{CO}_2$  is a limiting factor under field conditions.  
Hydrophytic plants use  $\text{CO}_2$  dissolved in water. During night plants do not consume  $\text{CO}_2$  rather they release  $\text{CO}_2$  by the breakdown of their reserve food.

OR

There are five steps in the process of nutrition in Human beings.

1. Ingestion: The process of taking food into the body is called ingestion. Humans have holozoic mode of nutrition. They engulf solid particles.
  2. Digestion: the process in which the food containing large, insoluble molecules is broken down into small, water soluble molecules is called digestion.
  3. Absorption: The process in which the digested food passes through the intestinal wall into blood stream is called absorption.
  4. Assimilation: The process in which the absorbed food is taken in by the body cells and used for energy, growth and repair is called assimilation.
  5. Egestion: The process in which the undigested food is removed from the body is called egestion.
24. i. The lens is a converging lens.  
ii. Such an image is obtained in a magnifying glass and in a lens to correct hypermetropia defect of eye.  
iii. The image is virtual, erect and enlarged and is formed behind the concave mirror.
25. The phenomenon of progressive increase in concentration of certain harmful non-biodegradable chemicals such as DDT at different levels of food chain is called biological magnifications.  
The concentration of harmful chemicals will be different at different trophic levels as the amount of such substances go on increasing progressively at each trophic level. It will be lowest in the first trophic level and highest in the last trophic level of the food chain.

OR

The characteristics of energy transfer in biosphere are :

- i. The ultimate source of energy is sun and is converted from one form to another.
- ii. Energy gets continuously transferred through food chain and energy flow is unidirectional.
- iii. There is loss of some energy during transfer from one trophic level to the next.
- iv. Only 10% of energy is transferred from one trophic level to the next. The solar energy trapped by producers does not revert back to the sun.
- v. At each trophic level, some of the energy is utilized by organisms, rest is lost to environment and only 10% is available to the next trophic level.

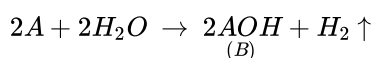


26. No, the position of a star as seen by us is not its true position that is the apparent position. The stars appear slightly higher than the actual position because the light coming from the stars suffers refractions due to different layers of atmosphere which is due to different refractive indices value. It seems as if stars are slightly higher than they actually appear.

### Section C

27. Aluminium develops a thin oxide layer when exposed to air. This aluminium oxide coat makes it resistant to further corrosion. The resistance can be improved further by making the oxide layer thicker. This process is called anodising. During anodising, a clean aluminium article is made the anode and is electrolysed with dilute sulphuric acid. The oxygen gas evolved at the anode reacts with aluminium to make a thicker protective oxide layer. This oxide layer can be dyed easily to give aluminium articles an attractive finish.

28. Let the atomic mass of alkali metal A be x. According to the question, the metal A reacts with water and forms a compound B of molecular mass 40.

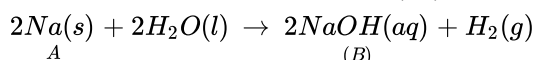


According to the question,

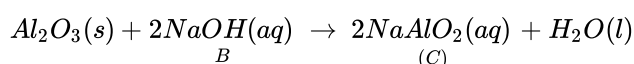
$$x + 16 + 1 = 40$$

$$\therefore x = 40 - 17 = 23$$

and, 23 is the atomic mass of sodium(Na). Therefore, the alkali metal (A) is Na and the reaction is written below:



So, compound B is sodium hydroxide (NaOH). Sodium hydroxide reacts with aluminium oxide ( $Al_2O_3$ ) to give sodium aluminate ( $NaAlO_2$ ).



Thus, compound C is sodium aluminate ( $NaAlO_2$ ).

OR

- a. i. Sodium (Na) / Potassium (K)
- ii. Iodine (I)
- iii. Mercury (Hg)
- iv. Gold (Au)
- v. Silver / Copper
- vi. Carbon / Sulphur / Phosphorous

b. Alloys are better than metals as they are generally stronger / have high tensile strength / high electrical resistivity / resistant to corrosion.

Composition of Solder : Lead + Tin / Pb + Sn

Composition of Amalgam - an alloy in which mercury is one of the constituent / Any metal + mercury

29. Mammalian (human) alimentary canal comprises mouth, buccal cavity, pharynx, oesophagus, stomach, small intestine (duodenum, jejunum and ileum), large intestine (caecum, colon and rectum) and anus.

Digestive glands include salivary glands, gastric glands, intestinal glands, liver and pancreas.

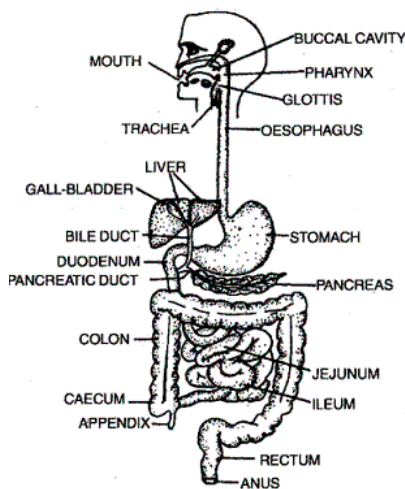
Buccal cavity contains teeth and tongue, and receive saliva from 3 pairs of salivary glands (parotid, submaxillary, sublingual).

Teeth are meant for cutting and mastication of food. Teeth are the codent, heterodont and diphyodont.

Buccal cavity of man: The mouth is a slit-like aperture bounded by two lips. It leads to buccal cavity. Its roof is formed of hard palate, continues as soft palate, and hangs as uvula. The sides of buccal cavity are formed by cheeks. At the floor is present a musculo-sensory organ called tongue.

The oral cavity is supported by bones of jaws. The oral cavity contains the glands, tongue and teeth.





**Pharynx:** It is a vertical tube. It is a cross passage for food and air. It has uvula and epiglottis which closes the internal nares and glottis respectively during swallowing of food to ensure the passage of food into oesophagus (food pipe).

**Oesophagus:** It is 25 cm long narrow muscular straight tube. It runs downward through the chest behind heart and passes through the diaphragm into the abdomen. Here, it opens into stomach. Oesophagus propels the swallowed food into stomach.

**Stomach of man:** It is a sac-like structure situated in the upper part of abdominal cavity below the diaphragm. Large part of this sac is situated left of the median line. The stomach is divisible into three parts namely cardiac, fundus or body and pylorus. At the junction of stomach and duodenum is a pyloric constriction having pyloric sphincter.

**Small intestine:** It is the longest part of alimentary canal. It is thin walled and highly coiled tubular structure. It is about 3-3.5 metres long and occupies most part of abdominal cavity. It is coiled upon itself. It is differentiated into three regions, viz. duodenum, jejunum and ileum.

**Duodenum** is 25 cm long C-shaped. It receives the opening of bile-pancreatic duct. It also receives the opening of stomach.

**Jejunum** is 90 cm long. It lies above and left beyond duodenum.

**Ileum** is 180 cm long. Its inner lining is thrown into numerous villi.

**Large intestine:** The large intestine is about 1.5 metres long. It is divided into following parts, i.e. the vermiform appendix, the colon and the rectum. Caecum is blind tube and represented by vermiform appendix (5-8 cms) and is present below the junction of small and large intestine. Rectum is the last part and opens to outside by anus guarded by anal sphincter.

30. The ratio of purple flowers to white flowers in  $F_2$  generation was approximately 3 : 1. This ratio is termed Mendelian ratio or Monohybrid ratio. It explains:

1)  $F_1$  hybrids always exhibited only one of the parental form of a trait and showed dominance / recessive mechanism.

2) Both parental forms of trait segregate and were expressed in  $F_2$  (second filial) generation.

3) The form of trait that appeared in  $F_1$  offspring i.e. the dominant form was present in the  $F_2$  generation about three times as frequently as its alternate form (470 : 162). It is approximately 3 : 1. It is due to mechanism of segregation at the time of gamete formation.

31. We know that pencil appears to be bent at the interface of air and water because of refraction of light. The degree of refraction depends on refractive index of a given liquid. Refraction indices of kerosene, water and other liquids would be different. Hence, degree of bend would be different in case of different liquids.

32. (a) We know that

$$P = \frac{V^2}{R}$$

$$\text{Therefore, } R = \frac{V^2}{P}$$

Resistance of 1st lamp,

$$R_1 = \frac{V^2}{P} = \frac{220 \times 220}{100}$$

$$= 484 \Omega$$

Resistance of 2nd lamp,

$$R_2 = \frac{220 \times 220}{60}$$

$$= \frac{2420}{3} \Omega$$

Since, two lamps are connected in parallel, so its equivalent resistance is given by

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{484} + \frac{3}{2420} = \frac{8}{2420}$$

$$R = \frac{2420}{8} \Omega$$

By Ohm's Law, current drawn from the mains:

$$I = \frac{V}{R} = \frac{220 \times 8}{2420}$$

$$= 0.73 \text{ A}$$

∴ The current drawn from the mains is 0.73 A

$$(b) \text{ Energy consumed} = \frac{\text{Watt} \times \text{hour}}{1000} = \frac{50 \times (2 \times 30)}{1000} = \frac{3000}{1000} = 3 \text{ unit or } 3 \text{ kWh}$$

33. Suppose we replace the parallel resistors  $R_1$  and  $R_2$  by an equivalent resistor of resistance,  $R'$ . Similarly we replace the parallel resistors  $R_3$ ,  $R_4$  and  $R_5$  by an equivalent single resistor of resistance  $R''$ . Then using eq.  $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$ , we have

$$\text{Similarly, } \frac{1}{R''} = \frac{1}{30} + \frac{1}{20} + \frac{1}{60} = \frac{6}{60}$$

that is  $R'' = 10\Omega$

Thus, the total resistance,  $R = R' + R'' = 18\Omega$

To calculate the current, we use Ohm's law, and get

$$I = \frac{V}{R} = \frac{12V}{18\Omega} = 0.67A$$

### Section D

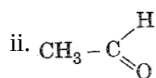
34. a. • Carbon compounds containing only carbon and hydrogen are called hydrocarbons

Example: Alkane / Alkene / Alkyne / any other

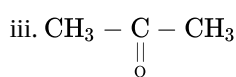
b. Saturated Hydrocarbons	Unsaturated Hydrocarbons
Consists of Only Single Bonds	Consists of Double and Triple bonds
$\begin{array}{c} \text{H} \quad \text{H} \\   \quad   \\ \text{H}-\text{C}-\text{C}-\text{H} \\   \quad   \\ \text{H} \quad \text{H} \end{array}$ <p>Ethane</p>	$\begin{array}{c} \text{H} \quad \text{H} \\   \quad   \\ \text{H}-\text{C}=\text{C}-\text{H} \end{array}$ <p>Ethene</p>
$\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\   \quad   \quad   \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\   \quad   \quad   \\ \text{H} \quad \text{H} \quad \text{H} \end{array}$ <p>Propane</p>	$\text{H}-\text{C}\equiv\text{C}-\text{H}$ <p>Ethyne</p>

c. i.  $\text{CH}_3-\text{OH}$

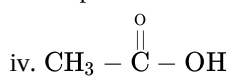
Methanol / Methyl alcohol



Ethanal / Acetaldehyde



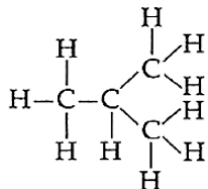
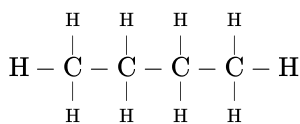
Propanone / acetone



Ethanoic Acid / Acetic acid

OR

i. The two isomers of butane,  $\text{C}_4\text{H}_{10}$  are as follows:



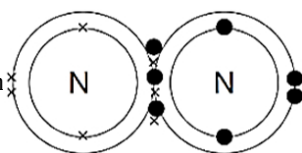
ii. Structure of propanal and propanone are as follows

$$\text{CH}_3-\text{CH}_2-\overset{\text{O}}{\underset{\text{O}}{\text{C}}}-\text{H} \quad \text{and} \quad \text{CH}_3-\overset{\text{O}}{\underset{\text{O}}{\text{C}}}-\text{CH}_3$$

Propanal  Propanone

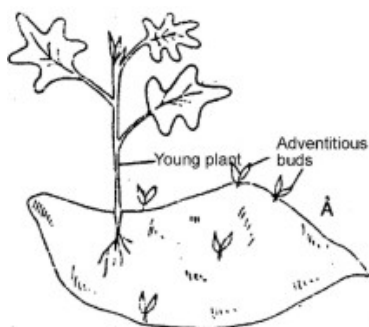
- iii. a. Propanol, which has the chemical formula  $C_3H_7OH$ , is the third homologue of an alcohol. It has a three-carbon straight chain with a hydroxyl (-OH) group joined to the second carbon.  
 b. Propanal, which has the chemical formula  $C_3H_6O$ , is an aldehyde's third homologue. Having a carbonyl group (C=O) attached to the second carbon, it consists of a straight chain of three carbon atoms.
- iv. a. Benzene  
 b. But-1-ene

v. Covalent bond formation of nitrogen



35. A number of herbaceous and woody perennial plants propagate vegetatively in nature. The common structures that take part in natural vegetative propagation are roots, stems, leaves and buds.

Vegetative propagation by roots. Roots of some plants like radish, carrot, asparagus, tapioca, Dahlia and sweet potato etc. are tuberous and store abundant food material.



These roots when planted in specially prepared beds (soil), develop adventitious buds which grow into leafy shoots called "slips". As the root tubers in sweet potato store large amounts of food, each produces several "slips" the young "slips" are detached from the parent plant and grown separately.

OR

- i. The midbrain controls the reflex movements of the head, neck, and trunk in response to visual and auditory stimuli.
  - ii. The medulla contains a vital centre for controlling blood pressure, respiration, swallowing, salivation, vomiting, sneezing, and coughing.
  - iii. Pons regulates respiration.
  - iv. The brain is protected by a bony box called cranium, within that three layers of fluid-filled membranes called meninges are present for absorbing shock.
  - v. The forebrain is the largest part of the brain and is the main thinking region.
36. 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

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

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

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

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

$$\text{Or, } v = -10 \text{ cm}$$

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

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

Image is twice as big as object.

OR

Given: focal length  $f = +20$  cm, object distance  $u = -30$  cm, height of object  $h_o = 4$  cm.

We know that,  $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

$$\frac{1}{20} = \frac{1}{v} - \frac{1}{-30}$$

$$\frac{1}{v} = \frac{1}{60}$$

$$\Rightarrow v = 60 \text{ cm}$$

So,  $\frac{h_i}{h_0} = \frac{v}{u}$

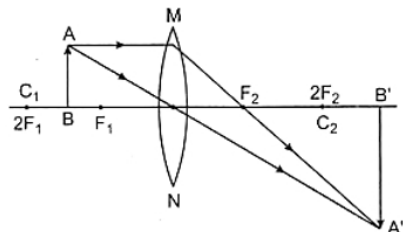
$$\frac{h_i}{h_0} = \frac{60}{-30}$$

$$\Rightarrow -t_i = -8 \text{ cm}$$

Thus, the height or size of the image is 8 cm. The minus sign shows that this height is in the downward direction, that is, the image is formed below the axis.

Ratio of size of image to object = -2

So image is enlarged beyond  $2F_2$



Object between  $F_1$  and  $2F_1$ .

Image is formed beyond  $2F_2$ , real, inverted.

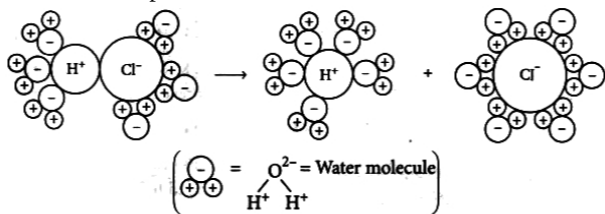
### Section E

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

The acidic behaviour of acids is due to the presence of hydrogen ( $H^+$ ) ions in them. They produce hydrogen ions in the presence of water. Water is a polar solvent and this property of water helps in weakening the bond between the ions and makes them soluble.

Hence, acids and bases produce ions in aqueous solutions. It may be noted that a dry HCl gas or a solution of hydrogen chloride in organic, non-polar solvents like toluene or benzene do not show acidic properties. This is because hydrogen chloride does not undergo ionization in toluene.

The reason why HCl splits into  $H^+$  and  $Cl^-$  ions in presence of water lies in the fact that water molecules, being polar, pull the  $H^+$  and  $Cl^-$  ions apart and thus, the bond in HCl is broken.



Dissociation of HCl into  $H^+$  and  $Cl^-$  ions in presence of water

(i) Formic acid is the common name for methanoic acid and it is present in a bee stings.

(ii)  $pH = -\log_{10} [H^+] = 8$

$$\log_{10} [H^+] = -8$$

$$[H^+] = 10^{-8} \text{ mol/L}$$

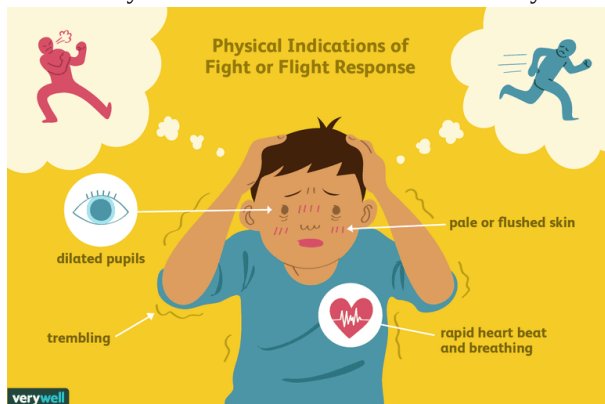
OR

Water < Acetic acid < Hydrochloric acid

#### 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.



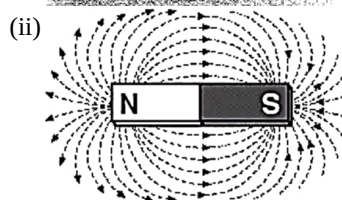
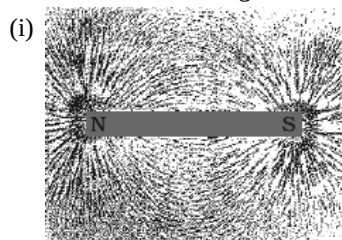
- (i) In animals, chemical coordination is achieved through the agency of hormones which function as chemical messengers. Different plant hormones help to coordinate growth, development, and responses to the environment.
- (ii) Adrenaline hormone is called an emergency hormone. Adrenaline hormone is 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:**

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.



- (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.

If magnetic field lines intersect each other, then at the intersection point there will be two directions of the same field which is not possible.

OR

Magnetic field lines can be drawn by moving a small compass from point to point around a magnet. At each point, draw a short line in the direction of the compass needle. Joining the points together reveals the path of the magnetic field lines.

