Class X Session 2024-25
Subject - Science
Sample Question Paper - 20

Time: 3 hours **Total Marks: 80**

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.*

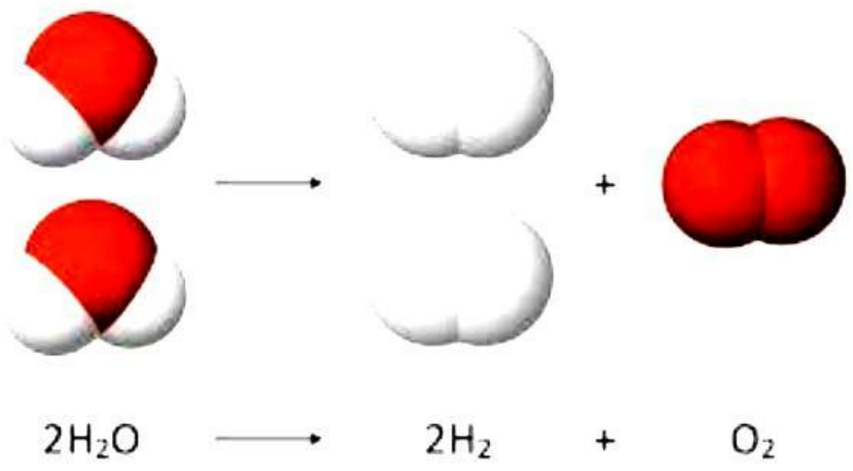
v. *Section D would have 3 Long Answer (LA) type questions carrying 05 marks each.*

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. The type of chemical reaction represented by the below image is [1]



$$2H_2O \longrightarrow 2H_2 + O_2$$

a) Thermal decomposition
b) Electrolytic decomposition
c) Photochemical decomposition
d) Double Displacement

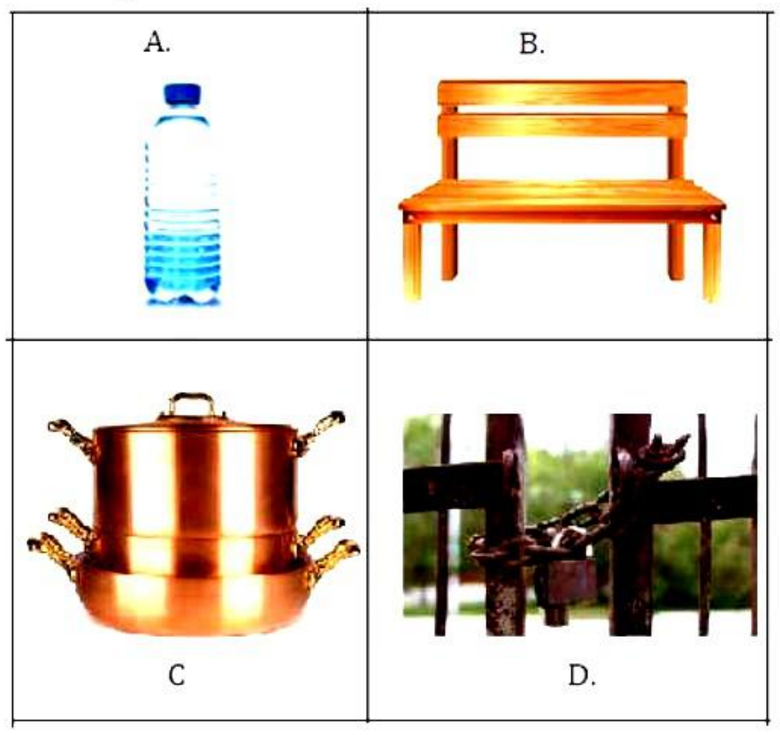
2. Saponification of which of the following compounds gives soaps? [1]
a) Alcohols
b) Glycosides
c) Simple esters
d) Carboxylic acids

3. Rohan kept calcium, magnesium ribbon, iron piece and a piece of zinc metal in cold water. The test tube showing chemical reaction would be [1]

A B C D

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

4. The objects which will corrode are [1]



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

5. An instrument maker, Rehman needs to select a metal with the property used for making bells and strings of musical instruments like sitar and violin. The property which the metal possess for this purpose is: [1]

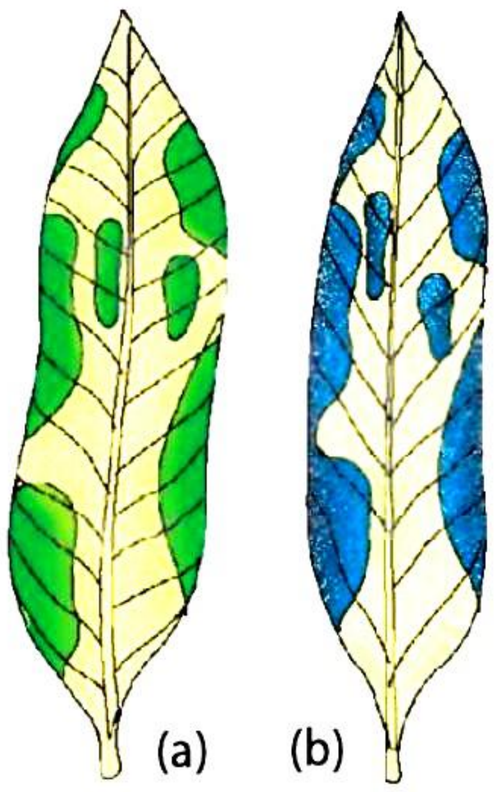
a) Malleability
b) Sonorousness
c) Ductility
d) Conductivity

6. Ethanol on heating with conc. H_2SO_4 at 170 °C give rise to: [1]
   a) Ethene
   b) Ethanal
   c) Ethane
   a) Ethanoic acid

7. Detergents are long chains of [1]

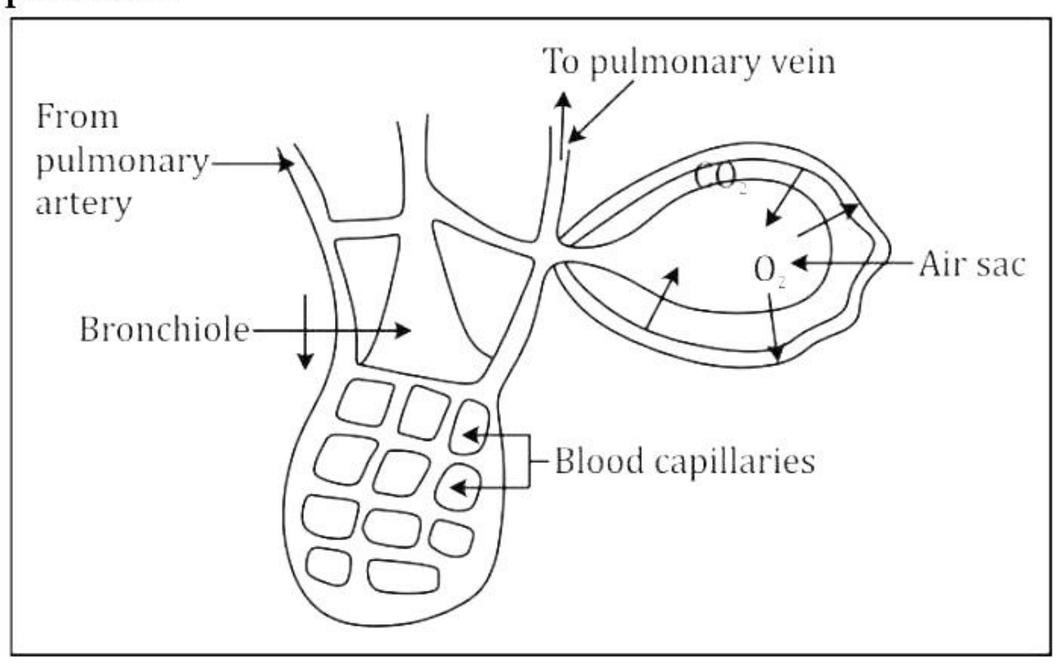
   a) calcium salts of sulphonic acids
   b) sodium salts of sulphonic acids
   c) magnesium salts of carbonic acids
   d) potassium salts of carbonic acids

8. Observe the given experimental test results. Figures (a) and (b) show variegated leaves before and after the starch test, respectively. From this, what can you infer about the aim of the experiment? [1]



   a) To demonstrate that variegated leaves can undergo photosynthesis.
   b) To demonstrate that water is necessary for photosynthesis.
   c) To demonstrate that oxygen is necessary for respiration.
   d) To demonstrate that chlorophyll is necessary for photosynthesis.

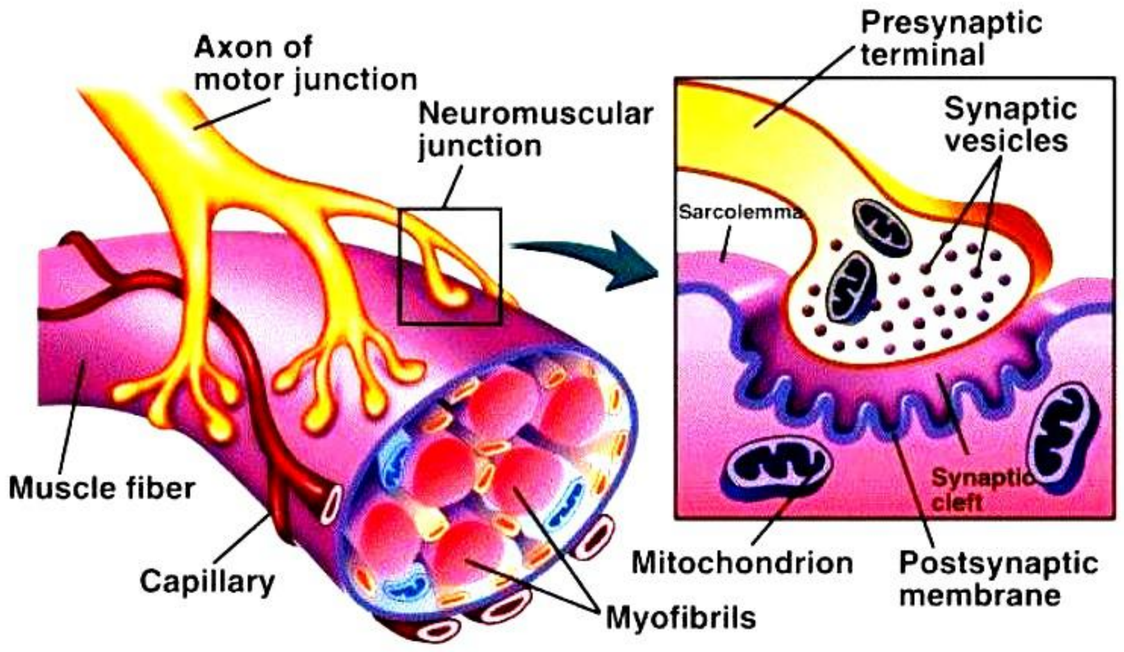
9. The below figure depicts a process which occurs in human beings. A similar process occurs in plants. Name the corresponding structure in plants which carries out this process. [1]



a) Chloroplast
b) Vacuole
c) Stomata
d) Nucleolus

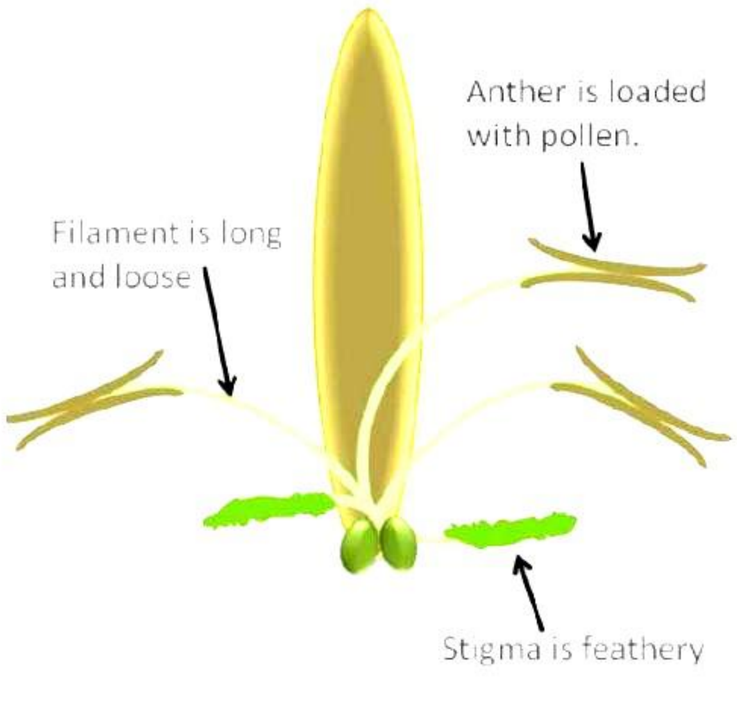
10. If a pure tall pea plant is crossed with a pure dwarf pea plant, what percentage of F_2 generation will be homozygous pure? [1]
a) 25%
b) 50%,
c) 75%
d) 100%

11. Which of the following statements is not true with respect to the event shown below? [1]



a) Two neurons communicate with each other at synapse.
b) Certain chemicals called cytokinins are released at synapse.
c) Synapses ensure that the nerve impulses travel in one direction only.
d) The neuromuscular junction is responsible for transducting the excitatory electrical impulse from the nervous system to the muscle fiber, resulting in a muscle fiber action.

12. The below adaptations in the flower assist in pollination. Identify the type of pollination based on the given features. [1]

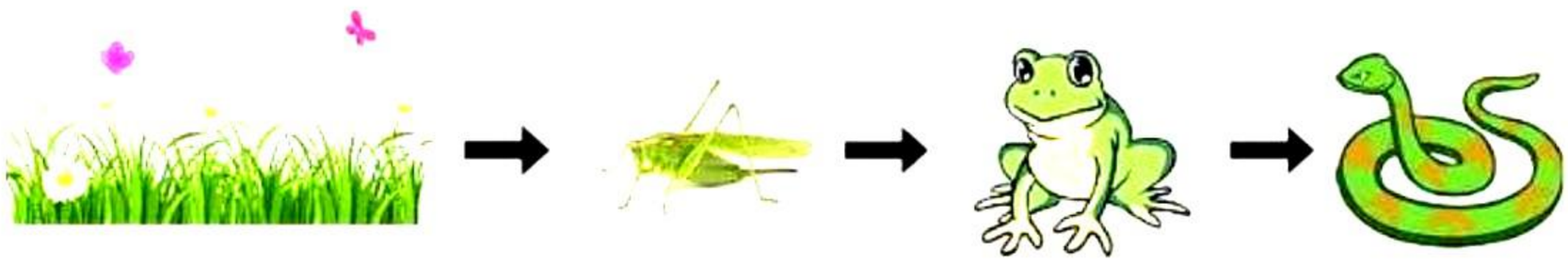


a) Ornithophily
b) Hydrophily
c) Malacophily
d) Anemophily

13. A convex lens can produce an image of magnification [1]
i. less than 1
ii. more than 1
iii. equal to 1
a) i. and ii.
b) ii. and iii.
c) i. and iii.
d) i., ii. and iii.

14. A doctor has prescribed a corrective lens of power +2 D to Radhika. The focal length and the nature of the lens used by Radhika is _____. [1]
a) 0.5 cm, converging
b) 5 cm, diverging
c) -0.5 cm, converging
d) 50 cm, converging

15. The given figure best represents a [1]



a) Parasitic food chain
b) Grassland food chain
c) Forest food chain
d) Aquatic food chain

16. Choose the waste management strategy that is matched with the correct example. [1]

a)	Refuse	Choose products that use less packaging
b)	Reduce	Give unwanted toys and books to hospitals or schools
c)	Reuse	Not using single use plastic
d)	Repurpose	Making flower pot from used plastic bottle

Question No. 17 to 20 consist 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):** Chips manufacturers usually flush bags of chips with nitrogen gas to prevent the chips from getting oxidised. [1]
Reason (R): This enhances the taste of chips and helps us to digest the chips.

18. **Assertion (A)**: Paramoecium reproduces by budding. [1]
Reason (R): All unicellular organisms reproduce by asexual methods.

19. **Assertion (A)**: Greater number of individuals are present in lower trophic levels. [1]
Reason (R): The flow of energy is unidirectional.

20. **Assertion (A)**: The compass placed near the current-carrying wire remains stationary. [1]
Reason (R): The current flowing through a wire always gives rise to a magnetic field.

SECTION - B

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

21. Minakshi added a solution of sodium sulphate to a solution of barium chloride taken in a test tube. Write equation for the chemical reaction involved and name the type of reaction in this case. [2]

22. What causes the union of stock and scion during grafting? Additionally, identify one desirable characteristic that each of the plants contributing to the stock and scion should possess to ensure a successful graft. [2]

23. If you consume butter during lunch, how will it get digested in your body? [2]

OR

The length of the small intestine differs in different animals. In which animal – deer or wolf, this organ is found to be longer? Why?

24. Vidula is using a convex lens which forms a real image 2 times magnified at a distance of 30 cm from the lens. What will be the focal length and power of the convex lens used? [2]

25. Why does a current-carrying solenoid, when suspended freely, rest along a particular direction? Explain. [2]

OR

Is it possible that a magnetic field be produced without using a magnet?

26. If Roshni is consuming curd/yogurt for lunch, which trophic level in a food chain should she be considered as occupying? [2]

SECTION - C

Question No. 27 to 33 are short answer questions.

27. Answer the following: [3]

(a) While camping, Amrita lights a fire using wood as fuel. After some time, the wood burns down to ashes, and heat is released. Explain whether this change is physical or chemical change. Give reason for the same.

(b) In a chemistry class, Sanket learns that a compound on heating decomposes into simpler substances. Explain why all the decomposition reactions are endothermic.

(c) Jyotika heats blue copper(II) sulphate crystals, and they turn white after heating. Explain why the color change occurs.

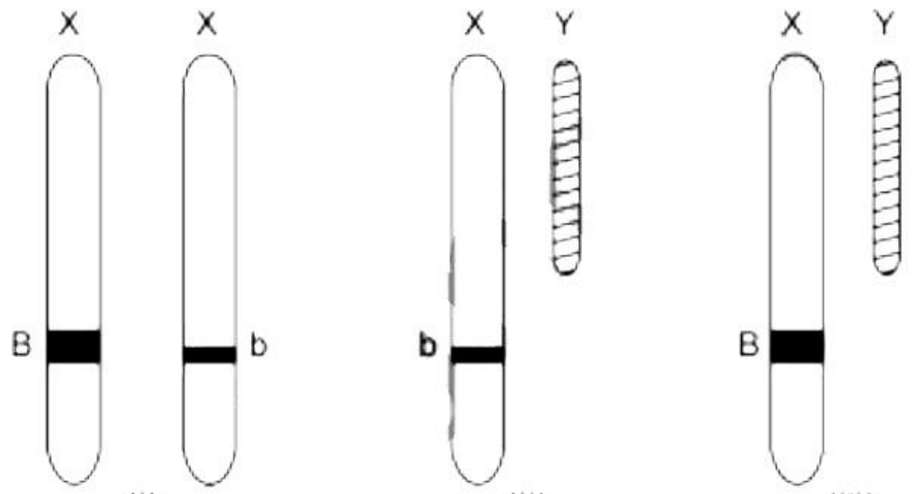
28. Write six differences between oxidation and reduction. [3]

OR

Distinguish between metals and non-metals based on their physical properties.

29. Explain giving reasons the bending of the shoot tip of a plant towards light source coming from one side of the plant. [3]

30. Red green colour blindness is a sex-linked inherited character. Gene b for colour blindness is recessive to gene B for normal vision. This gene b is carried only on the X chromosome. [3]



(a) Describe the phenotypes of (i), (ii) and (iii).

(b) Explain why red green colour blindness is more likely to occur in men than in women.

31. An electric lamp of resistance 20 Ω and a resistor of 4 Ω are connected to a 6 V battery as shown in the circuit diagram. [3]

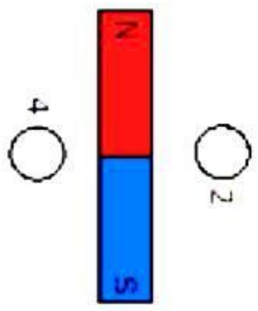
Calculate

(a) total resistance of the circuit

(b) current through the circuit

(c) potential difference across the electric lamp and the resistor.

32. The diagram below shows a bar magnet surrounded by two compasses numbered 2 and 4. What directions will these compasses show? [3]



33. An erect image of an object is to be formed using a concave mirror of 15 cm focal length. Find the range of distance of the object from the mirror. Draw a ray diagram and state the nature and size of the image for the observer. [3]

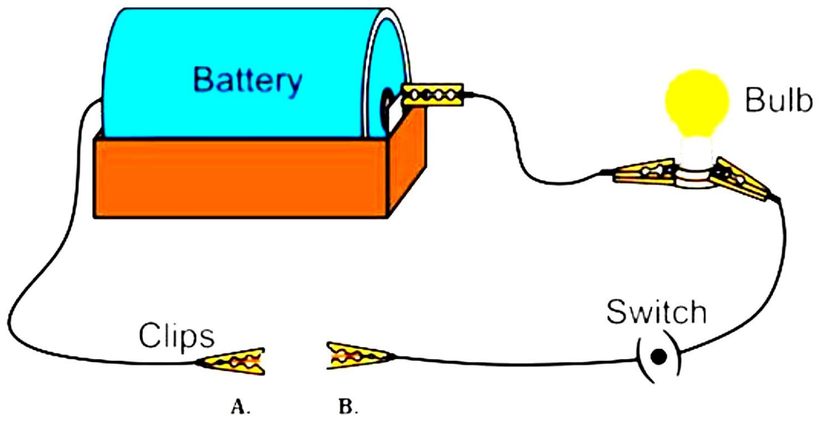
SECTION - D

Question No. 34 to 36 are long answer questions.

34. Carbon cannot reduce the oxides of sodium, magnesium, and aluminium to their respective metals. Why? Where in the reactivity series are these metals placed? How are these metals obtained from their ores? Take an example to explain the process of extraction along with chemical equations. [5]

OR

(a) Meera set up an electric circuit as shown in the illustration below. She placed the metal to be tested in the circuit between terminals A and B as shown.



(i) Does the bulb glow? What does this indicate?

(ii) Why are electric wires coated with PVC or a rubber like materials?

(b) Write chemical equations to represent what happens when:

(i) Ethanol burns in air.

(ii) Ethanol reacts with sodium metal.

35. [5]

(a) State the importance of chromosomal difference between sperms and eggs of humans.

(b) Give reasons for each of the following:

(i) Regeneration is not considered as a method of reproduction.

(ii) Blocking of the fallopian tube causes birth control.

(iii) Spores have a thick wall.

OR

(a) Why do people living in the low Himalayan hilly regions often suffer from goitre?

(b) During a street fight between two individuals, mention the effects on the following organs by the autonomous nervous system, in the table given below: (one has been done for you as an example).

(c)

Organ	**Sympathetic System**	**Parasympathetic System**
Lungs	Dilates bronchi and bronchioles	Constricts bronchi and bronchioles
1. Heart	.....	.....
2. Pupil of the eye	.....	.....
3. Salivary gland	.....	.....

36. Draw the ray diagram and state the nature and position of the image formed when the object is placed at

a) 2F in front of a convex lens

b) Anywhere between the optical centre and infinity of the concave lens [5]

OR

(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?

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. Two allotropic forms of carbon that are crystalline in nature are represented by ''A'' and ''B''. They are physically distinct, yet chemically identical. The hardest crystalline form of carbon is ''A''. Covalent connections connect each carbon atom in ''A'' to four other carbon atoms. Each carbon atom in ''B'' is covalently connected to three other carbon atoms. ''B'' is a somewhat soft and oily material. It is also a good electrical conductor. The C — C bond length in ''B'' is 141.5 pm, while it is 154 pm in ''A''.

(a) Identify the name of carbon allotrope represented by A. Comment on its electricical conductivity with reason. [2]

(b) Identify the name of carbon allotrope represented by B. Comment on its electrical conductivity with reason. [2]

OR

(c) Draw the structures of A and B and name it. [2]

38. Two human beings who can both roll their tongues produced 11 children. 3 of these children could not roll their tongues and 8 children could roll their tongues. [4]

a) Which trait (rolling or not rolling) is controlled by the recessive allele? [1]

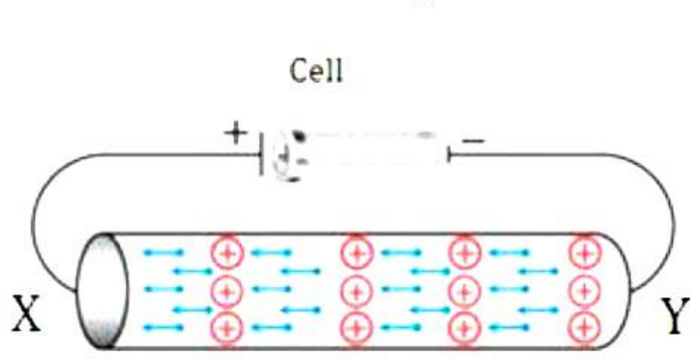
b) State all possible genotypes of the F_1 generation of the cross. [1]

c) Show the inheritance of the tongue rolling in humans in the given example using a suitable cross. What percentage of offspring will show the same genotype as the parents? [2]

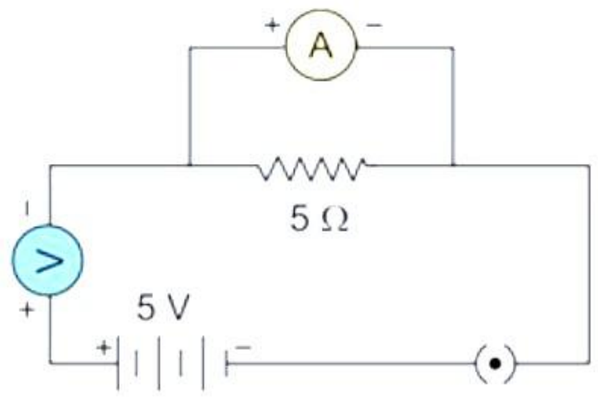
OR

c) If one of the parents could not roll their tongue, with the help of a cross, calculate the ratio of tongue-rollers to non-tongue-rollers in the offspring.

39. Observe the diagrams (A) and (B) and answer the questions from (a) to (c) on the basis of related studied concepts.



(A)



(B)

a) State the direction of current in metal wire XY. [1]

b) What happens when the cell across the metal wire XY is removed? [1]

c) Which devices are connected incorrectly in circuit diagram (B)? Why? [2]

OR

d) Draw the correct circuit diagram for replacing the incorrect circuit connections.

Solution

SECTION - A

1. Correct option – b: Electrolytic decomposition
   Electrolysis of acidulated water produces two volumes of hydrogen gas and one volume of oxygen gas on passing an electric current through it.

2. Correct option – c: Simple esters
   The ester, on treating with a base such as NaOH is converted back to alcohol and sodium salt of carboxylic acid. The reaction is known as saponification because it is used in the manufacture of soap.

   $$\underset{\text{Ethylethanoate}}{CH_3COOC_2H_5} + NaOH \longrightarrow \underset{\text{Ethanol}}{C_2H_5OH} + \underset{\text{Sodium acetate}}{CH_3COONa}$$

3. Correct option –a: Only A
   Magnesium, Iron, and zinc do not react with cold water.
   Calcium reacts with water less vigorously, producing bubbles of a gas which stick to the metal surface. Calcium forms calcium hydroxide, and hydrogen gas is evolved. The heat evolved in this reaction is not sufficient for hydrogen gas to catch fire.

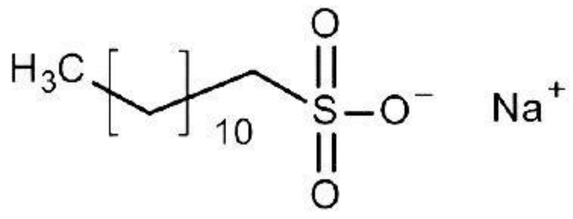
4. Correct option – c: C and D
   When the surface of a metal is attacked by air, moisture or any other substance around it, the metal is said to corrode, and the phenomenon is known as corrosion. The objects C and D are made up of copper and iron respectively, hence will get corroded.

5. Correct option –b: Sonorousness
   The property of metals used for making bells and strings of musical instruments like sitar and violin is termed as sonorousness.

6. Correct option – a: Ethene
   Ethanol, on heating with excess of conc. H_2SO_4 at 170 °C gets dehydrated to form ethane.

   $$C_2H_5OH + NaOH \xrightarrow{\text{conc.}H_2SO_4, 170^\circ C} CH_2 = CH_2 + H_2O$$

7. Correct option – b: sodium salts of sulphonic acids.

   Detergents are long chain of sodium salts of sulphonic acids.

8. Correct option – d: To demonstrate that chlorophyll is necessary for photosynthesis.
   Along with green parts, variegated leaves have pale parts which do not contain chlorophyll. Only the green areas of the leaf react with iodine and turn blue-black. Pale areas, in the absence of chlorophyll, do not produce starch and hence, do not react with iodine.

9. Correct option – c: Stomata
   The process shown in the figure is gaseous exchange in alveoli in human beings. Exchange of gases in plants occurs through stomatal pores.

10. Correct option – b : 50%
    In a monohybrid cross of tall (TT) and dwarf (tt) pea plants, F_2 generation progeny will be in the ratio TT (25%), Tt (50%) and tt (25%). Thus, pure homozygous progeny would be 50% while recombinants would be 50%.

11. Correct option – b : Certain chemicals called cytokinins are released at synapse.
    Neurotransmitters are chemicals which allow the transmission of signals from one neuron to the next across synapses. Cytokinins are plant hormones.

12. Correct option – d : Anemophily
    Long and feathery stigma, long and loose filament and anther loaded with pollen are characteristic features of flowers that are pollinated by the wind (anemophily).
    Ornithophilous flowers are generally tubular, cup-shaped, or urn-shaped and produce large quantity of nectar. They have bright colours, which attract birds from long distances.
    In hydrophily, flowers are colourless, small, inconspicuous without nectar and fragrance. Pollen grains are long, ribbon-like structures which are carried with current of water. The pollen grains are light but covered with wax.

13. Correct option – d) i., ii. and iii.
    A convex lens can produce the image of magnification less than 1, more than 1 or equal to 1.

14. Correct option – d) 50 cm, converging
    Applying, focal length (in metre) = 1/Power
    We get, f = 1/ (+2 D) = 0.5 m = 50 cm
    Positive value of the focal length of a lens indicates that the lens is converging.

15. Correct option – b: Grassland food chain
    The given food chain comprises of grass (producer), grasshopper (primary consumer), frog (secondary consumer) and snake (secondary consumer). Therefore, it is a grassland food chain.

The chain does not include any aquatic organisms and so, it cannot be an aquatic food chain.
Since the food chain does not start with dead organic materials, it cannot be a detritus food chain.
The chain also does not include a parasite at any of the trophic levels. Hence, it is also not a parasitic food chain.

16. Correct option – d:

Repurpose	Making flower pot from used plastic bottle

Refuse to buy or accept products that can harm you, and the environment, e.g., refuse chemical solvents and use alternatives that are water-based.
Reduce the energy use and stick to the basic requirements, e.g., reduce the use of electricity when not required.
Reuse items and replace single use items with reusable ones, e.g., reuse water bottles and mugs.
Repurpose is the process of taking something and using it for a separate purpose, e.g., making a flower pot from used plastic bottle.
Recycle materials that can be subjected to a chemical process so that they can be recycled back to the new form again, e.g., recycle paper, plastic, and glass items.

17. A is true but R is false.
Nitrogen is an antioxidant, hence prevents the chips from getting oxidised. So, the assertion is true, and the reason is false.

18. A is false, but R is true.
All unicellular organisms, due to simplicity of their structure, reproduce by asexual methods of reproduction. So, the reason is true.
Paramoecium is a unicellular organism. It reproduces by binary fission and not by budding. So, the assertion is false.

19. Both A and R are true, but R is not the correct explanation of A.
A food chain begins with a producer and ends with a tertiary or quaternary consumer. Generally, a food chain comprises of 4-5 trophic levels. According to the 10% law of energy transfer, only 10% energy is transferred from one trophic level to the next. As we move to the higher trophic levels, the amount of energy available decreases. Hence, higher trophic levels have lesser organisms while a greater number of individuals are present in lower trophic levels. So, the assertion is true.
An ecosystem's energy flow is always linear or unidirectional. It is not possible to return the energy from the producers back to the Sun. Additionally, the energy that is transferred to herbivores is not returned to the autotrophs. Thus, energy flow is an ecosystem is unidirectional. So, the reason is also true.
However, although both assertion and reason are true, the reason statement does not explain the assertion statement.

20. A is false, but R is true.
    The compass when placed near the current-carrying wire gets deflected because the current flowing through the wire always gives rise to a magnetic field.

SECTION - B

21. When sodium sulphate is added to barium chloride, it gives a white precipitate of barium sulphate (water insoluble) and sodium chloride (water soluble). This is a double displacement reaction.

$$Na_2SO_4 + BaCl_2 \longrightarrow 2NaCl + BaSO_4 \downarrow$$

22. During grafting, the stock and the scion unite due to cambial activity.

The plant contributing to the scion should have large-sized fruits and the plant contributing to the stock should have a deep root system.

23. Butter consists of fat, which is digested by bile released from the liver.

- Fats are present in the intestine in the form of large globules, making it difficult for enzymes to act on them.
- Bile salts present in the bile break fats into smaller globules to increase the action of enzymes. This process is known as emulsification.
- Later, lipase acts on the emulsified fats and breaks them down into fatty acids and glycerol.

OR

- The length of the small intestine differs in different animals based on the type of food they eat. Cellulose is a carbohydrate food which is difficult to digest. So, herbivorous animals like cows, goat and deer which feed on grass need a longer small intestine to allow the cellulose in grass to be digested completely.
- On the other hand, meat is a food which is easier to digest. So, carnivorous animals such as tiger, lion and wolf have a shorter small intestine.
- Therefore, as compared to a wolf, a deer will have a longer small intestine.

24.

Magnification (m) = v/u

-2 = 30/u

So, u = 30/-2 = -15cm

Applying lens formula, we get,

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

$$= \frac{1}{30} - \frac{1}{15}$$

$$= \frac{-15}{450}$$

$f = 30\ cm = 0.3m$

Thus,

$$P = \frac{1}{0.3} = -3.33D$$

The focal length and the power of the convex lens used by her are 0.3 m and +3.33 D respectively.

25. A current-carrying solenoid acts like a bar magnet. We know that a freely suspended bar magnet aligns itself in the north–south direction. So, a freely suspended current-carrying solenoid also aligns itself in the north–south direction.

OR

A magnetic field can be produced without a magnet by passing current through the conductor.

26. A predatory food chain consists of around five trophic levels where the first trophic level is occupied by the producers i.e., plants. Animals which consume plants are placed in the second trophic level. They are primary consumers. Herbivores are included in this trophic level. Organisms which feed on organisms in the second trophic level are called secondary consumers; they are categorized under the third trophic level. Curd and yogurt are the products of cow or buffalo that belong to the second trophic level, herbivores. So, Roshni who is eating either curd or yogurt belongs to the third trophic level.

SECTION – C

27.

(a) Burning of fuels is a chemical change since it involves chemical reactions resulting in the formation of new products.

(b) All decomposition reactions are endothermic reactions because energy in the form of heat, light or electricity is required for decomposition reactions to occur.

(c) When blue salt of copper is heated, it becomes colourless because of the loss of water of crystallization from the hydrated salt.

$$CuSO_4.5H_2O \xrightarrow{\Delta} CuSO_4 + 5H_2O$$

Blue Colourless

28. Differences between oxidation and reduction:

	Oxidation	**Reduction**
1.	Addition of oxygen.	Removal of oxygen.
2.	Removal of hydrogen.	Addition of hydrogen.
3.	Addition of electronegative ion or atom.	Removal of electronegative ion or atom,
4.	Removal of electropositive ion or atom.	Addition of electropositive ion or atom.
5.	Loss of electrons.	Gain of electrons.
6.	Occurs in reducing agents.	Occurs in oxidising agent.

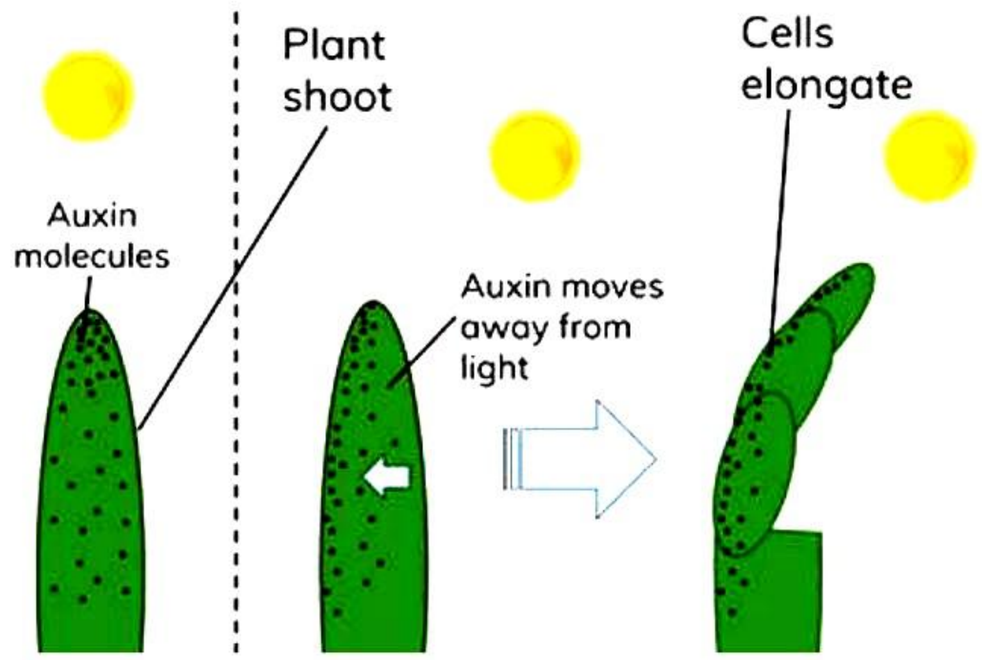
OR

Differences between metals and non-metals based on their physical properties:

Physical properties	**Metals**	**Non-Metals**
Melting and boiling point	Generally, have high melting point and boiling point except gallium and caesium.	Generally, have low melting point and boiling point except diamond and graphite.
Sonorous sound	Give sonorous sound when struck.	Does not give sonorous sound.
Malleability and Ductility	Malleable and ductile.	Neither malleable nor ductile.
Electrical and thermal conductivity	Good conductors of heat and electricity.	Generally poor conductors of heat and electricity.
Lustre	Have shining lustre.	Do not have lustre except iodine.
Hardness	Generally hard except Na and K.	Most of the non-metals are gases. Hard non-metals are generally soft except diamond.

29.

- When the shoot tip of a growing plant detects light, a hormone called auxin is synthesised in the shoot tip which is sensitive to light.
- As a result, auxin diffuses towards the shady side of the stem.
- It stimulates the growth of the cells on the shady side of the plant which causes the bending of the plant to the other side.
- This results in the curvature of the shoot tip towards the light and gives the appearance that the stem of the plant bends in the direction of light.



30.

(a) <u>Phenotypes are as follows:</u>

(i) Normal female but carrier of colorblindness

(ii) Colourblind male

(iii) Normal male

(b) Red green colourblindness is caused due to the recessive genes present on the X chromosome.

In females (XX), it is less likely that both the X chromosomes will carry the defective gene. So, if either of the X chromosome carries the defective gene, the gene being recessive, its influence will be masked by the normal gene present on the other X chromosome.

However, in males (XY), if the defective gene is present on the X chromosome, there is no other normal gene on the Y chromosome to mask the effect of the defective gene. As a result, the recessive gene gets expressed and the defect for colourblindness occurs.

31.

(a) The resistance of the electric lamp $R_1 = 20\ \Omega$.

The resistance of the conductor connected in series $R_2 = 4\ \Omega$.

The total resistance in the circuit

$R = R_1 + R_2$

$R = 20\ \Omega + 4\ \Omega = 24\ \Omega$

(b) The total potential difference across the two terminals of the battery V = 6 V.

By Ohm's law, the current through the circuit is given by

$I = V/R$

$= 6\ V/24$

$= 0.25\ A$

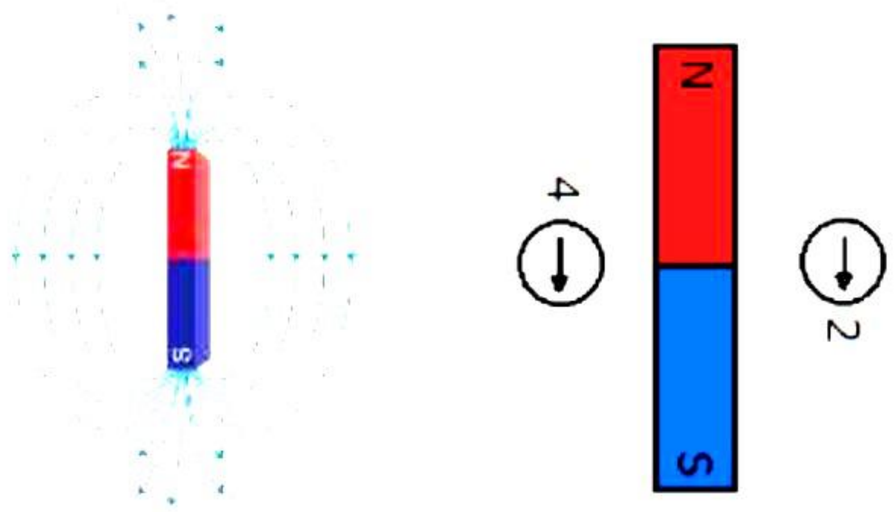
(c) On applying Ohm's law to the electric lamp and resistor separately, we get potential difference across the electric lamp

$V_1 = 20\ \Omega \times 0.25\ A = 5\ V$

and that across the conductor

$V_2 = 4\ \Omega \times 0.25\ A = 1\ V$

32. Directions shown by the needle of compasses 2 and 4 would be as shown below.

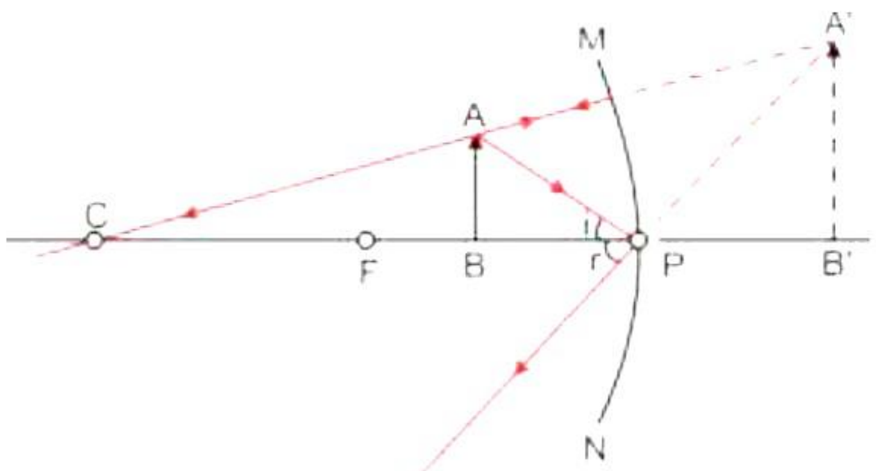


This is because the magnetic field lines arise from the North Pole and end at the South Pole.

Hence, the needle of compasses 2 and 4 will be aligned along the magnetic field lines directed downwards.

33. Focal length of the concave mirror f is –15 cm.

A concave mirror produces an erect image when the object is between the pole and the focus.



Hence, the range of the object distance should be 0–15 cm from the mirror.

The image so formed would be virtual, erect and magnified.

SECTION - D

34. Metals like sodium, magnesium and aluminium are very reactive and form strong oxides. They have a greater affinity for oxygen than for carbon. Carbon is not a potent reducing agent; therefore, carbon cannot reduce the oxides of sodium, magnesium, and aluminium.

These metals are placed at the top of the reactivity series.

The metals placed at the top of the reactivity series are very reactive and are obtained by electrolytic reduction.

Example:

Sodium and magnesium are obtained by the electrolysis of their molten chlorides.

The metals are deposited at the cathode, whereas chlorine is liberated at the anode.

Sodium metal is extracted by the electrolytic reduction of molten sodium chloride.

The reactions are

$$2\,NaCl_{(l)} \xrightarrow{\text{Electrolysis}} 2\,Na_{(s)} + Cl_{2(g)}$$

At the cathode: $Na^+ + e^- \rightarrow Na$

At the anode: $2\,Cl^- \rightarrow Cl_2 + 2e^-$

OR

(a)

i. Yes, the bulb glows. It indicates that the metal is a good conductor of electricity.

ii. Polyvinyl chloride (or PVC) and rubber are non-conductors of electricity.
To make the electricity-conducting wires shockproof, these are coated with PVC or rubber-like materials.

(b)

i. $C_2H_5OH + 3O_2 \rightarrow 2CO_2\uparrow + 3H_2O$

ii. $2C_2H_5OH + 2Na \rightarrow 2C_2H_5ONa + H_2\uparrow$

35.

(a) Human eggs are of one type with a chromosomal complement of 22 + X. Human sperms are of two types with chromosomal complements of 22 + X and 22 + Y. Sex of the child will be determined by which sperm type fuses with the egg. Sex of the child will be male if 22 + Y sperm fuses with the egg (22 + Y, 22 + X). It will be a female if 22 + X sperm fuses with the egg (22 + X, 22 + X).

(b)

i. Regeneration is not the same as reproduction as no propagule is formed and no organism will depend on being cut to be able to reproduce.

ii. Blocking of fallopian tubes will not allow the sperms to reach the ovum and thus will prevent fertilisation.

iii. Spores are a means of dispersal as well as perennation. Spores must be thick-walled to tolerate adverse environmental conditions.

OR

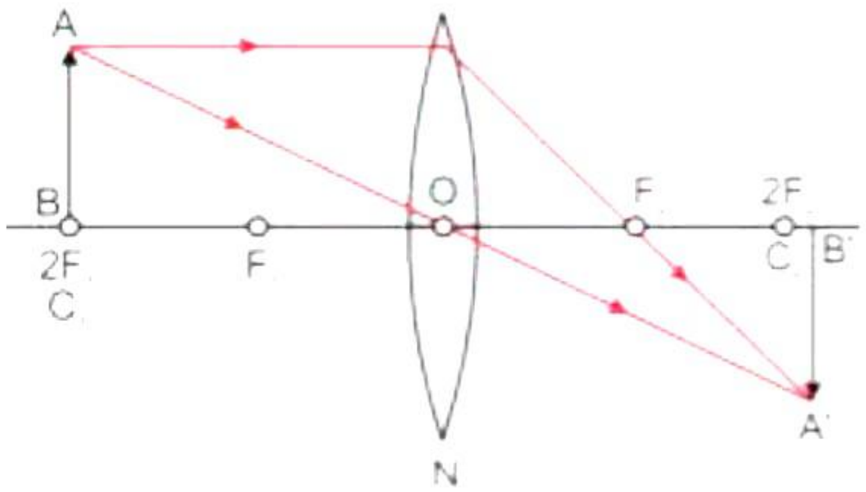
(a) Goitre is directly caused by a lack of iodine in the diet, which is necessary for the proper functioning of the thyroid gland. The Himalayan soil is deficient in iodine. Thus, the food grown in such soil also becomes iodine deficient. As a result, when Himalayan people consume iodine-deficient food, they do not get the proper intake of iodine. Therefore, people living in the low Himalayan hilly regions often suffer from goitre.

(b)

Organ	**Sympathetic System**	**Parasympathetic System**
1. Heart	Accelerates heartbeat	Retards heartbeat
2. Pupil of the eye	Dilates	Constricts
3. Salivary gland	Inhibits the secretion of saliva causing the drying of the mouth	Stimulates the release of saliva

36.

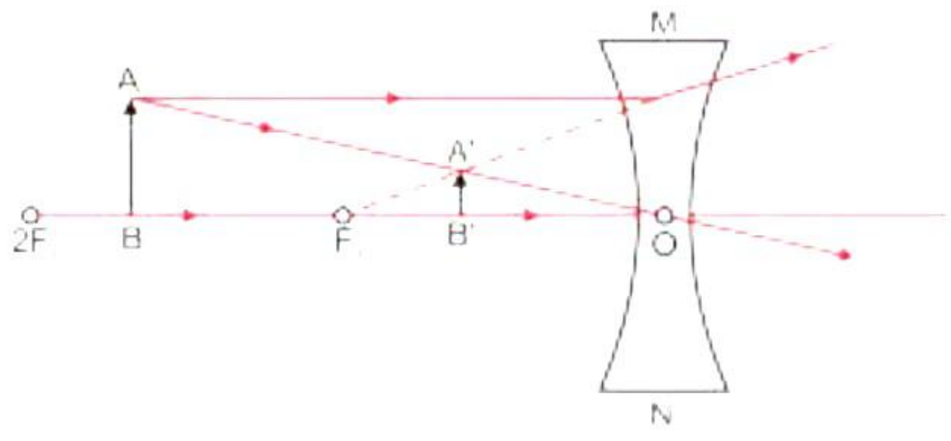
a) When an object is placed at 2F in front of the convex lens:



Object at 2F

Nature of the image is real, inverted and is of the same size as that of the object.
Position of the image formed is at a distance of 2f on the other side of the image.

b) When an object is placed anywhere between the optical centre and infinity of the concave lens:



Object between infinity and optical centre

Nature of the image is virtual, erect and diminished.
Position of the image is between the optical centre and the focus.

OR

(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.

SECTION - E

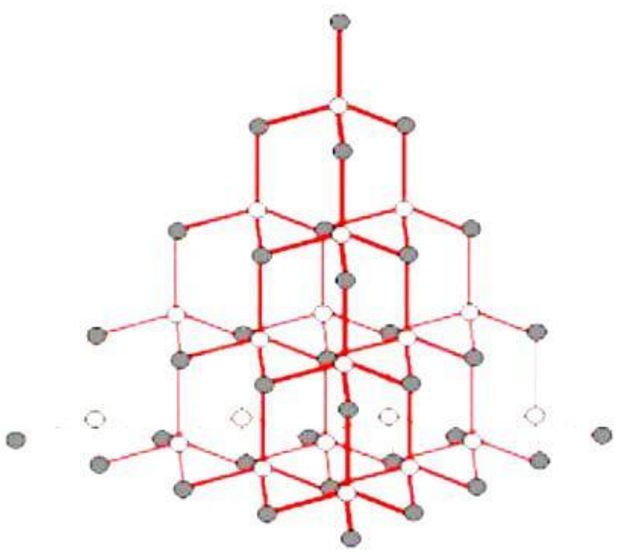
37.

(a) The carbon allotrope represented by "A" is 'Diamond.' It cannot conduct electricity due to the absence of free electrons since each carbon atom is connected to four other carbon atoms

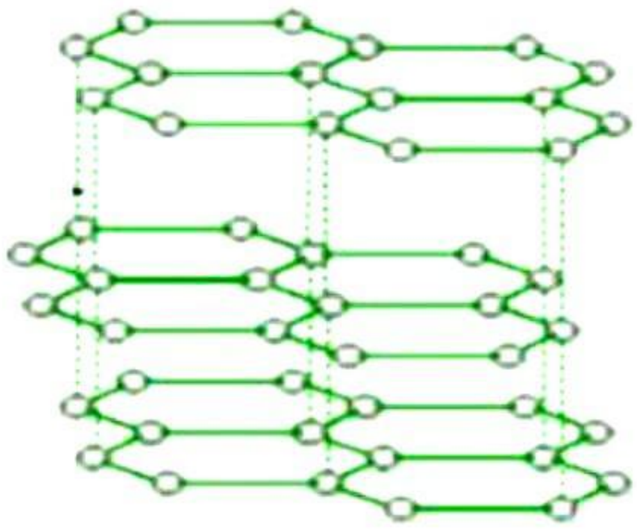
(b) The carbon allotrope represented by "B" is 'Graphite'. It can conduct electricity due to the presence of free electrons.

OR

(c) A = Diamond:

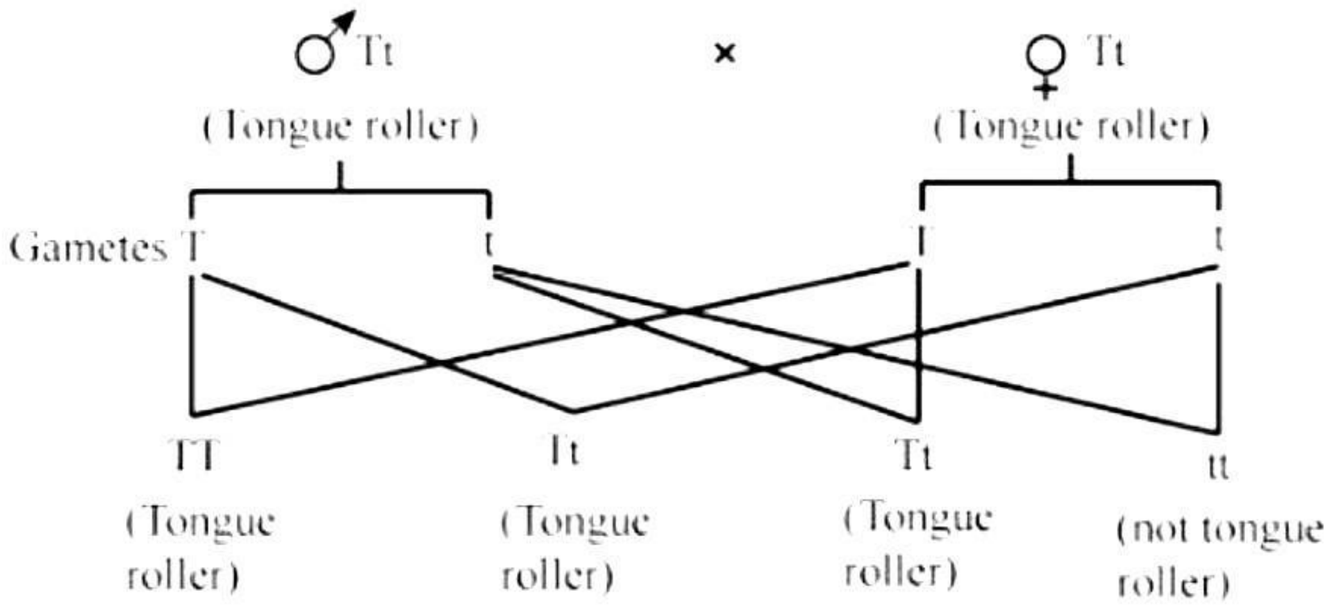


B = Graphite:



38. Questions states that both the parents are tongue-rollers but not all offspring are tongue-rollers. So, we can conclude that the parents are heterozygous for the character of tongue-rolling.

Parents – Tt where T is dominant, and t is recessive.



a) Tongue rolling (TT/Tt) is dominant while non-rolling (tt) is controlled by the recessive allele.

b) The possible genotypes of the F_1 generation of the cross are TT (homozygous dominant), Tt (heterozygous dominant), tt (homozygous recessive).

c) Parents – Tt × tt

Gametes – T, t, and T, t

	T	**t**
T	TT	Tt
t	Tt	tt

TT : Tt : tt = 1 : 2 : 1

50% of the offspring will show the same genotype (Tt) as the parents.

OR

c) Parents – Tt (tongue-roller) and tt (non-roller)

Gametes – T, t and t, t

	T	**t**
t	Tt	tt
t	Tt	tt

Tt : tt = 1 : 1

Thus, the ratio of tongue-rollers to non-tongue-rollers is 1 : 1.

39.

a) As the direction of electrons is from Y to X, the direction of the current will be from X to Y in the circuit.

b) When the cell is not connected across the metal wire XY, the electrons in the wire XY flow randomly in all directions.

c) The voltmeter and ammeter are incorrectly connected in the circuit. The voltmeter should be connected across the resistor to measure the PD across the conductor, and the ammeter must be connected in series with the resistor to measure the current flowing through it.

OR

d)