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. Substance X is used for the work done shown in image A which is basic in nature, while Y is an acid found in the fruit shown in image 2. Identify the substances X and Y. [1]

Image A.

Image B

a) X - Potassium hydroxide and Y – Acetic acid
b) X – Ammonium hydroxide and Y – Oxalic acid
c) X – Ammonium hydroxide and Y – Tartaric acid
d) X – Potassium hydroxide and Y – Tartaric acid

2. The below image shows the use of aluminium in daily life. [1]

Aluminium cooking utensil

The properties of aluminium responsible for this use are,
(i) Good thermal conductivity
(ii) Good electrical conductivity
(iii) Ductility
(iv) High melting point
a) (i) and (ii)
b) (i) and (iii)
c) (ii) and (iii)
d) (i) and (iv)

3. Meenal went to her kitchen garden on terrace where bee stung her hand. In which of the following solutions should she dip her hands for instant relief from pain? [1]

a) Baking powder
b) Lime juice
c) Vinegar
d) Alcohol

4. Which one of the following pairs of elements combine with electrovalent bond to form ionic compound? [1]
a) Na and Cl
b) C and H
c) Mg and Ca
d) F and Cl

5. Food materials containing oils and fats when kept for a long time is shown in the below image. They give out a foul odour and taste different. Name this process. [1]

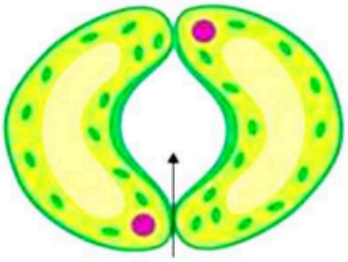
a) Corrosion
b) Milling
c) Rancidity
d) Osmosis

6. Kunal had dinner late at night and so developed stomach pain due to indigestion. Which type of medicines from the options below, he should prefer? [1]
a) Antibiotic
b) Analgesic
c) Antiseptic
d) Antacid

7. The functional group –CHO is present in: [1]
   a) Ketone
   b) Aldehyde
   c) Alcohol
   d) Carboxylic acid

8. Shilpa wanted to cross the road. She looked on either side of the road and then walked across to the other side of the road.
   Which of the following is/are involved in the process described above? [1]
   I) Cerebrum
   II) Cerebellum
   III) Skeletal muscles
   IV) Medulla oblongata
   a) Only III
   b) Only I and III
   c) Only I, III and IV
   d) Only I, II and III

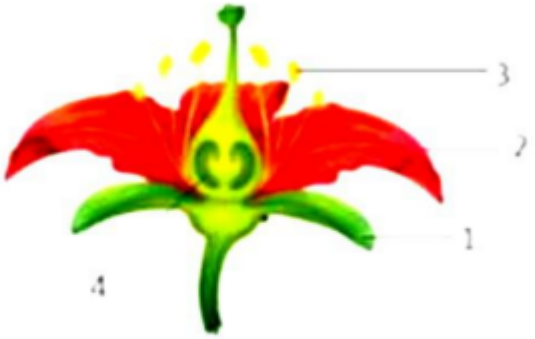
9. The diagram shows a single stoma in the epidermis. What is the state of the guard cells? What is the effect of this state on guard cells? [1]



   a) Turgid state: helps in decreasing the size of the stoma, i.e. opening the stomata.
   b) Flaccid state: helps in decreasing the size of the stoma, i.e. opening the stomata.
   c) Turgid state: helps in increasing the size of the stoma, i.e. opening the stomata.
   d) Flaccid state: helps in increasing the size of the stoma, i.e. opening the stomata.

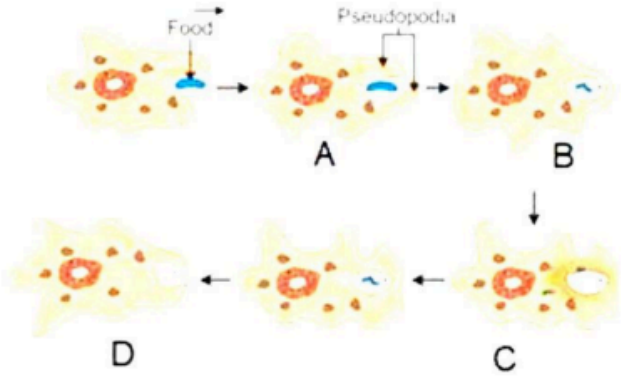
10. A pea plant with inflated pods denoted by WW is cross bred with a pea plant with constricted pods denoted by ww. State the expected ratio of the genotypes WW and Ww in the F_2 progeny. [1]
   a) 1:3
   b) 3:1
   c) 1:2
   d) 2:1

11. Which of the following parts protect the essential parts of the flower during the bud stage? [1]



a) 1 only
b) 2 only
c) 2 and 3
d) 4 only

12. Observe the diagram of nutrition in *Amoeba*. Match the labeling referred to in column I with the process mentioned in column II. [1]



Column I	Column II
A	i. Food diffusing into cytoplasm
B	ii. Forming food vacuole
C	iii. Engulfing food within food vacuole
D	iv. Undigested food thrown out

a) A – i, B – ii, C – iii, D – iv
b) A – ii, B – iii, C – i, D – iv
c) A – iii, B – ii, C – iv, D – i
d) A – iv, B – ii, C – I, D – iii

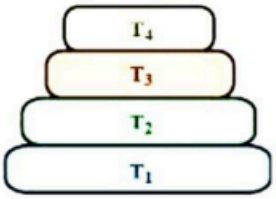
13. A heater of resistance 30 ohm is connected to 220 V line. How much current will this heater draw? [1]

(a) 6.2 A
(b) 5.5 A
(c) 4 A
(d) 7.3 A

14. If the potential difference between the ends of a fixed resistor is doubled, the electric power will become [1]

a) double
b) half
c) one-fourth
d) four times

15. In the given figure, various trophic levels are shown in a pyramid. At which trophic level is minimum energy available?



(a) T_1
(b) T_2
(c) T_3
(d) T_4

16. Rajeev's father had ordered disposable plastic plates for his birthday to reduce the cleaning work. However, Rajeev convinced his father that instead of plastic, they should opt for paper plates. What could be the reason behind not using disposable plastic plates? [1]

(a) They are made of materials with light weight.
(b) They are inconvenient to handle.
(c) They are made of biodegradable materials.
(d) They are made of non-biodegradable materials.

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

17. **Assertion (A):** If an acid reacts with a base, then salt and water are formed. [1]
Reason (R): This is an example of redox reaction.

18. **Assertion (A):** Offspring produced by sexual reproduction are likely to adjust better in environmental fluctuations. [1]
Reason (R): There is mixing of genetic material from the two parents during the fusion of gametes.

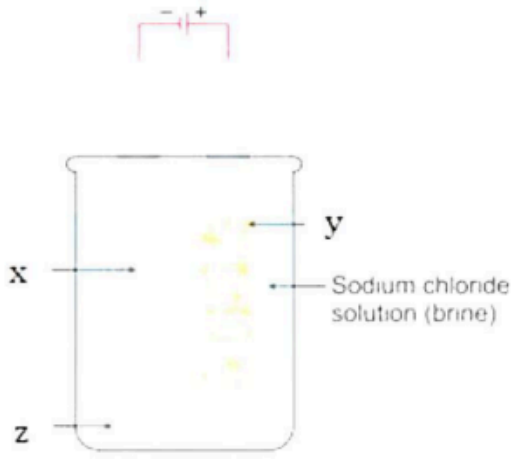
19. **Assertion (A):** The second trophic level of a food chain operating in a grassland is mostly occupied by a carnivore. [1]
Reason (R): Carnivores feed on herbivores and are secondary consumers.

20. **Assertion (A)**: When light rays enter the eyes, most of the refraction takes place at outer surface of cornea.
Reason (R): Cornea controls the size of the pupil. [1]

SECTION - B

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

21. Study the experimental set up shown in given figure and answer the following questions: [1]



Name the experiment. Write the name of products at cathode and at anode x, y and z. Write the chemical reaction for this experiment.

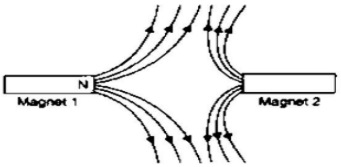
22. Variation is beneficial to the species but not necessarily for the individual. Justify this statement. [2]

23. Tooth enamel is one of the hardest substances in our body. How does it undergo damage due to eating chocolates and sweets? [2]

OR

Diffusion will not be sufficient to provide raw materials in leaves and energy in roots in plants; therefore, a proper system of transportation is essential. Explain.

24. The figure given below shows the magnetic field between two magnets:



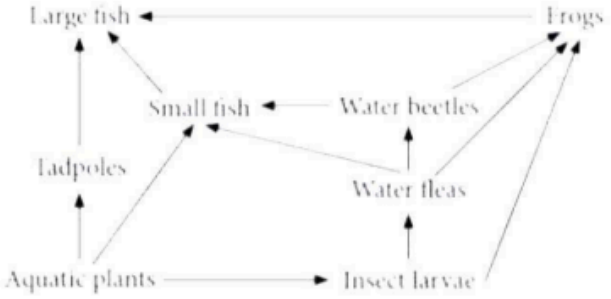
(i) Copy the diagram and label the other poles of the magnets.
(ii) Which is the weaker magnet? [2]

25. Draw ray diagrams to show the formation of image of an object by a concave mirror, when it is placed between its centre of curvature and focus also describe the nature of image formed for the given case. [2]

OR

A -0.5 D lens is required to correct a person's distant vision. He requires a lens with a power of +1.5 D to correct his near vision.
What is the focal length of the lens required to correct his distant vision and near vision?

26. Refer to the given food web. [2]



What will be the effect on the food web if the population of water fleas gets eliminated?

SECTION - C

Question No. 27 to 33 are short answer questions.

27. A silvery white metal P is in the form of ribbons. Upon ignition, it burns with a dazzling white flame to form white powder Q. When water is added to the powder Q, it partially dissolves to form a substance R which is used as an antacid. [3]

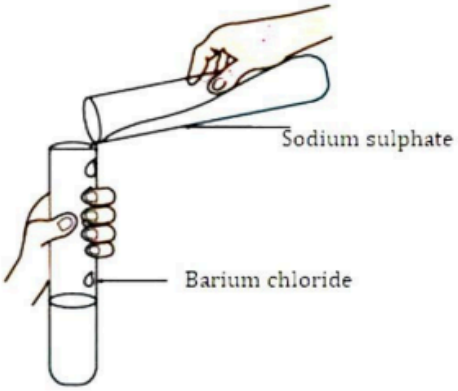
(a) What is metal P?

(b) Name the white powder Q.

(c) What is the substance R?

(d) Write the chemical reactions that are taking place.

28. Observe the given figure and answer the following questions. [3]



(a) Write the complete balanced reaction for the reaction that takes place in the above experiment.

(b) Type of reaction involved in the reaction.

(c) Is there any precipitate formed? If any precipitate formed, write the colour of the precipitate.

OR

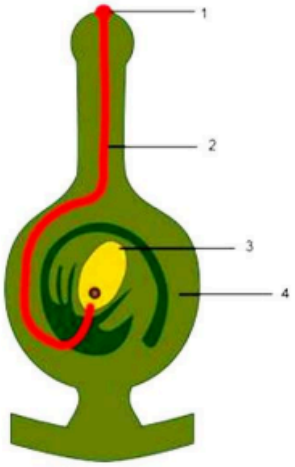
Madhuri prepares HCl gas in her school laboratory using certain chemicals. She puts both dry and wet blue litmus papers in contact with the gas. [3]

(a) Name the reagents used by Madhuri to prepare HCl gas.

(b) Explain the colour changes observed with the dry and wet blue litmus paper.

(c) Show the formation of ions when HCl gas combines with water.

29. The diagram given alongside shows a type of tropism. Study the same and answer the questions that follow: [3]



(a) Name and define the type of tropism shown in the diagram.

(b) Label the guidelines (1) to (4).

(c) Name two effective stimulants that help in the growth of part (2).

30. Does the sex of a child depend on the father or is it just a matter of chance? Discuss.[3]

31. [3]

(a) What is the nature of the image formed by a convex mirror when the object is placed between the pole and infinity?

(b) What is diffused reflection of light?

(c) Which mirror is used as a rear-view mirror? Why?

32. The image of an object placed at 40 cm in front of a lens is obtained on a screen at a distance of 100 cm from it. Find the focal length of the lens. What would be the height of the image if the object is 4 cm high? [3]

33. The values of potential difference V applied across a resistor and the corresponding values of current I flowing in the resistor are given below:

Potential difference, V (in volts)	2.5	5.0	10.0	15.0	20.0	25.0
Current, I (in amperes)	0.1	0.2	0.4	0.6	0.8	1.0

a) Draw the V-I graph for given value of current and potential difference.

b) What is the nature of the V-I graph plotted for the above values of potential difference and current?

c) Which law is illustrated by such type of graph? [3]

SECTION - D

Question No. 34 to 36 are long answer questions.

34. Riya learned about carbon and its unique properties during a chemistry class. She was curious about how carbon forms so many different compounds and why substances like diamond and graphite, though made of carbon, look and behave so differently. Explain: [5]

(a) Tetravalency of carbon (with diagram)

(b) Two allotropes of carbon based on characteristics.

OR

Distinguish between esterification and saponification reaction with the help of the chemical equations for each. State one use of each (i) esters, and (ii) saponification process.

35. [5]

(a) In a tobacco plant, the male gametes have 24 chromosomes. What is the number of chromosomes in the female gamete? What is the number of chromosomes in the zygote?

(b) Kashyap noticed that an organism by mistake was cut into parts. After some time, both parts developed into new individuals.

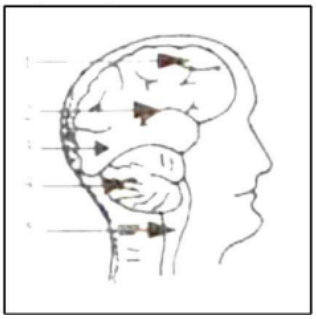
i) Name the mode of reproduction used by the organism.

ii) State the type of cells which carry out this process.

iii) Give one example of an organism which reproduces by the above method.

OR

The figure represents the human brain.



(a) Label the parts 1 – 5.
(b) State the function of part 4 and 5.
(c) How is the brain protected?

36. [3]

(a) For what position of the object does a convex lens form an erect and virtual image?
(b) What is regular reflection of light?
(c) What type of mirror is used as a shaving mirror? Support your answer with a reason.

OR

Answer the following:
(a) What is the advantage of having two eyes instead of one?
(b) Explain the function of the iris.
(c) What is the difference in the defect of a person wearing spectacles of +1 D to a person wearing spectacles of –1 D?

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?

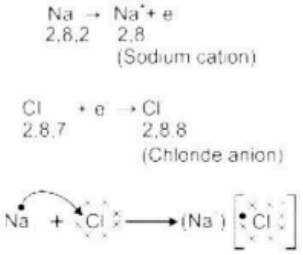
SECTION - A

1. Correct option-c: X- Ammonium hydroxide and Y – Tartaric acid
   Window cleaner consists of ammonium hydroxide while grapes consist of tartaric acid.

2. Correct option-d: (i) and (iv),
   Aluminium has good thermal conductivity and high melting point.

3. Correct option-a: Baking powder solution
   The effect of an acid can be nullified by the application of a base.
   Bee sting venom contains formic acid which is one of the major factors for the painful burning sensation. Hence, the acidic effect can be neutralised by applying baking powder.

4. Correct option- a: Na and Cl



   Sodium gives away one valence electron to chlorine to form ionic bond.

5. Correct option-c: Rancidity
   Rancidity of food: Oils and fats react with oxygen and get oxidised or turn rancid. This process is called rancidity.

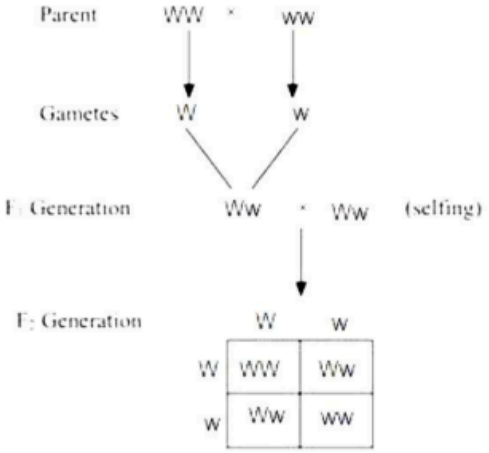
6. Correct option-d: Antacid
   Indigestion causes acidity and to neutralize this acid, antacid is taken as it is basic in nature.

7. Correct option-b: Aldehyde
   The functional group –CHO is present in aldehyde.

8. Correct option – d: Only I, II and III
   Cerebrum is involved in the process of sensory information or decision making. Skeletal muscle is involved in the physical movement of the body. Cerebellum maintains body balance. Coordinated functions of these organs helped Shilpa to cross the road safely.

9. Correct option – c: Turgid state; helps in increasing the size of the stoma, i.e., opening the stomata.
Due to absorption of water, the guard cells become turgid, thus increasing the size of the stoma, and resulting in opening of the stomata.

10. Correct option – c : 1:2



The ratio of the genotype WW and Ww in the F_2 progeny is 1 (WW):2 (Ww).

11. Correct option – a : 1 only
1 – Sepals, 2 – Petals, 3 – Anther, 4 - Ovule
Sepals are the outermost, green, leaf-like protective structures in a flower. They protect the essential parts of the flower during the bud stage and help in the manufacture of food.

12. Correct option – b: A – ii, B – iii, C – i, D – iv
Ingestion – Food vacuole is formed with the help of pseudopodia.
Digestion – Food is engulfed within the food vacuole.
Absorption – Food diffuses into the cytoplasm.
Excretion – Undigested food is excreted out through the pseudopodia.

13. Correct option - d) 7.3 A
By using Ohm's law,
V = IR
I = V/R
Thus, I = 220/30 =7.3 A

14. Correct option - d) four times

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

$$P = \frac{(2V)^2}{R} = 4\left(\frac{V^2}{R}\right)$$

15. Correct option – d) T_4

At each trophic level of the food chain, majority of the energy available is utilised for respiration and other life processes while only 10% of the available energy is passed on to the next trophic level. Since only 10% of the available energy can be passed on to the next trophic level, higher trophic levels have substantially lesser energy and the number of trophic levels in a food chain is limited. Lower the trophic level, higher will be the amount of available energy. Hence, maximum amount of energy is expected in trophic level T_1 while T_4 will have minimum energy.

16. Correct option – d) They are made of non-biodegradable materials.

Disposable plastic plates are non-biodegradable and hence, cannot be degraded by micro-organisms. They continue to persist in the environment and pollute it.

17. A is true but R is false.

When an acid reacts with a base, then salt and water are formed. So, the assertion is true. When hydrochloric acid reacts with sodium hydroxide solution, then a neutralisation reaction takes place to form sodium chloride and water.

$NaOH(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O(l)$

Such a reaction is termed as neutralisation reaction. So, the reason is false.

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

During sexual reproduction the genetic material of two individuals is combined to produce genetically diverse offspring that differ from their parents. The genetic diversity of sexually produced offspring is thought to give species a better chance of surviving in an unpredictable or changing environment. So, both assertion and reason are true, and the reason correctly explains the given assertion.

19. A is false but R is true.

The second trophic level of a food chain is occupied by herbivores that feed on plants or producers present at the first trophic level. So, the assertion is false. Carnivores feed on herbivores. Here, herbivores are primary consumers and carnivores are secondary consumers. So, the reason is true.

20. A is true but R is false.

Iris controls the size of the pupil.

SECTION - B

21. This set up is of "Electrolysis of Brine".
At cathode: x = H_2 gas
Near cathode: z = NaOH solution
At anode: y = Cl_2 gas
The chemical reaction is as follows:
$2NaCl(aq) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g) + Cl_2(g)$

22. Variation is beneficial to the species but not necessarily for the individual because it allows a species to adapt to the changing environment. Variations at the individual level will not help in evolving, but would result in ageing, so variation from any source in an individual can be harmful. Some variations found in a few individuals of a population would lead to some chance for them to survive, rest will be wiped out. At species level, these variations bring about differences in generations which leads to evolution.

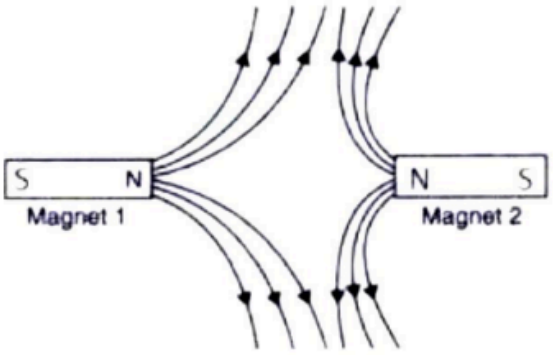
23. Acid is formed in the mouth after sugary food (chocolates and sweets) has been consumed. This acid lowers the pH in the mouth. Tooth decay starts when the pH of acid formed in the mouth falls below 5.5. This is because the acid becomes strong enough to attack the enamel of our teeth and corrode it.

OR

If the distances between soil-contacting organs and chlorophyll-containing organs are small, energy and raw materials can easily diffuse to all parts of the plant body. But if these distances become large because of changes in the plant body design, diffusion processes will not be sufficient to provide raw material in leaves and energy in roots. Diffusion is a very slow process. It would take years to supply the water from roots to leaves (upward). Hence, a proper system of transportation is essential in such situations.

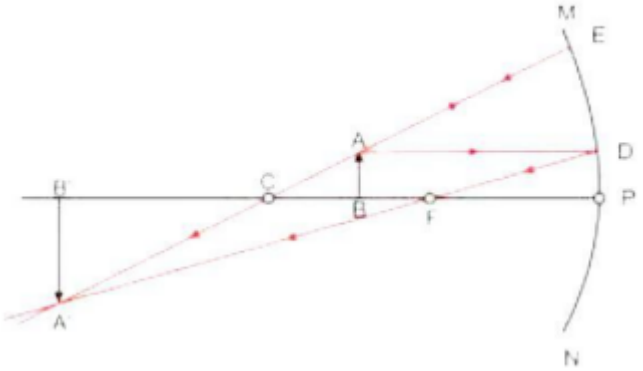
24.

i)



ii) Magnet 2 is weaker because its field lines are smaller than that of the magnet.

25.



Now for the given case as we can see, when an object is placed between centre of curvature and focus the image formed will be beyond the centre of curvature and its nature will be enlarged, real and inverted.

OR

Focal length of lens needed to correct distant vision will be

Distant vision $f = \frac{1}{P} = -\frac{1}{0.5} = -2\,m.$

Here negative sign shows that the lens needed for correction is concave lens.

Focal length of lens needed to correct Near vision will be

Near vision $f = \frac{1}{P} = \frac{1}{1.5} = 0.67\,m.$

26. In the given food web, water fleas feed on insect larvae and are in turn fed upon by water beetles. So, if water fleas get eliminated, then the population of insect larvae will increase and that of water beetles will decrease. As small fish are dependent on water beetles for food, a decrease in the population of water fleas will cause a decrease in their population as well. The population of frogs remains unaffected as frogs also depend on insect larvae for food.

SECTION - C

27.

(a) The metal is P is Mg.

(b) The white powder Q is MgO.

(c) White powder Y dissolves partially in water to form substance R. It is $Mg(OH)_2$, and is used as an antacid.

(d) The chemical reactions that are taking place are :

$$\underset{(X)}{2Mg(s)} + \underset{}{O_2(g)} \xrightarrow{\text{Ignition}} \underset{(Y)}{2MgO(s)}$$

$$\underset{(Y)}{MgO(s)} + \underset{}{H_2O(l)} \longrightarrow \underset{(Z)}{Mg(OH)_2}$$

28.

(a) $BaCl_2(aq) + Na_2SO_4(aq) \rightarrow BaSO_4(s) + 2NaCl(aq)$

(b) The type of this reaction is double displacement reaction.

(c) Yes, a precipitate of barium sulphate ($BaSO_4$) is formed.

(d) The precipitate is white in colour.

OR

(a) Solid sodium chloride (NaCl) and concentrated sulphuric acid (conc. H_2SO_4)

(b) Dry litmus – no change because separation of H^+ ions cannot occur in the absence of water,
Wet litmus – Blue to red since hydrogen ions present in the form of hydronium ions.
Hydrogen ions cannot exist alone, but they exist after combining with water molecules. Thus, hydrogen ions are always present as hydronium ions as follows:
$H^+ + H_2O \longrightarrow H_3O^+$

(c) $HCl + H_2O \rightarrow H_3O^+ + Cl^-$
H_3O^+ - Hydronium ion
Cl^- - Chloride ion

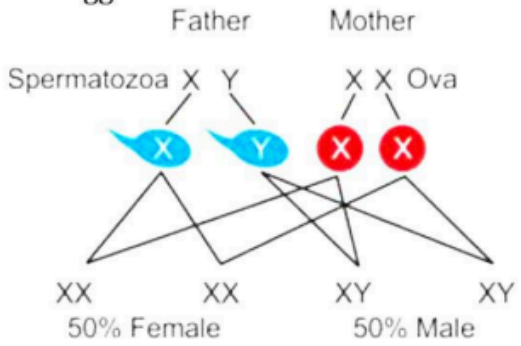
29.

(a) Chemotropism. It is the phenomenon of growth of plant organs in response to chemicals.

(b) (1): Pollen grain, (2): Pollen tube, (3): Ovule, (4): Ovary.

(c) Sugar and peptones.

30. The sex of a child depends on the kind of sperm that fertilises the egg. The egg always contains an X chromosome, but the sperms can either contain an X-chromosome or a Y-chromosome. It is simply a matter of chance as to which category of sperm fuses with the egg and this determines whether the child will be a male or a female.



If the egg fuses with the X-bearing sperm, the resulting combination is XX and the child born is a female.

If the egg fuses with the Y-bearing sperm, the resulting combination is XY, and the child born is a male.

31.

(a) When an object is placed between the pole and infinity, the image formed is virtual, erect and diminished.

(b) When light rays are incident on the rough surface, they are reflected in different directions. This type of reflection is called diffused reflection or irregular reflection.

(c) A convex mirror always produces an erect, virtual, and diminished image. This enables a driver to view a much larger area behind him. Hence, a convex mirror is suitable as a rear-view mirror.

32. Object distance, u = –40 cm

Image distance, v = 100 cm

From the lens formula,

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

$$\therefore \frac{1}{f}=\frac{1}{100}-\frac{1}{-40}=\frac{1}{100}+\frac{1}{40}$$

$$\therefore \frac{1}{f}=\frac{140}{4000}=0.035$$

$$\therefore f=28.57 \text{ cm}$$

Height of the object, h = 4 cm

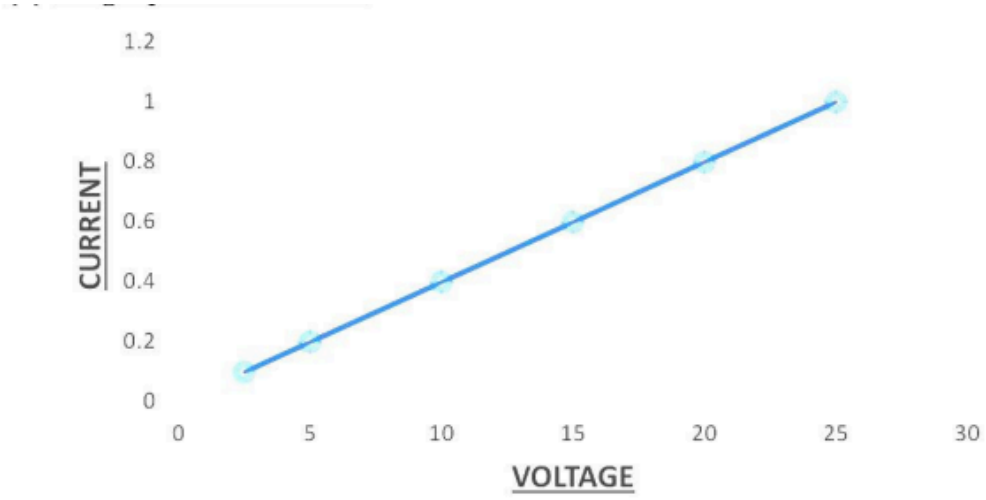
From the magnification formula,

$$m=\frac{v}{u}=\frac{h'}{h}$$

$$\therefore h'=\frac{v}{u}h=\frac{100}{-50}\times 4=-8 \text{ cm}$$

33.

(a) V-I graph is as follows:



(b) Straight line graph

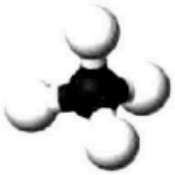
(c) Ohm's law is illustrated when nature of V- I graph is straight line.

SECTION - D

34.

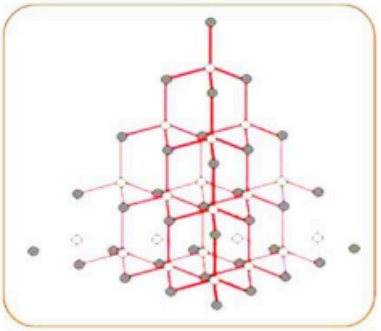
a) Tetravalency of carbon:

Carbon has a valency of four. So, it is capable of bonding with four other atoms of carbon or atoms of some other monovalent element. Compounds of carbon are formed with oxygen, nitrogen, hydrogen, sulphur, chlorine and many other elements, giving rise to compounds with specific properties which depend on the elements other than the carbon present in the molecule.



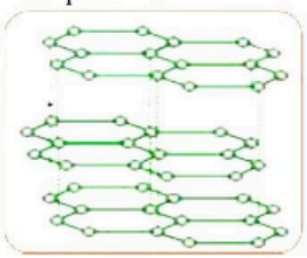
b) Allotropes of carbon:

(i) Diamond:



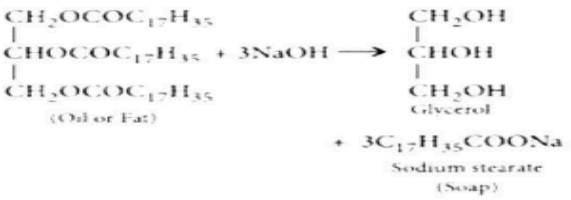
- Network Solid
- Crystalline form
- Each carbon is bonded to 4 other carbons
- Very strong
- High melting point

(ii) Graphite:



- Each carbon is bonded to 3 other carbons; the 4th bond is weak
- Layers of Carbon
- Weak
- Layers "rub off"
- Example: pencil lead

OR

Sr. No.	Esterification	Saponification
1.	The process of addition of alcohol to carboxylic acid in the presence of acid catalyst to form fruity smelling ester is called Esterification reaction.	The reaction in which oils or fats are treated with sodium hydroxide solution to form sodium salts of fatty acids and glycerol is called Saponification reaction.
2.	Chemical reaction: 	Chemical Reaction: 

Use of esters: They are used for making perfumes or used as artificial flavouring substances.

Use of saponification process: This process is used in making soaps.

35.

(a) Number of chromosomes in female gamete is 24.
Number of chromosomes in zygote is 48.

(b) i) The mode of reproduction used by the organism is regeneration.
ii) Regeneration is carried out by specialised cells called regenerative cells which can proliferate and make a large number of cells by cell division.
iii) *Planaria* reproduces by the method of regeneration.

OR

(a) 1 - Frontal lobe
2 - Temporal lobe
3 - Occipital lobe
4 – Cerebellum
5 - Medulla oblongata

(b) Function of Part 4 (Cerebellum) - Coordination of muscular activity and balance of the body.
Function of Part 5 (Medulla oblongata) - Controls the activity of the internal organs such as the heartbeat, and respiration.

(c) The cranium protects the brain from external injuries. Inner to the cranium lie the three layers of the meninges viz. duramater, arachnoid and piamater. The space between the meninges and the cavities of the brain contains the cerebrospinal fluid which protects the brain from mechanical injury.

36.

(a) When the object lies between the optical centre and the focus of the lens, a convex lens forms an erect and virtual image.

(b) When a parallel beam of light falls on a smooth and highly polished surface, the reflected beam is also parallel and directed in a fixed direction. Such reflection of light is called regular reflection.

(c) Concave mirrors are used as shaving mirrors to see a large image of the face. This is because when the face is held within the focus of a concave mirror, an enlarged image of the face is seen in the concave mirror. This helps in getting a smooth shave.

OR

(a) Having two eyes has the following advantages over having just one eye:

(i) Reduces the degree of parallax from our field of view

(ii) Allows us to see farther into the distance with higher resolution

(iii) Provides us with proper eyesight even if one of our eyes is damaged

(iv) Gives organisms a wider field of view and the perception of depth

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

(c) If a person is wearing spectacles of power +1 D, the lens has a positive focal length which indicates that he is wearing a convex lens. Hence, it can be concluded that he is suffering from hypermetropia or long-sightedness.

For a person wearing spectacles of power −1 D, the lens has a negative focal length which indicates that he is wearing a concave lens. Hence, it can be concluded that he is suffering from myopia or short-sightedness.

SECTION - E

37.

(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)

(i) Example of metal A is aluminium and oxide = Al_2O_3.

(ii) Example of metal B is zinc and oxide = ZnO.

OR

(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.