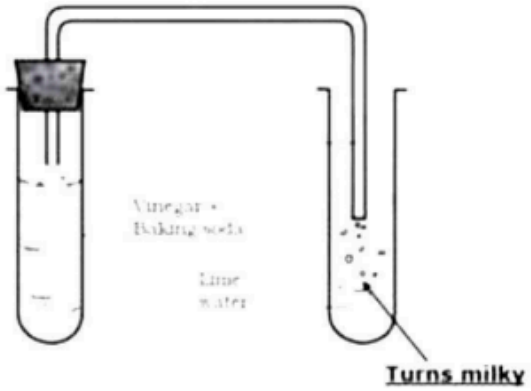
General Instructions:

i. *All questions would be compulsory. However, an internal choice of approximately 33% would be provided. 50% marks are to be allotted to competency-based questions.*
ii. *Section A would have 16 simple/complex MCQs and 04 Assertion-Reasoning type questions carrying 1 mark each.*
iii. *Section B would have 6 Short Answer (SA) type questions carrying 02 marks each.*
iv. *Section C would have 7 Short Answer (SA) type questions carrying 03 marks each.*
v. *Section D would have 3 Long Answer (LA) type questions carrying 05 marks each.*
vi. *Section E would have 3 source based/case based/passage based/integrated units of assessment (04 marks each) with sub-parts of the values of 1/2/3 marks.*

SECTION - A

Select and write the most appropriate option out of the four options given for each of the questions 1-20. There is no negative mark for incorrect response.

1. Observe the below image and select the name of gas which turned lime water milky? [1]

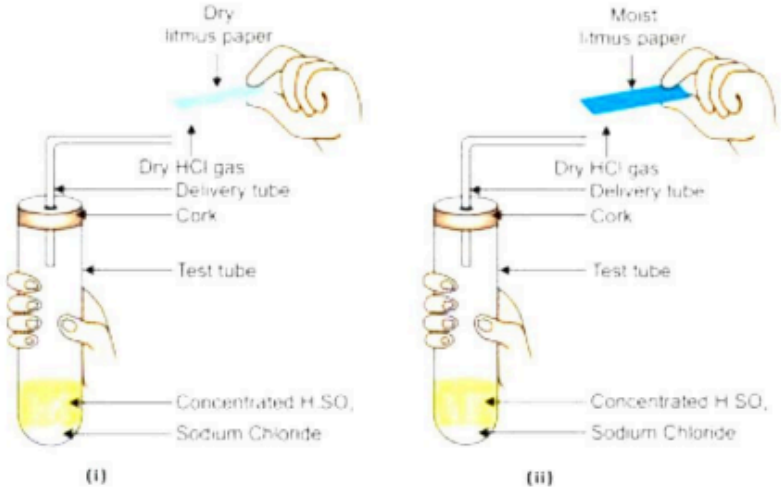


a) Oxygen
b) Carbon dioxide
c) Nitrogen dioxide
d) Carbon monoxide

2. Madhuri mixed a solution of hydrochloric acid with a solution of sodium hydroxide in a test tube. Which of the following would be the correct observations? [1]
i. The temperature of the solution increases
ii. The temperature of the solution decreases
iii. The temperature of the solution remains the same
iv. Salt formation takes place

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

3. Which litmus will show the colour change? [1]



a) Only (i)
b) Only (ii)
c) Both (i) and (ii)
d) None of the above

4. Which of the following reactions requires light? [1]
a) Electrolytic decomposition reactions
b) Thermolytic decomposition reactions
c) Photolytic decomposition reactions
d) Combination reactions

5. Four students studied reactions of zinc and sodium carbonate with dilute hydrochloric acid and dilute sodium hydroxide solutions and presented their results as follows. The '√' represents the evolution of gas whereas '×' represents the absence of any reaction,[1]

A.

	Zn	Na_2CO_3
HCl	√	√
NaOH	√	×

B.

	Zn	Na_2CO_3
HCl	√	×
NaOH	√	√

C.

	Zn	Na_2CO_3
HCl	×	×
NaOH	√	√

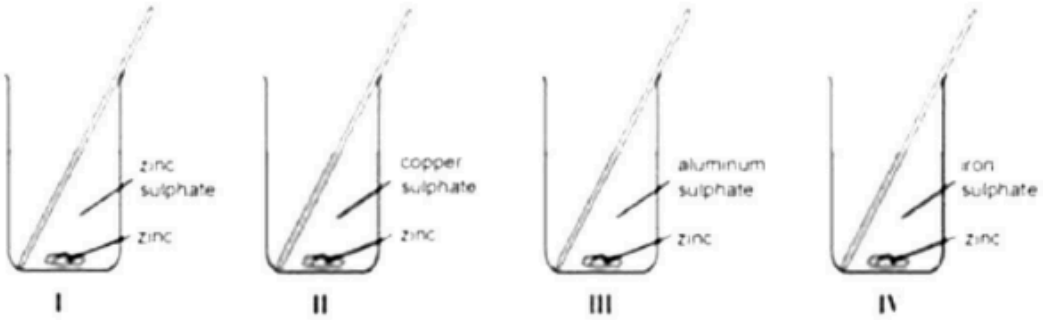
D.

	Zn	Na_2CO_3
HCl	√	√
NaOH	×	×

The right set of observations is that of student.

a) A
b) B
c) C
d) D

6. Silver chloride turns black when it gets exposed to sunlight. Select the chemical reaction taking place resulting in this change. [1]



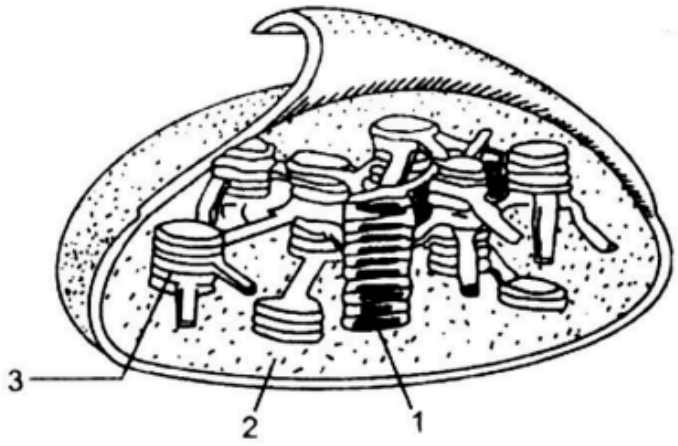
a) Only I
b) Only II
c) I and III
d) II and IV

7. In the given reaction, select and write the name of 'X'. [1]

$$CH_3CH_2OH \xrightarrow{\text{alkaline } KMnO_4 + \text{Heat}} X$$

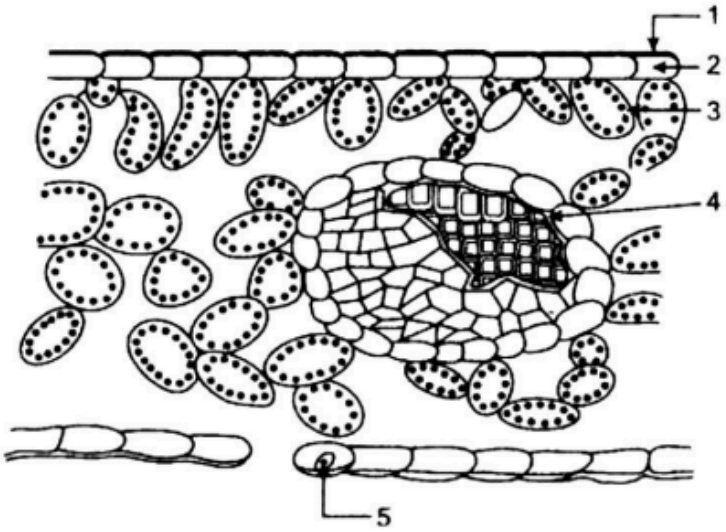
a) Ethyne
b) Acetic acid
c) Ethane
d) None of the above

8. Which event occurs in part labelled as 2? [1]



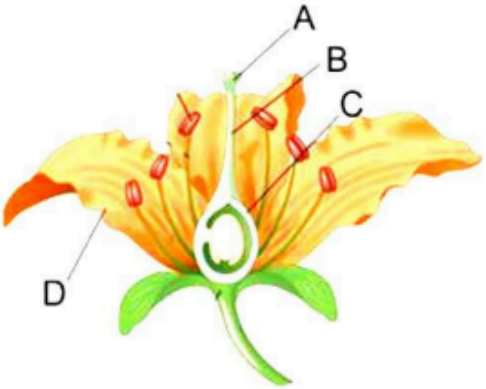
a) Light reaction
b) Dark reaction
c) Photolysis of water
d) Hydrolysis of water

9. The figure below represents the vertical section of a leaf. Which part is associated with the conduction of water and minerals in plants? [1]



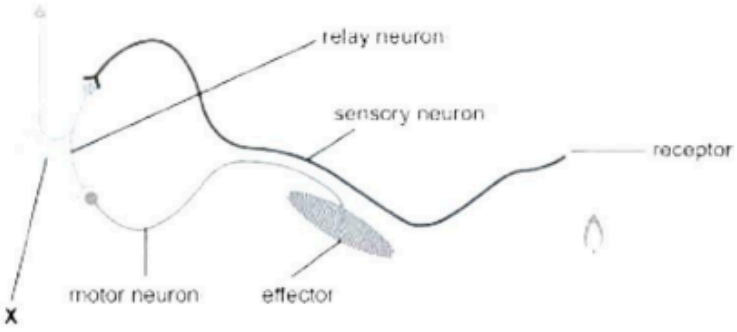
a) Part 2
b) Part 3
c) Part 4
d) Part 5

11. The given diagram shows the structure of a flower. Which of the given parts is receptive during pollination? [1]



a) A
b) B
c) C
d) D

12. The figure shows a reflex arc formed in response to heat. [1]



Which of these is the correct sequence for the flow of information in the reflex arc?

a) Sensory Neuron → Receptor → Motor Neuron → Relay Neuron → Effector
b) Receptor → Sensory Neuron → Relay Neuron → Motor Neuron → Effector
c) Sensory Neuron → Receptor → Motor Neuron → Relay Neuron → Effector
d) Effector → Motor Neuron → Relay Neuron → Sensory Neuron → Receptor

13. The current is doubled if the resistance is ____. [1]

a) Halved
b) doubled
c) one-fourth
d) thrice the original value

14. STATEMENT-1: If a magnetic needle is placed close to a current-carrying conductor, the direction of its deflection changes if the current flowing through the conductor is reversed.
STATEMENT-2: As the current through the conductor increases, so does the strength of the magnetic field near it. [1]

a) Statement 1 is true, statement 2 is true but, Statement 2 is correct explanation for statement 1.
b) Both Statement 1 and statement 2 are true but, Statement 2 is not the correct explanation for statement 1.
c) Statement 1 is true, statement 2 is false.
d) Statement 1 is false, statement 2 is true.

15. Some fishes and plants have died in an aquarium designed by you. Which group of organisms are required to naturally cleanse the aquarium? [1]

a) Scavengers
b) Decomposers
c) Consumers
d) Producers

16. The synthetic chemicals responsible for the depletion of the ozone layer are majorly found in [1]

a) Sewage
b) Refrigeration equipment
c) Vehicular emissions
d) Effluents

Question No. 17 to 20 consists of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:
(a) Both A and R are true, and R is the correct explanation of A
(b) Both A and R are true, and 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 food chain can have a maximum of three trophic levels. [1]
Reason (R): Energy available at each trophic level keeps on decreasing as we move higher up the food chain.

20. **Assertion (A):** The electric bulb glows immediately when the switch is ON.
Reason (R): Drift velocity of electrons in a metallic wire is very high. [1]

17. **Assertion (A):** The aqueous solutions of glucose and alcohol do not show acidic character.
Reason (R): Aqueous solutions of glucose and alcohol do not give H^+ ions. [1]

18. **Assertion (A):** Spore formation is found in unicellular organisms only. [1]
Reason (R): *Rhizopus* and *Mucor* reproduce by spore formation method.

19. **Assertion (A)**: A food chain can have a maximum of three trophic levels. [1]
Reason (R): Energy available at each trophic level keeps on decreasing as we move higher up the food chain.

20. **Assertion (A):** The electric bulb glows immediately when the switch is ON.
Reason (R): Drift velocity of electrons in a metallic wire is very high. [1]

SECTION - B

Question No. 21 to 26 are very short answer questions.

21. Mention two chemical reactions which are characterised by the evolution of gas. [2]

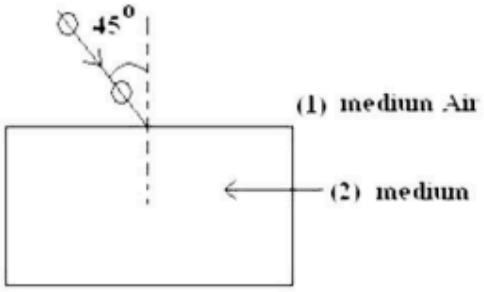
22. What could be the possible reason for the declining female–male sex ratio in our country? Suggest two measures to achieve the 1:1 ratio. [2]

23. What will happen if mucus is not secreted by the gastric glands? [2]

OR

Leaves of a healthy potted plant were coated with *Vaseline*. Will this plant remain healthy for long? Give reasons.

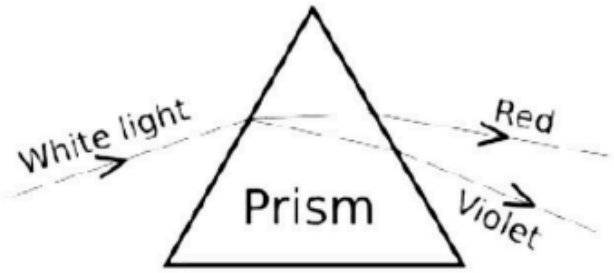
24. A ray of light is incident at an angle of 45° at the interface of medium (1) and medium (2) as shown in the above diagram. Redraw this diagram in the answer book and complete it. If the angle of refraction is 30°, find the refractive index of medium (2) with respect to medium (1).



(Given that $\sin 45^0 = \frac{1}{\sqrt{2}}$ sin and $\sin 30^0 = \frac{1}{2}$)

If the second medium is water in place of medium (2), will the angle of refraction increase or decrease? Why? (Refractive index of water = 4/3)

25.



A student observes the above phenomenon in the lab as a white light passes through a prism. Among many other colours, he observed the position of the two colours Red and Violet. What is the phenomenon called? What is the reason for the violet light to bend more than the red light?

OR

A concave lens has focal length of 25 cm. At what distance should the object from the lens be placed so that if it forms an image at 20 cm distance from the lens? [2]

26. Our food grains such as wheat and rice, vegetables, and fruits, and even meat are found to contain varying amounts of pesticide residues. State the reason to explain how and why it happens. [2]

SECTION - C

Question No. 27 to 33 are short answer questions.

27. Ryan was helping his mother bake a cake for the first time. He accidentally uses baking soda instead of baking powder. After putting the cake in the oven, he noticed it was not rising properly and the taste of the cake turned out bitter. [3]

(a) Why didn't the cake rise properly as expected?
(b) Why did the cake taste bitter?
(c) What should have been done to fix both the issues?

28. Describe three reactions to show that chemical reactions are characterised by a change in colour. [3]

OR

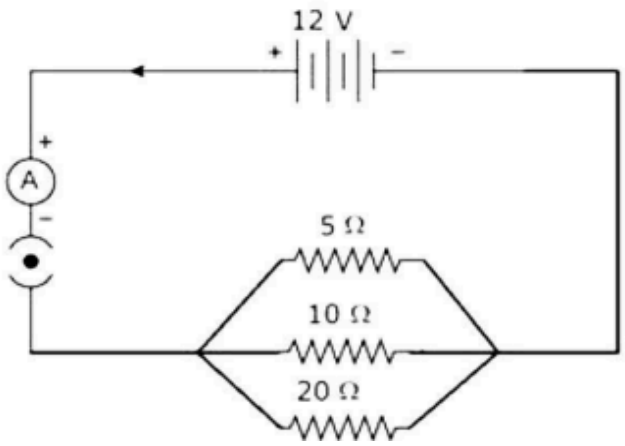
Write the balanced equation for the chemical reactions involved when
(a) Chlorine is passed over dry slaked lime.
(b) Sodium bicarbonate reacts with dilute hydrochloric acid.
(c) Sodium bicarbonate is heated.

29. Which hormone would be released during the following situations? [3]
(a) Watching a horror movie
(b) Low blood sugar levels
(c) Growth of a child to an adult

30. A blue-flowered plant denoted by BB is cross-bred with a white-flowered plant denoted by bb. [3]
(a) State the colour of the flowers you would expect in the F_1 generation plants.
(b) What must be the percentage of white-flowered plants in the F_2 generation if flowers of F_1 plants are self-pollinated?
(c) State the expected ratio of the genotypes BB and Bb in the F_2 progeny.

31. Answer the following: [3]
(a) What according to you happens to the eyes when you enter a dark room from bright sunlight?
(b) Suggest how the iris helps protect the retina from damage by bright light.
(c) How do you compare the defect of a person wearing spectacles of +1.5 D to the one wearing spectacles of –1.5 D?

32. In the circuit given below, three resistors of 5 Ω, 10 Ω and 20 Ω, respectively, are connected across a battery of 12 V. [3]



Calculate:

(a) Current through each resistor

(b) Total current in the circuit

(c) Total resistance of the circuit

33. A 2 cm high object is placed at a distance of 20 cm from a concave mirror. A real image is formed at 40 cm from the mirror. Calculate the focal length of the mirror. Also, find the height of the image formed. [3]

SECTION - D

Question No. 34 to 36 are long answer questions.

34. [5]

(a) What is a homologous series? Explain with an example.

(b) State two characteristics of a homologous series.

(c) The molecular formula of an organic compound is $C_{18}H_{36}$. Name its homologous series.

(d) Select the hydrocarbons which belong to the same homologous series. Give the name of each series.

CH_4, C_2H_2, C_2H_4, C_2H_6, C_4H_{10}, C_3H_4, C_3H_6

(e) What is meant by 'heteroatom'? Give examples. Write the names and formulae of two organic compounds containing different heteroatoms.

OR

Mugdha was asked by her chemistry teacher to identify common elements in the items shown in the following images. Explain the type bonding formed by this element. Explain the bonding in graphite.

35. [5]

(a) How are variations useful for species if there is drastic alteration in the niches?

(b) Explain how the uterus and placenta provide necessary conditions for proper growth and development of the embryo after implantation?

OR

(a) Ratna saw a snake and instantly jumped back. Later, she slowly moved away from the snake. What is the difference between the two actions of instantly jumping and slowly walking away?

(b) Which part of the brain will control the following actions?

(i) cycling (ii) body temperature(iii) heartbeat

36.

(a) Distinguish between a bar magnet and an electromagnet.

(b) State Fleming's left-hand rule.

(c) Positively charged particles moving towards the west are deflected towards the north by a magnetic field. What will be the direction of the magnetic field?

OR

(a) State the Joule's law of heating and given equation for it.

(b) Compare the heat produced when two identical resistors of resistance 'R' with a potential difference of 'V' for time 't' are connected in a

(i) Series combination

(ii) Parallel combination

SECTION - E

Question No. 37 to 39 are case - based/data -based questions with 2 to 3 short sub - parts. Internal choice is provided in one of these sub-parts.

37. Metal A burns in air, on heating, to form an oxide A_2O_3 whereas another metal B bums in air only on strong heating to form an oxide BO. The two oxides A_2O_3 and BO can react with hydrochloric acid as well as sodium hydroxide solution to form the corresponding salts and water. And element E forms an oxide E_2O. An aqueous solution of E_2O turns red litmus paper blue. [4]

(a)

(i) What is the type or nature of oxide A_2O_3? Give the reason for the same.

(ii) What is the type or nature of oxide BO? Give reason for the same.

(b)

(i) Name one metal like A and write its oxide.

(ii) Name one metal like B and write its oxide.

OR

(b) Give an example of an oxide like E_2O. Write the type or nature of this oxide.

38. Guinea pigs having black eyes were crossed with guinea pigs having the same eye colour. The cross produced 100 offspring out of which 75 pigs had black eyes and 25 of them had white eyes. [4]

(a) What is the possible genotype of the parent guinea pigs?

(b) Which trait is dominant and which trait is recessive?

(c) What is the ratio of F_2 progeny obtained from this cross?

OR

Instead of the above cross, if there was a cross between short-haired guinea pigs and long-haired guinea pigs resulting in 400 pigs in F_2 generation, how many pigs would be long haired? Give reason for your answer.

39. Prabha wants to project the image of a candle flame on screen 60 cm in front of a mirror by keeping the flame at a distance of 15 cm from its pole. [4]

a) What type of mirror must be used?

b) What is the linear magnification of the image produced?

c) What does the value linear magnification indicate about the image?

OR

c) How much is the distance between the object and its image in the given case?

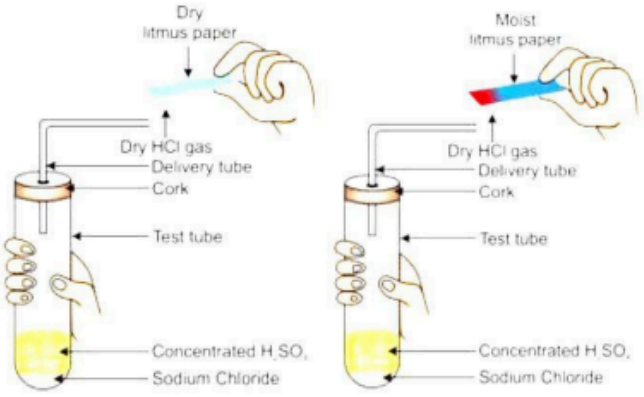
Solution

SECTION - A

1. Correct option – b : Carbon dioxide
Carbon dioxide turns lime water milky.

2. Correct option- d: (i) and (iv)
When an acid (e.g. hydrochloric acid) reacts with a base (e.g. sodium hydroxide), neutralization reaction occurs to form salt and water as follows along with release of heat.
$HCl + NaOH \rightarrow NaCl + H_2O$ + heat

3. Correct option – b: only (ii)



(i) (ii)

Moist blue litmus paper turns red as ionization of HCl into H^+ and Cl^- ions takes place in the aqueous medium that makes the moist litmus paper acidic due to the presence of H^+ ions.

4. Correct option –c: Photolytic decomposition reactions

Photolytic decomposition reaction is the chemical reaction which proceeds with absorption of light. For example: photolytic decomposition of silver chloride in the presence of sunlight.

5. Correct option- a: A

	Zn	Na_2CO_3
HCl	√	√
NaOH	√	×

Since zinc is more reactive than hydrogen and can displace it from HCl, sodium carbonate also reacts with HCl and gives a salt; NaCl. Zinc reacts with NaOH, but sodium carbonate does not react with NaOH since both are bases.

6. Correct option- d: II and IV

Since zinc is more reactive than copper and iron so it displaces copper and iron from their solution to form zinc sulphate and deposition of the free metal on the rod.

7. Correct answer – b: Acetic acid.

Alkaline $KMnO_4$ oxidises ethanol to ethanol gets to ethanoic acid or acetic acid.

8. Correct option b. Dark reaction

1 - Granum, 2 - Stroma, 3 - Thylakoids.

Dark reactions of photosynthesis take place in the stroma of chloroplast.

9. Correct option c. Part 4

1 - Cuticle, 2 - Upper Epidermis, 3 - Palisade tissue/chloroplast, 4 - Xylem,

5 - Stomata

Xylem helps in the conduction of water and minerals in plants.

10. Correct option – a: 17

In a monohybrid cross, the phenotypic ratio of the F_2 generation is 3 (tall) : 1 (dwarf). Hence, ¼ of the plants would be dwarf. Hence, out of 68 plants, 17 would be dwarf.

11. Correct option – a : A

A – Stigma, B – Style, C – Ovary, D – Petal.

The top of the pistil is called the stigma, which is a sticky surface receptive to pollen.

12. Correct option – b: Receptor → Sensory Neuron → Relay Neuron → Motor Neuron → Effector.

In a reflex arc, the stimulus is picked up by a receptor which conducts the information to sensory neuron. In the spinal cord, the stimulus is passed to the relay neuron which in turn passes the signal to motor neuron. This motor neuron conducts the information to the effector organ which shows the response.

13. Correct answer – b: doubled

According to Ohm's law we know that, if the resistance is halved, then the current gets doubled.

14. Correct answer – a: Statement 1 is true, statement 2 is true but, Statement 2 is correct explanation for statement 1.

As we know according to the Oersted experiment any current-carrying conductor will have a magnetic field around itself and as a result, the magnetic needle deflects when placed near such coil. And if we increase the magnitude of current the magnitude of magnetic needles deflection also increases, as a result, if we change the polarity of current through the conductor the direction of deflection also changes.

15. Correct answer – b: Decomposers

Microorganisms such as bacteria and fungi break down the dead remains and waste products of organisms. These microorganisms are called decomposers as they break down complex organic substances into simple inorganic substances.

16. Correct answer – b: Refrigeration equipment

The synthetic chemicals responsible for ozone layer destruction are chlorofluorocarbons. These can be found in everyday products such as air conditioners, refrigerators, and aerosol cans.

17. Both A and R are true, and R is the correct explanation of A.

The aqueous solutions of glucose and alcohol do not show acidic character because aqueous solutions of glucose and alcohol do not give H^+ ions.

18. A is false but R is true.

The method of spore formation occurs in both unicellular and multicellular organisms. So, the assertion is false.

Rhizopus and *Mucor* are multicellular fungi which reproduce by spore formation method. So, the reason statement is true.

19. A is false but R is true.

A food chain can have a maximum of five to six trophic levels because a lot of energy is lost as heat at each trophic level on account of metabolism. So, only a small amount of energy becomes available to the next trophic level. This limits the number of trophic levels in a food chain. So, the assertion is false, but the reason statement is true.

20. Both A and R are true, and R is the correct explanation of A.

As we know when the circuit is closed (Switch is ON), the electric field is established instantly which causes drift at every portion of circuit. This sets up the electric current in the entire circuit instantly. Thus, at the moment when switch is ON electric bulb glows.

SECTION - B

21.

a) When zinc granules react with dilute sulphuric acid, bubbles of hydrogen are produced.

$Zn(s) + H_2SO_4(dil) \rightarrow ZnSO_4(aq) + H_2\uparrow$

b) The chemical reaction between sodium carbonate and dilute hydrochloric acid is characterised by the evolution of carbon dioxide.

$Na_2CO_3\ (s) + 2HCl(dil) \rightarrow 2NaCl(aq) + CO_2\uparrow + H_2O(l)$

22. The reason for declining females in India is sex-selective abortions of the female foetus through surgeries (female foeticides).

<u>This can be avoided by taking the following measures to achieve 1:1 ratio:</u>

- Ban pre-natal sex determination.
- Educate everyone in society about the equality of gender and the health of women.

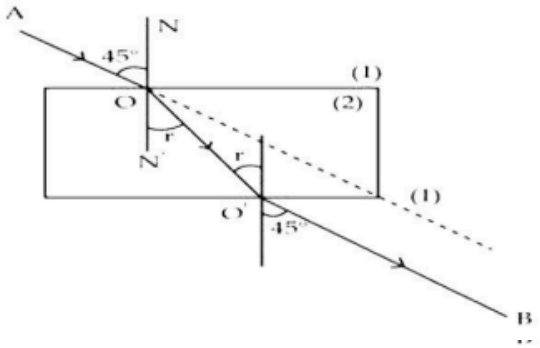
23. Gastric glands in the stomach release hydrochloric acid, enzyme pepsin and mucus. Mucus protects the inner lining of stomach from the action of hydrochloric acid and enzyme pepsin. If mucus is not released, it will lead to erosion of the inner lining of stomach, leading to acidity and ulcers.

OR

<u>The plant will not remain healthy for a long time because:</u>

- No photosynthesis will occur so no glucose will be made. Also, no respiration will take place as no oxygen will be taken in.
- No transpiration will occur, so there would be no upward movement of water or minerals from the soil as there will be no transpiration pull.
- Temperature regulation of leaf surface will be affected.

24.



Using Snell's law, the refractive index of medium (2) with respect to medium (1) is given as

$$n_{21} = \frac{\sin i}{\sin r} = \frac{\sin 45^0}{\sin 30^0} = \frac{1/\sqrt{2}}{1/2} = \sqrt{2} = 1.414$$

If the second medium is water in place of medium (2), the angle of refraction will decrease because water is rarer than medium (2).

25. The phenomenon is called dispersion.

Speed of violet light inside the prism is slowest and that of red is highest. Hence, deviation of violet light is maximum and that of red is minimum.

OR

A concave lens always forms a virtual, erect image on the same side of the object.

v = -20 cm, f = -25 cm, u =?

1/v -1/u = 1/f 1/u = 1/ (-20) - 1/ (-25) 1/u = -1/100

Thus, u = -100cm

Thus, object distance is 100 cm.

26. Harmful pesticides like DDT enter the plant body on being absorbed from the soil. When the plants are eaten by the animals, the pesticides get accumulated in the animal's body as they are neither metabolized nor excreted out of their bodies. The concentration of the harmful chemicals increases at successive trophic levels of the food chain leading to biomagnification. In this way, wheat and rice, vegetables, and fruits, and even meat which occupy different trophic levels are found to contain varying amounts of pesticide residues.

SECTION - C

27.

(a) The cake didn't rise because baking soda ($NaHCO_3$) was used instead of baking powder. Baking soda alone cannot create carbon dioxide, which makes the cake rise and become soft and fluffy.

(b) If baking soda is used instead of baking powder to make cakes, the sodium carbonate formed will make the cake taste bitter.

(c) Tartaric acid, an edible oil, must be added to the baking soda. The acid reacts with baking soda and releases carbon dioxide, which helps the cake rise. It also neutralises the basic effect of baking soda, which helps eliminate the bitter taste.

28.

(a) The chemical reaction between citric acid and purple coloured potassium permanganate solution is characterised by a change in colour from purple to colourless.

(b) The chemical reaction between sulphur dioxide and acidified potassium dichromate solution is characterised by a change in colour from orange to green.

(c) The chemical reaction between iron and blue coloured copper sulphate is characterised by a change in colour from blue to light green.

OR

(c) When chlorine is passed over dry slaked lime at room temperature, the main reaction product is $CaOCl_2$ (bleaching powder).

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

(a) When dilute hydrochloric acid reacts with sodium hydrogen carbonate, carbon dioxide gas is liberated.

$NaHCO_3 + HCl(dil) \rightarrow NaCl + CO_2 + H_2O$

(b) Sodium hydrogen carbonate on heating decomposes into sodium carbonate, water, and carbon dioxide. This is a type of thermal decomposition reaction.

$2NaHCO_3 \xrightarrow{\Delta} Na_2CO_3 + H_2O + CO_2 \uparrow$

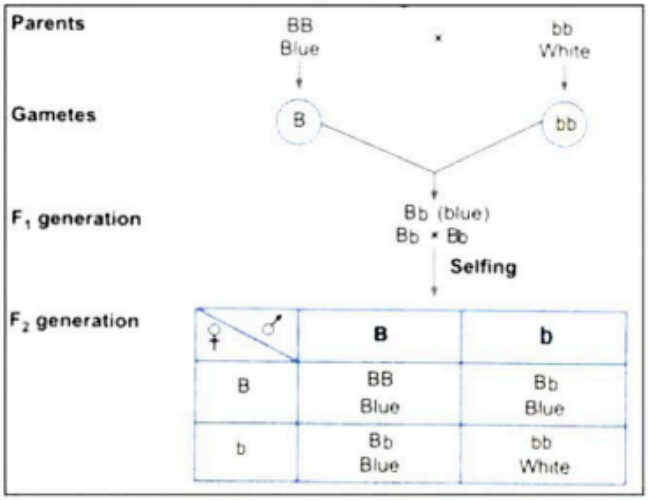
29.

(a) Adrenaline

(b) Insulin

(c) Growth hormone

30. Cross between blue-flowered plant (BB) and white-flowered plant (bb) is a monohybrid cross which involves a single trait, i.e., colour of the flower.



(a) All the F_1 generation plants would be blue (Bb).

(b) If flowers of F_1 plants are self-pollinated, then we would have 75% plants with blue flowers and 25% plants with white flowers in the F_2 generation.

(c) The expected ratio of the genotypes BB and Bb in the F_2 progeny is 1:2.

31.

(a) When we enter a dark room from bright sunlight, we are unable to see at first. This is because the size of the pupil is small. When we enter the dark room, the pupil expands and more light enters the eye enabling us to see.

(b) The iris controls the size of the pupil. So, when our eye encounters bright light, the iris contracts the pupil and protects the retina from damage.

(c) A person is wearing spectacles of power +1.5 D. So, the lens has a positive focal length which indicates that he is wearing a convex lens. Hence, he is suffering from hypermetropia or long-sightedness. For a person wearing spectacles of power −1.5 D, the lens has a negative focal length which indicates that he is wearing a concave lens. Hence, he is suffering from myopia or short-sightedness.

32.

(a) As the resistors are connected in parallel, the voltage across each resistor is the same. Hence, current through each resistor is

$$I_5 = \frac{V}{5} = \frac{12}{5} = 2.4 \text{ A}$$

$$I_{10} = \frac{V}{10} = \frac{12}{10} = 1.2 \text{ A}$$

$$I_{20} = \frac{V}{20} = \frac{12}{20} = 0.6 \text{ A}$$

(b) Total current in the circuit is

$$I = I_5 + I_{10} + I_{20}$$

$$\therefore I = 2.4 + 1.2 + 0.6$$

$$\therefore I = 4.2 \text{ A}$$

(c) Total resistance in the circuit is

$$V = IR_{eq}$$

$$\therefore R_{eq} = \frac{V}{I} = \frac{12}{4.2}$$

$$\therefore R_{eq} = 2.85\ \Omega$$

33. Given:

Object distance, u = −20 cm

Image distance, v = −40 cm

Height of object (h_0) = 2 cm

According to the mirror formula,

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

$$\frac{1}{-40}+\frac{1}{-20}=\frac{1}{f}$$

$$\frac{1}{f}=\frac{-1-2}{40}$$

$$f=-\frac{40}{3}=-13.33\ \text{cm}$$

$$\text{magnification, } m=-\frac{v}{u}=\frac{h_i}{h_0}$$

$$m=-\frac{-40}{-20}=\frac{h_i}{2}$$

$$h_i=-4\ \text{cm}$$

SECTION - D

34.

(a) A homologous series is a group of organic compounds having similar structures and similar chemical properties in which the successive compounds differ by the CH_2 group.

Example of homologous series: All the alkanes have similar structures with single covalent bonds and show similar chemical properties, so they can be grouped together in the form of a homologous series.

Homologous series of alkanes: Methane, CH_4; Ethane, C_2H_6; Propane, C_3H_8; Butane, C_4H_{10}; Pentane, C_5H_{12}

(b)

(i) All the members of the homologous series can be represented by the same general formula.

(ii) Any two adjacent homologues differ by 1 carbon atom and 2 hydrogen atoms in their molecular formulae.

(c) Alkene, C_nH_{2n}

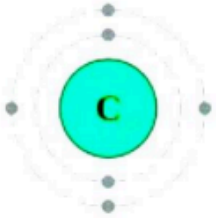
(d) Alkanes: CH_4, C_2H_6, C_4H_{10}
Alkenes: C_2H_4, C_3H_6
Alkynes: C_2H_2, C_3H_4

(e) In an organic compound, any atom other than carbon and hydrogen is called a heteroatom.
Examples: Chlorine (Cl), Bromine (Br), Oxygen (O)
Chloromethane (CH_3Cl) and methanol (CH_3OH)

OR

The common element present in graphite, sugar and diamond is "Carbon."
Bonding formed by Carbon element is as follows:

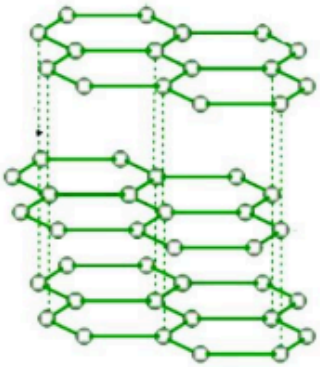
- Carbon atom has four electrons in its outermost shell.



- It requires four electrons to achieve the stable, 8 electron, inert gas electron arrangement.
- Carbon atoms can achieve the inert gas electron arrangement only by sharing of the electrons. Hence, carbon always forms covalent bonds.
- The valency of carbon is four since one carbon requires 4 electrons to achieve the nearest inert gas configuration. Thus, we can say that carbon is tetravalent.
- The four valencies of carbon are usually represented by putting four short lines around the symbol of carbon, C.

Graphite:

- In graphite, each carbon atom is bonded to three other carbon atoms in the same plane, giving a hexagonal array.
- One of the bonds is a double bond and thus the valency of the carbon is satisfied.
- Graphite structure is formed by the hexagonal arrays being placed in layers, one above another.
- Graphite is smooth and slippery.
- It is a very good conductor of electricity due to the presence of free electrons.



35.

(a) If the niche were drastically altered, the population could be wiped out. However, if some variations were to be present in a few individuals in these populations, there would be some chance for them to survive. Variation is thus useful for the survival of species over time.

(b)

- The lining of the uterus thickens and is richly supplied with blood to nourish the growing embryo.
- The embryo gets nutrition from the mother's blood with the help of placenta. It is embedded in the uterine wall.
- It contains villi on the embryo's side of the tissue. On the mother's side are blood spaces, which surround the villi.
- This provides a large surface area for glucose and oxygen to pass from the mother to the embryo. The developing embryo will also generate waste substances which can be removed by transferring them into the mother's blood through the placenta.
- The child is born as a result of rhythmic contractions of the muscles in the uterus.

OR

(a) Jumping back instantly on seeing a snake is an example of a quick, involuntary, reflex action. Reflex actions help organisms to quickly adapt to an adverse circumstance that could have the potential to cause bodily harm or even death.

Walking away slowly is an example of a slow, voluntary action. Voluntary actions are produced with the involvement of thoughts. These actions are produced consciously.

(b) (i) Cycling will be controlled partially by the cerebrum as the act of pushing the paddles and partially by the cerebellum to balance the body and co-ordination between muscles of during paddling.

(ii) Body temperature is controlled by the hypothalamus.

(iii) Heartbeat is regulated by medulla oblongata.

36.

(a)

Bar magnet	Electromagnet
1. A bar magnet is a permanent magnet.	1. An electromagnet is a temporary magnet.
2. A permanent magnet produces a comparatively weak force of attraction.	2. An electromagnet can produce a very strong magnetic force.
3. The strength of a permanent magnet cannot be changed.	3. The strength of an electromagnet can be changed by changing the number of turns in the coil or changing the current passing through it.
4. The polarity of a permanent magnet is fixed and cannot be changed.	4. The polarity of an electromagnet can be changed by changing the direction of current.

(b) According to Fleming's left-hand rule, hold the forefinger, the middle finger, and the thumb of your left hand at right angles to one another. Adjust your hand in such a way that the forefinger points in the direction of the magnetic field and the middle finger points in the direction of current. The direction in which the thumb points give the direction of force acting on the conductor.

(c) As the positively charged particles are moving towards the west, the direction of current will be towards the west. It is given that the deflection is towards the north. Thus, according to Fleming's left-hand rule, holding the middle finger towards the west (direction of current) and the thumb towards the north (in the direction of force), the forefinger points in the upward direction. Hence, the direction of the magnetic field is in the upward direction.

OR

(a) **Joule's law of heating:** Amount of heat energy produced in an electric circuit is directly proportional to the

(i) Square of the amount of electric current

(ii) Time for which the current passes

(iii) Amount of resistance which the circuit provides to the flow of current

The heat energy produced in a conductor of resistance 'R' when current 'I' is flowing for time 't' is given by equation,

$H = I^2Rt$

(b)

(i) When the resistors are connected in series:

$R_s = R + R = 2R$

$\therefore H_s = \frac{V^2}{R_s} = \frac{V^2}{2R}$ ..... (1)

(ii) When the resistors are connected in parallel:

$\frac{1}{R_p} = \frac{1}{R} + \frac{1}{R} = \frac{2}{R}$

$\therefore R_p = \frac{R}{2}$

$\therefore H_p = \frac{V^2}{R_p} = \frac{2V^2}{R}$ ..... (2)

From (1) and (2),

$\frac{H_s}{H_p} = \frac{V^2}{2R} \times \frac{R}{2V^2} = \frac{1}{4}$

$\therefore H_p = 4H_s$

SECTION - E

37.

OR

(a)

(i) The nature of oxide A_2O_3 is amphoteric since it can react with both acid and alkali to form salt and water.

(ii) The nature of oxide BO is amphoteric since it can react with acid and alkali to form salt and water.

(b) Example of oxide like E_2O = Na_2O or K_2O.
The nature of this oxide is basic as the aqueous solution of this oxide turns red litmus blue.

38. Let B be the gene for dominant eye colour, and b be the gene for recessive eye colour.
The cross was made between parents having the same eye colour - black.
So, the possible genotypes of the parents would be either BB or Bb or bb.
Let us analyse the results obtained after crossing each of these parents.
Case I:

- Parents – BB × BB
- Gametes – B, B
- Progeny – BB

Case II:

- Parents – bb × bb
- Gametes – b, b
- Progeny – bb

Case III:

- Parents – Bb × Bb
- Gametes – B, b, B, b
- Progeny – BB, Bb, Bb, bb

However, after crossing both the parents, 75 pigs had black eyes and 25 of them had white eyes.
Hence, we can directly rule out case I and II since only one type of progeny is obtained in both these cases. Case III is applicable in the given cross.
And since 75 pigs had black eyes and 25 had white eyes, the gene for black eyes is dominant and the gene for white eyes is recessive.
Therefore,
(a) The possible genotype of the parent guinea pigs is Bb.
(b) The trait for black eye colour is dominant and the trait for white eye colour is recessive.
(c) 75 pigs had black eyes and 25 had white eyes. Therefore, the ratio of F_2 progeny obtained from the cross of Bb × Bb is 3 : 1.

OR

In guinea pigs, short hair is dominant to long hair.
Short hair – HH, Long hair – hh
This is an example of a monohybrid cross.
Genotypic ratio of F_2 progeny – 1 : 2: 1
Phenotypic ratio of F_2 progeny – 3 (short hair) : 1 (long hair)
Hence, out of 400 pigs in F_2 generation, 300 pigs would be short-haired, and 100 pigs would be long-haired.

39.

a) As the image has to be obtained on the screen Prabha must use concave mirror.

b) $m = -v/u$

$v = -60$ cm

$u = -15$ cm

Thus,

Linear magnification of image produced is $m = -4$

c) Negative sign indicates that image is real and inverted and value 4 which greater than one indicates that the image formed is enlarged or magnified.

OR

d) $v = -60$ cm

$u = -15$ cm

Thus,

$v - u = -60 + (-15) = -45$ cm

The distance between image and object in the given case is 45 cm.