CLASS X (2019-20)
SCIENCE (CODE 086)
SAMPLE PAPER-5

Time : 3 Hours   **Maximum Marks : 80**

General Instructions :

(i)   The question paper comprises of three sections-A, B and C. Attempt all the sections.

(ii) All questions are compulsory.

(iii) Internal choice is given in each sections.

(iv) All questions in Section A are one-mark questions comprising MCQ, VSA type and assertion-reason type questions. They are to be answered in one word or in one sentence.

(v) All questions in Section B are three-mark, short-answer type questions. These are to be answered in about 50-60 words each.

(vi) All questions in Section C are five-mark, long-answer type questions. These are to be answered in about 80-90 words each.

(vii) This question paper consists of a total of 30 questions.

Section A

1. Write the next higher homologue of the following : [1]

   i. C_3H_6

   ii. C_5H_8

   Ans :

   i. C_4H_8

   ii. C_6H_{10}

2. What do we call the movement of shoot towards light? [1]

   Ans :

   Tropic movement i.e., phototropism.

3. **Answer question numbers 3.1-3.4 on the basis of your understanding of the following paragraph and the related studied concepts.**

   The compounds entirely consisting of carbons and hydrogen's are known as hydrocarbons. There are different categories in which hydrocarbons are divided out of which the two are :

   Saturated Hydrocarbons : The hydrocarbons having only sing bonds between the carbon atoms are called saturated hydrocarbons. The includes alkanes having a general formula C_nH_{2n+2}. The first member of homologous series of alkanes is methane ds(CH_4).

   Structure of methane is as follows:

$$H - \underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C}} - H$$
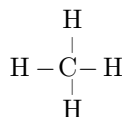
   Unsaturated Hydrocarbons : The hydrocarbons having double and triple bonds between the carbons atoms are called unsaturated hydrocarbons. This includes alkanes and alkynes having general formula C_nH_{2n} and C_nH_{2n+2}, respectively. The first member of homologous series of alkenes is Ethane (C_2H_4). The structure of ethane is as follows: $H_2C = CH_2$.

   The first member of homologous series of alkynes is Ethyne (C_2H_2) having structural formula $HC \equiv CH$.

3.1 Select alkenes and alkynes fron the following: [1]
   C_2H_4, C_3H_4, C_2H_2, C_4H_8
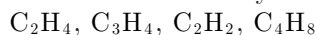
   Ans : C_2H_4 and C_4H_8 are alkenes, C_3H_4 and C_2H_2 are alkynes.

3.2 Name the reaction used to convert saturated hydrocarbons to unsaturated hydrocarbons. [1]
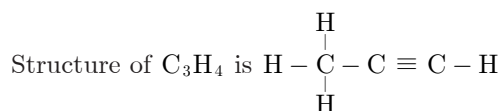
   Ans : Hydrogenation reaction.

3.3 Name the catalyst used in the above conversion reaction. [1]

   Ans : Nickel catalyst

3.4 Draw the structure of hydrocarbons with general formula C_nH_{2n-2} where $n = 3$. [1]

   Ans : Hydrocarbon is C_3H_4

   Structure of C_3H_4 is $H - \underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C}} - C \equiv C - H$

4. **Question numbers 4.1-4.4 are based on the two tables given below. Study these tables and answer the questions that follows:**

Table A

Normal Hemoglobin Count Ranges Widely Accepted by Physicians.	
Birth	13.5 to 24.0 g/dl (mean 16.5 g/dl)
<1 month:	10.0 to 20.0 g/dl (mean 13.9 g/dl)
1 to 2 months:	10.0 to 18.0 g/dl (mean 11.2 g/dl)
2 to 6 months:	9.5 to 14.0 g/dl (mean 12.6 g/dl)
0.5 to 2 yrs:	10.5 to 13.5 g/dl (mean 12.0 g/dl)
2 to 6 yrs:	11.5 to 13.5 g/dl (mean 12.5 g/dl)
6 to 12 yrs:	11.5 to 15.5 g/dl (mean 13.5 g/dl)

Table B

Females	
Age 12 to 18 yrs:	12.0 to 16.0 g/dl (mean 14.0 g/dl)
Age > 18 yrs:	12.1 to 15.1 g/dl (mean 14.0 g/dl)

Male	
Age 12 to 18 yrs:	13.0 to 16.0 g/dl (mean 14.5 g/dl)
Age > 18 yrs:	13.6 to 17.7 g/dl (mean 15.5 g/dl)

4.1 Infer the disease which can be diagnosed from the given data in a girl studying in high school and has hemoglobin 8 g/dl. [1]

Ans : Anaemia

4.2 A student of class 10th likes to eat a diet rich in carbohydrates, junk food has been found anaemic hence he finds it difficult to concentrate on his studies. To help him out of this situations, name any four foods that he must include in his diet. [1]

Ans : Eating iron-rich foods, such as beef, dark green leafy vegetables, dry fruits, and nuts can prevent anaemia caused by iron or vitamin deficiencies.

4.3 A person of 18 years has pale skin, feels dizzy after mild exercise and feels very tired. He got his Hb levels tested. His tests may have shown haemoglobin levels– [1]
(a) 14> g/dl   (b) <11 g/dl
(c) >16 g/dl   (d) <17 g/dl

Ans : (b) <11 g/dl

4.4 Role of haemoglobin is not to [1]
(a) Attach oxygen entering the lungs
(b) Serve as respiratory pigment
(c) Increase residual volume of our lungs.
(d) Decreases residual volume of our lungs

Ans : (c) Increase residual volume of our lungs.

5. 2 ampere current is flowing through a conductor from a 10 volt emf source then resistance of conductor is [1]
(a) 20 Ω   (b) 5 Ω
(c) 12 Ω   (d) 8 Ω

Ans : (b) 5 Ω

or

A voltmeter has a least count 0.05 volt. While doing Ohm's law experiment, a student observed that pointer of the voltmeter coincides with 15th division. The observed reading is :
(a) 0.75 V   (b) 0.075 V
(c) 7.5 V   (d) 75 V

Ans : (a) 0.75 V

6. A convex lens has a focal length of 12 cm. At which of the following positions should an object be placed so that this convex lens may act as magnifying glass ? [1]
(a) 26 cm   (b) 17 cm
(c) 9 cm   (d) 24 cm

Ans : (c) 9 cm

7. The embryonal axis above the cotyledons is called : [1]
(a) Hilum   (b) Radicle
(c) Epicotyle   (d) Seed coat

Ans : (c) Epicotyle

8. When a pH paper is dipped in a solution, the colour of the pH paper changes to deep red. What will be the possible pH of the solution? [1]
(a) 2   (b) 6
(c) 8   (d) none of these

Ans : (a) 2

or

All of the following properties of acetic acid are true except : [1]
(a) it is colourless
(b) it is odourless
(c) it is miscible in water
(d) it turns blue litmus red

Ans : (b) it is odourless

9. A blue litmus paper was first dipped in dil. HCl and then in dil. NaOH solution. It was observed that the colour of the litmus paper : [1]
(a) changed to red
(b) changed to first red and then to blue
(c) changed to blue to colourless
(d) remained blue in both the solutions

Ans : (b) changed to first red and then to blue

10. The freshly prepared aqueous solution of ferrous sulphate appears [1]
(a) dark green   (b) pale green
(c) light blue   (d) dark blue

Ans : (b) pale green

11. Kavya observed a slide of Amoeba with elongated nuclei. It would represent : [1]
(a) binary fission
(b) multiple fission
(c) budding
(d) vegetative propagation

Ans : (a) binary fission

12. Mendeleev classified elements in-
(a) increasing order of atomic groups
(b) eight periods and eight groups
(c) seven periods and nine groups
(d) eight periods and seven groups

Ans : (c) seven periods and nine groups

or

Noble gases were included in Mendelev's periodic table in the-
(a) 1st group   (b) 7th group
(c) 8th group   (d) none of these

Ans : (d) none of these

For question numbers 13 and 14, two statements are given-one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

(a) Assertion is true and reason is correct explanation of assertion.

(b) Assertion is true but reason is false.

(c) Assertion is false but reason is true.

(d) Both are true but reason is not correct explanation of assertion.

13. Assertion : Aluminium is called a self protecting metal.
Reason : Aluminium reacts with atmospheric oxygen to form a very thin layer of aluminium oxide, which is sticky in nature. [1]

Ans : (a) Assertion is true and reason is correct explanation of assertion.

14. Assertion : The double circulation of blood is necessary in human beings.
Reason : The double circulation of blood is necessary for constant and efficient supply of oxygen to the body. [1]
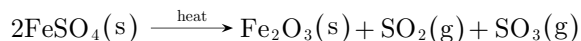
Ans : (a) Assertion is true and reason is correct explanation of assertion.

Section B

15. Write an equation each for the decomposition reactions, where energy is supplied in the form of heat, light, or electricity. [3]

Ans :

i. Energy is supplied in the form of heat, during the decomposition of ferrous sulphate crystals.

$$2FeSO_4(s) \xrightarrow{\text{heat}} Fe_2O_3(s) + SO_2(g) + SO_3(g)$$

ii. Energy is supplied in the form of light, when silver iodide decomposes to form silver and iodine.

$$2AgI(s) \xrightarrow{\text{light}} 2Ag(s) + I_2(s)$$
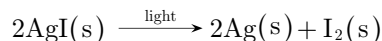
iii. Energy is supplied in the form of electricity, when molten lead bromide decomposes to form lead and bromine.

$$PbBr_2(l) \xrightarrow{\text{electricity}} Pb(s) + Br_2(l)$$
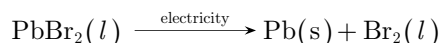
16. Explain the carbon forms compounds mainly by covalent bond. Explain in brief two main reasons for carbon forming a large number of compounds. Why does carbon form strong bonds with most of the other elements? [3]

Ans :

Carbon has 4 electrons in its outermost shell and needs to gain or lose 4 electrons to attain noble gas configuration.

Losing or gaining 4 electrons is not possible, due to energy considerations; hence it share electrons to form covalent bonds.

Two reasons for large number of carbon compounds:

Catenation: The unique ability of carbon to form bonds with other atoms of carbon give rise to along chains of different types of compounds.

Tetra-valency: Since carbon has a valency of 4, so it is capable of bonding with four other atoms of carbon or atoms of elements like oxygen, hydrogen, nitrogen, sulphur, chlorine etc.

The reason for the formation of strong bonds by carbon is due to its small size, which enables the nucleus to hold on to the shared pair of electrons

strongly.

or

i. Why does distilled water not conduct electricity, whereas rainwater does ?

ii. Why do the acids not show acidic behaviour in the absence of water ? [3]

Ans :

i. Distilled water is a covalent compound and as such has no $H^+(aq)$ ions present in it and hence it does not conduct electricity.

Rainwater contains dissolved gases such as carbon dioxide, sulphur dioxide, nitrogen dioxide, etc. These gases react with rainwater to produce their respective acids. These acids in turn produce $H^+(aq)$ ions, which are responsible for the conduction of current.

ii. All acids in the pure state are covalent compounds which do not contain any $H^+(aq)$ ions and hence, do not show acidic properties.

However, when dissolved in water, they produced $H^+(aq)$ ions and hence show acidic behaviour.

17. (i) Name two metals which react violently with cold water.

(ii) Write any three observations you would make when such a metal is dropped into water

(iii) How would you identify the gas evolved, if any, during the reaction ? [3]

Ans :

i. Sodium and potassium metals react violently with water.

ii. (a) When sodium is dropped in water it floats on the surface of water.

(b) It melts to form a silvery ball and darts on the surface of water giving tiny bubbles of a colourless gas.

(c) The sodium ball gradually decreases in size and finally disappears.

iii. The colourless gas evolved is hydrogen. When a burning wooden splint is brought near the gas, it burns with a pale blue flame and produces a "pop" sound.

18. What is Chipko movement? How did this movement ultimately benefit the local population and the environment? [3]

Ans :

The Chipko movement was a movement of the local people to resist the deforestation attempt on the hill slopes. It was started in early 1970s in village Reni in Garhwal (Uttarakhand). The women of Reni literally clasped the trees, thus preventing the workers of the contractor to cut the trees.

Benefits of Chipko movement to the local population

i. The Chipko movement helped in the conservation of forests.

ii. The 'Chipko andolan' forced the government to whom the forest belongs, to re-think their priorities in the use of forest produce.

iii. It helps to conserve forests, maintain ecological balance and prevent floods and soil erosion.

iv. It also helps in the availability of forest materials

for the future generations.

or

How is ozone formed in the upper atmosphere? Why is the damage of ozone layer a cause of concern to us? State cause of this damage. [3]

Ans :

The ozone layer occurs naturally in the stratosphere. The ozone layer is formed when intense UV radiation from the sun causes ordinary molecules of oxygen (O_2) in the stratosphere to dissociate into single oxygen atoms (O). Single oxygen atoms are very reactive and combine with O_2 to form O_3.

$$O_2 + UV \text{ radiation} \longrightarrow O + O$$
$$O + O_2 \longrightarrow \underset{\text{Ozone}}{O_3}$$
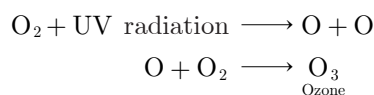
Ozone layer has become a cause of concern because depletion of ozone layer can cause serious effects on human body and other organisms of the environment like eye damage, skin damage, cancer, etc.

CFCs, nitrous oxide, methane, etc., are responsible for the damage of ozone layer.

19. Distinguish between analogous organs and homologous organs. Identify the analogous and homologous organs amongst the following : Wings of an insect, wings of a bat, forelimbs of frog, forelimbs of human. [3]

Ans :

Analogous organs	Homologous organs
These organ are look alike having same functions but are quite different in basic structure and embryonic origin in different species.	These organs are similar in basic structure and embryonic origin but perform different functions in different species.

Analogous organs – Wings of an insect and wings of a bat.
Homologous organs – Forelimbs of frog and forelimbs of human.

20. What is 'phototropism'? How does it occur in plants? Describe an activity to demonstrate phototropism. [3]

Ans :

The movement of plant or a part of plant in response to light is called phototropism.

When a growing plant receives light from one direction, a hormone called auxin is synthesised at the shoot tip which helps the cells to grow longer. Auxin diffuses to the shady side i.e. side opposite to the light. As a result, the cells grow longer on the side of the shoot which is away from light. Thus, the plant appears to bend towards light.

Take a straight potted plant and put it in a place where light is coming from one direction. Plant bends towards the source of light.

21. (a) What is the role of mucus in stomach? [1]
(b) What are the two vital functions of human kidney? [2]

Ans :

(a) To protect the stomach lining from the action of acid and pepsin.

(b) The two vital functions of human kidney are:
(i) **Excretion :** Removal of toxic wastes like urea, uric acid.
(ii) **Osmoregulation :** The process of maintaining the right amount of water and proper ionic balance in body. It is done by controlling the amount of water and salts reabsorbed by nephron - tubules.

22. How does the magnitude of induced current change in a closed coil, when
i.   a more powerful magnet is used ?
ii. the relative motion of the magnet with respect to the coil increases ?
iii. the number of turns in the copper coil are decreased ? [3]

Ans :

i.   The magnitude of the induced current increases.
ii. The magnitude of the induced current increases.
iii. The magnitude of the induced current decreases.

23. The near point of a person suffering from hypermetropia is 75 cm. Calculate the focal length and power of the lens required to enable him to read the newspaper which is kept at 25 cm from the eye. [3]

Ans :

Given,

$$u = -25 \text{ cm (For normal eye)}$$
$$v = -75 \text{ cm}$$

Now,
$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} = \frac{1}{-75} - \frac{1}{-25}$$
$$= \frac{-1+3}{75} = \frac{2}{75}$$

Thus, focal length of the lens,

$$f = \frac{75}{2} \text{ cm} = \frac{75}{2 \times 100} \text{ m} = \frac{3}{8} \text{ m}$$

Power of the lens, $P = \dfrac{1}{f \, (\text{in m})} = \dfrac{1}{3/8} = \dfrac{8}{3} \text{ D}$
$$= 2.67 \text{ D}$$

24. A student focussed the image of a candle flame on a white screen by placing the flame at distances from a convex lens. He noted his observation in the following table:

Distance of the flame from lens (cm)	Distance of the screen from lens (cm)
60	20
40	24
30	30
24	40
12	70

Analyse the above table and answer the following questions :
i.   What is the focal length of convex lens?
ii. Which set of observation is incorrect and why?
iii. Draw the ray diagram to show the image formation for any correct set of observation. [3]

Ans :

i.   From observation third, distance of object from

lens = distance of image from lens

So, radius of curvature, R = 30 cm

Thus, focal length, $f = \dfrac{R}{2} = \dfrac{30\,\text{cm}}{2} = 15$ cm

ii. Last observation is incorrect, because when object is placed less than 15 cm (focal length) from the convex lens will have virtual image, which cannot be taken on the screen.

iii. Ray diagram for image formation for third observation.
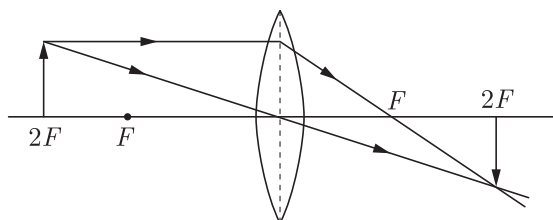
or

i. For the circuit shown in the diagram, calculate :
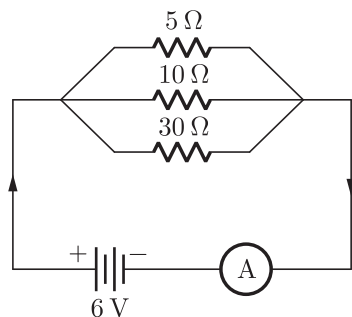
(a) Value of current through the 30 Ω resistor
(b) Total resistance of the circuit

ii. Give two advantages of connecting electrical devices in parallel with battery. [3]

Ans :

(i) (a) Value of current through the 30Ω resistor,

$$I = \dfrac{V}{R} = \dfrac{6}{30} = \dfrac{1}{5} = 0.2\,\text{A}$$

(b) In the circuit all resistor are connected in parallel combination. Hence it equivalent resistance, of the circuit is given by,

$$\dfrac{1}{R_{eq}} = \dfrac{1}{5} + \dfrac{1}{10} + \dfrac{1}{30} = \dfrac{6+3+1}{30}$$

$$= \dfrac{10}{30} = \dfrac{1}{3}$$

$$R_{eq} = 3\,\Omega$$

ii. Two advantages of connecting electrical devices in parallel with battery are:
(a) Each appliance can be operated by an independent switch.
(b) Each appliance with receive required amount of current at steady voltage.

Section C

25. An element X (atomic number 17) reacts with an element Y (atomic number 20) to form a divalent halide.

i. Where in the periodic table are elements X and Y placed?

ii. Classify X and Y as metal (s), non-metal(s) or metalloid(s).

iii. What will be the nature of the oxide of element Y? Identify the nature of bonding in the compound formed.

iv. Draw the electron dot structure of the divalent halide. [5]

Ans :

i. X belongs to Group 17 and 3rd period.
Y belongs to Group 2 and 4th period.

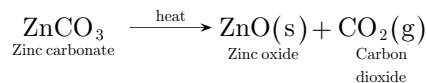ii. X—Non-metal, Y—Metal

iii. Basic oxide; Ionic bonding

iv.
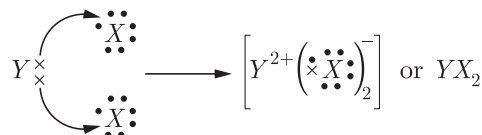
or

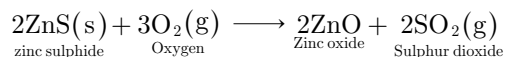Write balanced chemical equation for the reactions taking place when :

i. Zinc carbonate is calcinated.

ii. Zinc sulphide is roasted.

iii. Zinc oxide is reduced in the zinc.

iv. Cinnabar is heated in the air

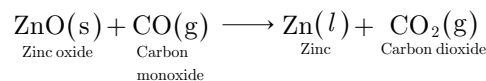v. Manganese dioxide is heated with aluminium powder. [5]

Ans :

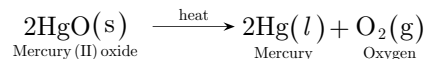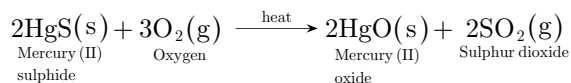i. On calcination zinc carbonate decomposes to form its oxide.

$$\underset{\text{Zinc carbonate}}{ZnCO_3} \xrightarrow{\text{heat}} \underset{\text{Zinc oxide}}{ZnO(s)} + \underset{\substack{\text{Carbon}\\\text{dioxide}}}{CO_2(g)}$$

ii. On roasting zinc sulphide changes to its oxide.

$$\underset{\text{zinc sulphide}}{2ZnS(s)} + \underset{\text{Oxygen}}{3O_2(g)} \longrightarrow \underset{\text{Zinc oxide}}{2ZnO} + \underset{\text{Sulphur dioxide}}{2SO_2(g)}$$

iii. Zinc oxide is reduced in zinc.

$$\underset{\text{Zinc oxide}}{ZnO(s)} + \underset{\substack{\text{Carbon}\\\text{monoxide}}}{CO(g)} \longrightarrow \underset{\text{Zinc}}{Zn(l)} + \underset{\text{Carbon dioxide}}{CO_2(g)}$$

iv. Cinnabar (HgS) is heated in air to form metal mercury.

$$\underset{\substack{\text{Mercury (II)}\\\text{sulphide}}}{2HgS(s)} + \underset{\text{Oxygen}}{3O_2(g)} \xrightarrow{\text{heat}} \underset{\substack{\text{Mercury (II)}\\\text{oxide}}}{2HgO(s)} + \underset{\text{Sulphur dioxide}}{2SO_2(g)}$$

$$\underset{\text{Mercury (II) oxide}}{2HgO(s)} \xrightarrow{\text{heat}} \underset{\text{Mercury}}{2Hg(l)} + \underset{\text{Oxygen}}{O_2(g)}$$

v. Manganese dioxide on heating with aluminium powder will form manganese metal.

$$\underset{\substack{\text{Manganese}\\\text{dioxide}}}{3MnO_2(s)} + \underset{\text{Aluminimum}}{4Al(s)} \xrightarrow{\Delta} \underset{\text{Manganese}}{3Mn(l)} + \underset{\text{Aluminium oxide}}{2Al_2O_3}$$
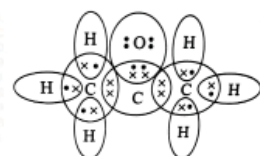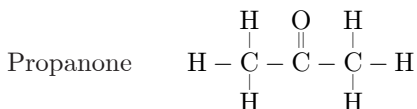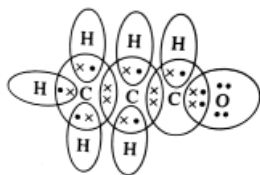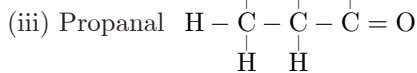$$+\,\text{Heat}$$
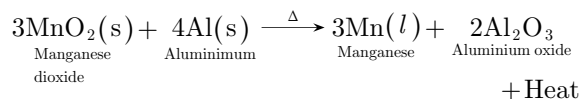
26. (i) Define the term 'isomer'.

(ii) Draw two possible isomers of the compound with molecular formula C_3H_6O and write their names.

(iii) Give the electron dot structure of the above two compound. [5]
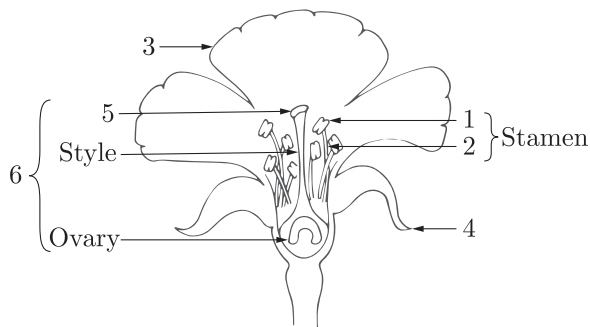
Ans :

(i) Isomers are the compound with same molecular formula but different structural formula.

(ii) Isomers of C_3H_6O: $CH_3CH_2CHO -$ Propanal

$CH_3COCH_3 -$ Propanone or acetone.

(iii) Propanal
$$H - \overset{\overset{\displaystyle H}{|}}{C} - \overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle H}{|}}{C}} - \overset{\overset{\displaystyle H}{}}{C} = O$$

Propanone
$$H - \overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle H}{|}}{C}} - \overset{\overset{\displaystyle O}{||}}{C} - \overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle H}{|}}{C}} - H$$

27. i. In the given figure name the parts marked 1 to 6 :

ii. Differentiate between self pollination and cross pollination. [5]

Ans :

i. 1. Anther, 2. Filament, 3. Petal
   4. Sepal, 5. Stigma, 6. Carpel

ii.

	Self Pollination	Cross Pollination
1.	Self pollination occurs within a flower or between two flowers of the same plant.	Cross pollination occurs between two flowers borne on different plants of the same species.
2.	Flowers are neither attractive, nor do they produce nectar.	Flowers attract insects by various means like coloured petals, nectar, etc.
3.	Pollen grains are produced in small number.	Pollen grains are produced in large number.
4.	No wastage of pollen grains occurs, thus economical.	Wastage of pollen grains occurs, hence uneconomical.

28. Name the main organs of the human digestive system in the order in which they are involved in the digestion of food. In what steps and how does digestion of

carbohydrates and proteins take place in our body? [5]

Ans :

The various organs of the human digestive system beginning from mouth are as follows :

Mouth $\rightarrow$ Oesophagus $\rightarrow$ Stomach $\rightarrow$ Small intestine (consisting of duodenum, jejunum and ileum) $\rightarrow$ Large intestine (consisting of caecum, colon and rectum).

There are three digestive glands associated with the alimentary canal. These are salivary glands, pancreas and liver.

Carbohydrate digestion begins in the buccal cavity itself as human saliva contains an enzyme ptyalin which digests starch into maltose.

Gastric juice in the stomach, contains protein digesting enzyme pepsin which breaks down protein into pep-tones.

The pancreatic juice in the duodenum contains trypsin for converting proteins into pep-tones and peptides. It also contains amylase for breaking starch into maltose.

The partially digested protein and carbohydrates with the help of succus entericus completes digestion. Amino acids and glucose are finally produced.

or

How do the guard cells regulate opening and closing of stomatal pores? Explain with the help of diagram. Also, indicate what happens to the rate of photosynthesis if stomata get blocked due to dust. [5]

Ans :

The opening and closing of the stomatal pore is a function of guard cells. Stomata act as turgor operated valves. The guard cells are thicker on the inner side and thinner on the outer side. The guard cells swell when water flow into them from the surrounding epidermal cells. They get curved out due to thick inner walls and produce a pore in between. Similarly, the pore closes when guard cells lose water to their surrounding cells and shrink back to their original position.
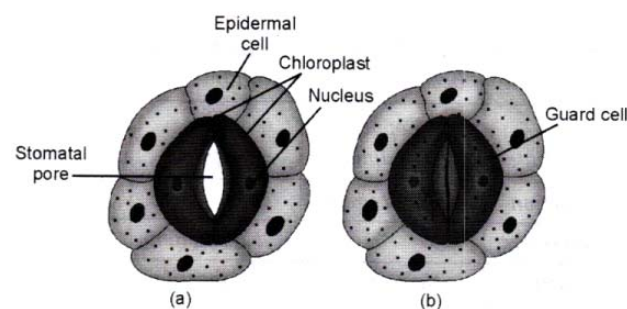
Plants takes carbon dioxide from stomata which is required for the process of photosynthesis. If stomata get blocked due to dust. The rate of photosynthesis will decrease due to deficiency of carbon dioxide.

29. i. What do you understand by the term fuse in an electric circuit ?
   ii. State two properties of a material, which make it suitable for making a fuse wire.
   iii. Why is a fuse wire always placed in the live wire of an electric circuit ?
   iv. How does a fuse wire protect an electric circuit ?
   v. Two fuse wires A and B of the same length are rated 15 A and 5 A. Which amongst the A and B will be thicker and why ? [5]

Ans :

i. Fuse is the weakest link in an electric circuit, which melts when the circuit gets overloaded or short circuited.

ii. (a) The material of the fuse wire should have high electric resistance.
    (b) The material of the fuse wire should have low melting point.

iii. When the fuse wire melts in the live wire circuit due to overloading, it completely disconnects the given appliance from the circuit. Thus, the appliance is safe to touch with bare hands and is also saved from any electrical damage.

iv. When the circuit gets overloaded, more current flows through the fuse wire, which in turn melts it. This cuts off the current in the given circuit and hence, it is protected from any damage, such as electric fire.

v. The wire A with 15 A rating is thicker. It is because, thicker the wire, less is its resistance and hence it can carry more current.

30. (i) Explain the term refraction of light.

(ii) Letters written on a paper when seen through a thick glass slab appear to be raised. Explain this phenomenon with the help of a ray diagram.

(iii) Light enters from air into diamond which has refractive index, 2.42. The speed of light in air is $3 \times 10^8 \, \text{ms}^{-1}$. Calculate the speed of light in diamond. [5]

Ans :

(i) The phenomenon of bending of light rays, when it passes from an optically rarer medium to an optically denser medium or vice versa is termed as refraction.

(ii) Letters written on paper when seen through a thick glass slab appears to be raised from their actual position because of the phenomenon of refraction of light.

　　　Consider two light rays coming from the printed letter below the glass slab.

　　　These rays would be refracted on coming out of the glass slab. When these rays were to be extended backwards they will meet at a slightly raised position, giving us the illusion that letters are raised.
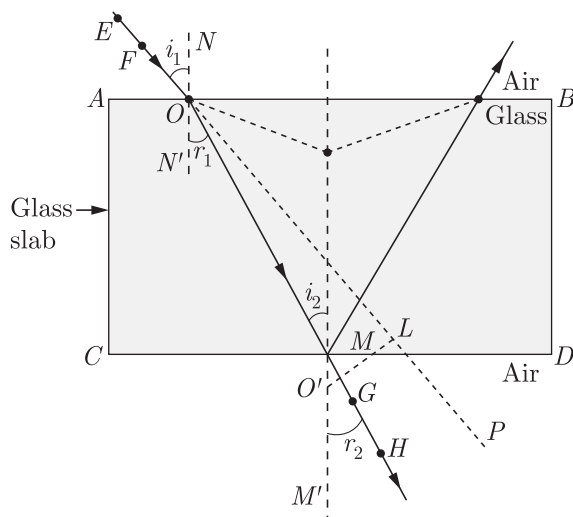
(iii) Refractive index of diamond, $n_d = 2.42$

Speed of light in air,　　　$v_a = 3 \times 10^8 \, \text{ms/}$
We know, refractive index,

$$n_{21} = \frac{\text{Speed of light in medium 1}}{\text{Speed of light in medium 2}}$$

$$2.42 = \frac{3 \times 10^8 \, \text{ms}^{-1}}{2 \, \text{Speed of light in diamond}}$$

Speed of light in diamond,

$$v_d = \frac{3 \times 10^8 \, \text{ms}^{-1}}{2.42}$$

$$= 1.24 \times 10^8 \, \text{ms}^{-1}$$