Class X Session 2024-25
Subject - Science
Sample Question Paper - 18

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. Three test tubes, A, B and C contain distilled water, an acidic solution and a basic solution, respectively. When red litmus solution is used for testing these solutions, the observed colour changes respectively will be: [1]

a) A — no change; B — becomes dark red; C — becomes blue

b) A — becomes light red; B — becomes blue; C — becomes red

c) A — becomes red; B — no change; C — becomes blue

d) A — becomes light red; B — becomes dark red; C — becomes blue

2. Select the statements from below which are true for hydrocarbons. [1]

i. Most carbon compounds are good conductors of heat and electricity.

ii. Most carbon compounds are poor conductors of heat and electricity.

iii. Force of attraction between molecules of carbon compounds is weak.

iv. Force of attraction between molecules of carbon compounds is strong.

This reaction is an example of:

a) ii and iv

b) i and iv

c) i and ii

d) ii and iii

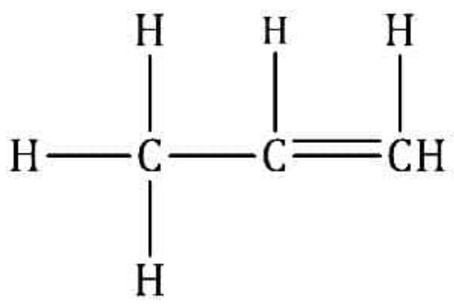
3. Ishaan decided to start a factory making scientific instruments. Which of the following alloy, he needs to purchase? [1]

a) Bronze
b) Amalgam
c) Solder
d) Brass

4. –CHO represent the functional group of: [1]

a) carboxylic acids
b) esters
c) aldehydes
d) alcohols

5. The IUPAC name of [1]



a) Propene
b) Prop –2-ene
c) Propyne
d) Prop-2-yne

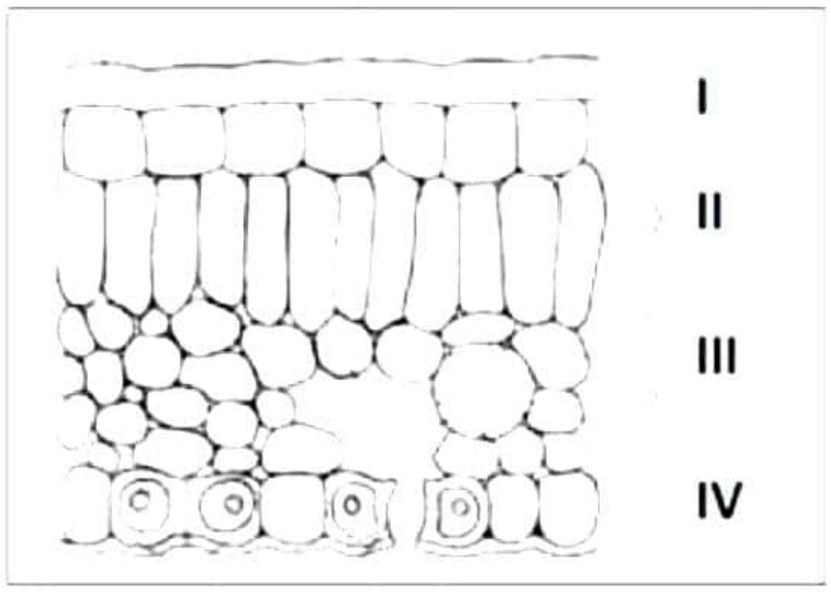
6. While doing a chemistry experiment, Jiya tried to dissolve common salt in both water and kerosene. She noticed that it dissolved quickly in water but not in kerosene because. [1]

a) Water is polar, and kerosene is non-polar.
b) Kerosene is polar, and water is non-polar.
c) Kerosene is lighter than water.
d) Electrostatic or ionic forces are weak.

7. The metal that reacts with steam to give metal oxide is: [1]

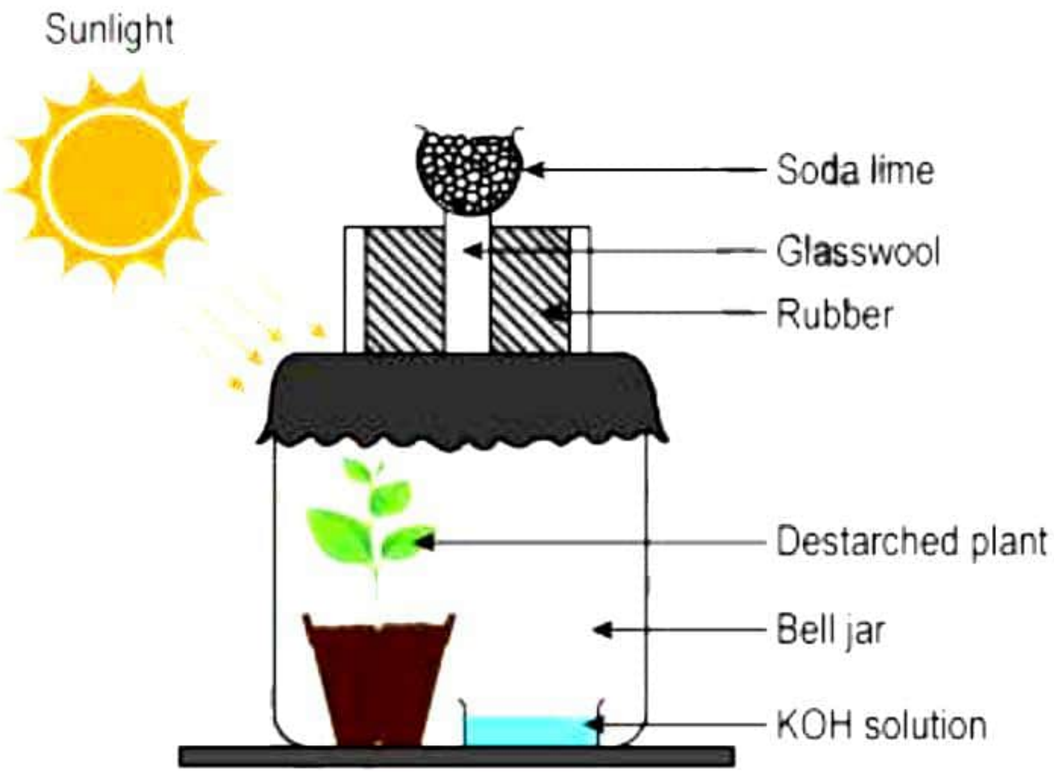
a) Aluminium
b) Sodium
c) Potassium
d) Calcium

8. In the given transverse section of a leaf, identify the layer of cells where maximum gaseous exchange takes place. [1]



a) I, II
b) II, III
c) IV only
d) III only

9. Observe the experimental set up shown below. What is the role of soda lime in this experiment? [1]

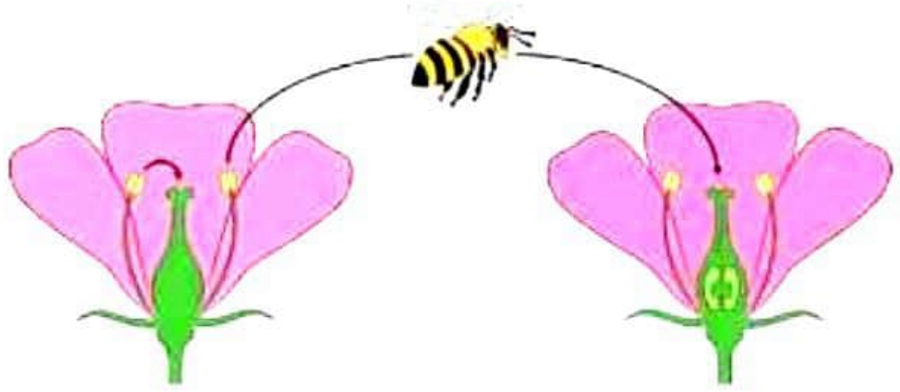


a) To absorb the nitrogen, present in the jar
b) To absorb the incoming carbon dioxide from the air
c) To absorb the oxygen present in the jar
d) To absorb the incoming water vapour from the air

10. If a pure pea plant with inflated pods is crossed with a pure pea plant with constricted pods, then what percentage of F_1 generation will bear inflated pods? [1]

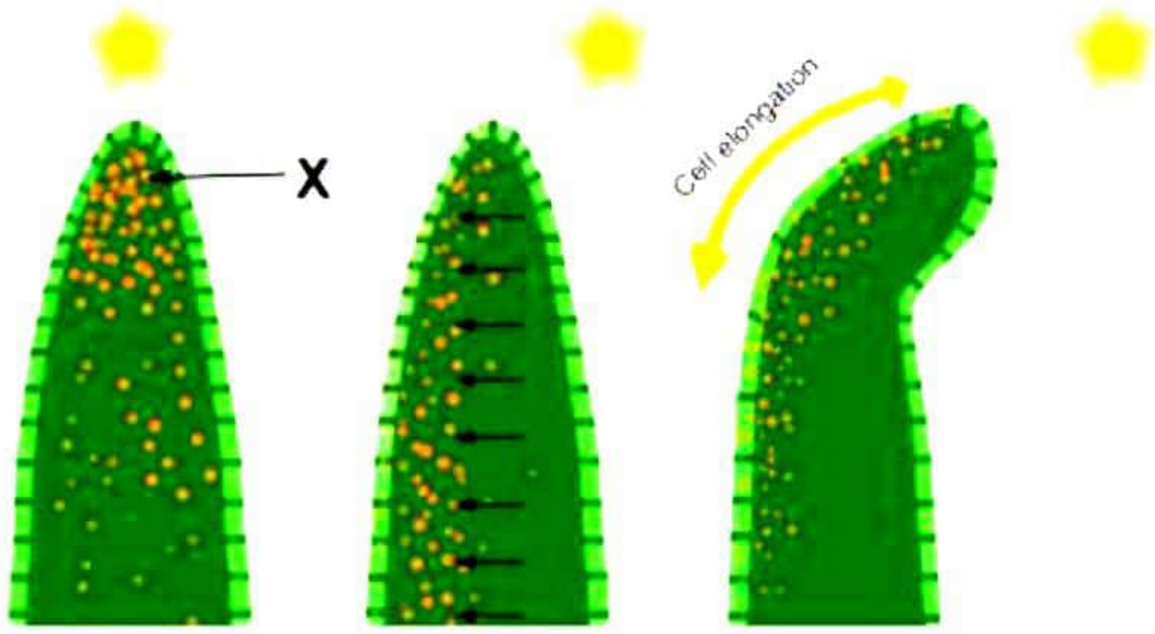
a) 75%
b) 25%
c) 0%
d) 100%

11. Which of the following is not true with respect to the process shown in the below figure? [1]



a) Transfer of pollen grains occurs from the anther of one flower to the stigma of a different flower.
b) Requires pollinating agents like insects, wind, or water.
c) Wastage of pollen does not occur.
d) Newer varieties can be produced.

12. Observe the given figure carefully. What is X most likely to be? [1]



a) Cytokinin
b) Gibberellin
c) Auxin
d) Abscisic acid

13. The size of the pupil of the eye is adjusted by [1]
a) ciliary muscles
b) optic nerve
c) iris
d) retina

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. Consider the following statements concerning food chains: [1]

(I) Removal of 80% tigers from an area resulted in greatly increased growth of vegetation.

(II) Removal of most of the carnivores resulted in an increased population of herbivores.

(III) The length of the food chains is generally limited to 3-4 trophic levels due to energy losses.

(IV) The length of the food chains may vary from 2 - 8 trophic levels.

Which of the above two statements are correct?

a) I and IV

b) I and II

c) II and III

d) III and IV

16. Recycling of paper is a good practice, but recycled paper should not be used as food packaging because recycled papers [1]

a) Occupy a lot of space.

b) Cannot cover food properly.

c) Can cause infection.

d) Are costly.

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): C and N do not react with dil. HCl and dil. H_2SO_4. [1]
Reason (R): Metals do not react with dil. H_2SO_4 and dil. HCl.

18. Assertion (A): Contraception is a method to prevent unwanted pregnancies. [1]
Reason (R): Unwanted pregnancies can only be prevented by using oral contraceptives.

19. Assertion (A): The energy available for a deer in a food chain is more as compared to that available for a lion. [1]
Reason (R): Deer occupies second trophic level whereas lion occupies first trophic level in a food chain operating in a grassland ecosystem.

20. Assertion (A): A fuse wire is connected in parallel with the mainline. [1]
Reason (R): A fuse wire melts when a larger current than specified value flows through circuit.

SECTION - B

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

21. Nisha performed a reaction between quicklime and water in the laboratory. Identify the product. Write a balanced chemical reaction for the same, along with the type of reaction. [2]

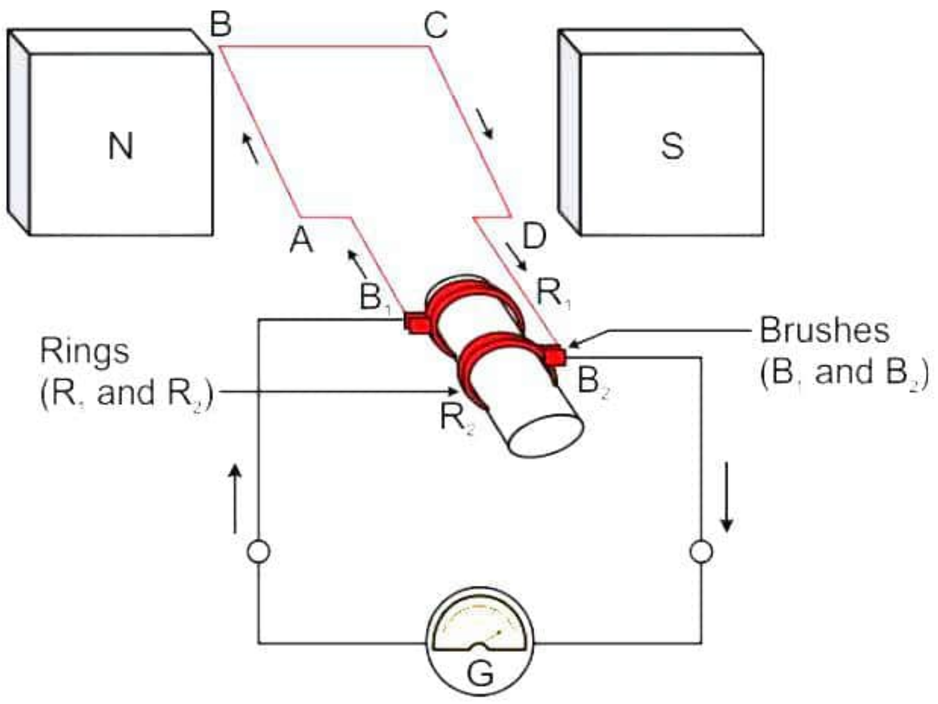
22. Why is contraception the need of the hour? [2]

23. Why is it necessary to boil the leaf in water after destarching it? [2]

OR

How do thin gills with a large surface area offer an advantage to fishes?

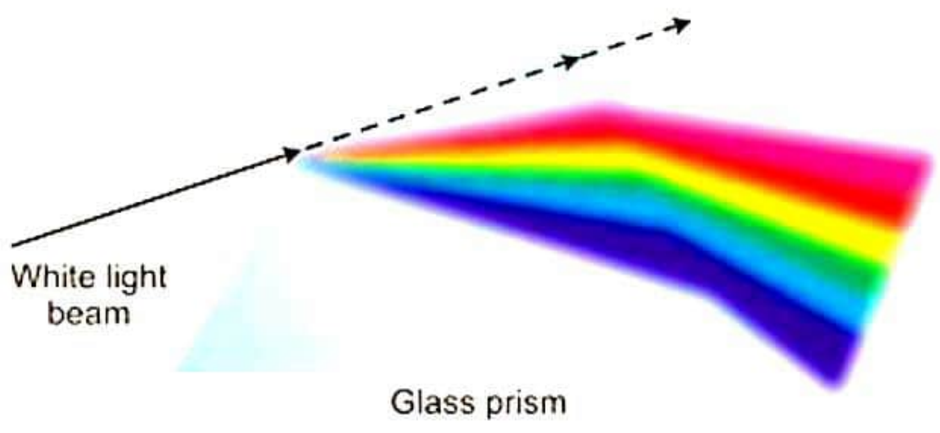
24.



a) What does above diagram represent?

b) On which principle the above device works? [2]

25. [2]

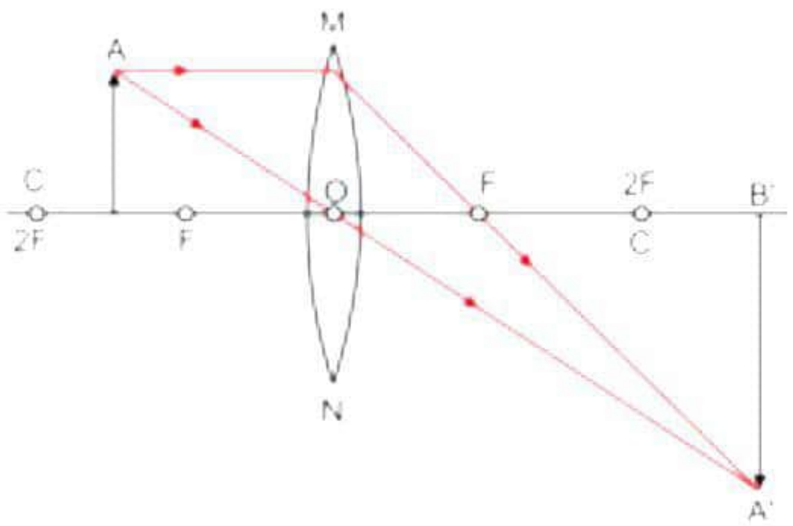


a) Name the phenomenon which takes place in the above diagram.

b) Which colour travels with minimum speed in a glass prism?

OR

Observe the diagram given below and answer the following questions:



a) What will be the position and nature of the image if the object is moved and brought at F_1?

b) If the lens forms an image of magnification –2 cm, then what is the nature of the image?

26. Pesticides are useful to farmers yet considered as pollutants. Give reason. [2]

SECTION - C

Question No. 27 to 33 are short answer questions.

27. In a chemistry experiment, Nysa's teacher asked her to explain how washing soda is prepared. Can you write the steps and the balanced chemical reactions involved in the preparation process of washing soda? [3]

28. Raghav was wondering why the plants were not growing properly. The agricultural department's auditor examined the soil and found out that the pH of soil needs to be balanced. Explain how pH affects the crop fertility and suggest remedy for the same. [3]

OR

Give IUPAC names of following compounds:

(a) $CH_2=CHCH_2CH_2Br$ (b) $(CH_3)_2CHCH_2CH_3$ (c) $CH_3OCH_2CH_3$

29. [3]

(a) Which of the following will you classify as a reflex action?

(i) Contraction of eye pupil (ii) Breathing

(b) How are reflex actions different from involuntary actions?

30. "Different species use different strategies to determine the sex of a newborn individual. It can be environmental cues or genetically determined." Explain the statement by giving example for each strategy. [3]

31. An object is placed between infinity and the pole of a convex mirror. Draw a ray diagram and also state the position, the relative size and the nature of the image formed. [3]

32. [3]

(a) Draw the magnetic field pattern produced by the current-carrying solenoid.

(b) On which factors do the magnitude of the magnetic field due to a circular coil depend?

33. A convex mirror on a bus has a radius of curvature 2 m. If a scooter is located at 600 cm from this mirror, find the position, nature and magnification of the image formed in the mirror. [3]

SECTION - D

Question No. 34 to 36 are long answer questions.

34. A compound, P of sodium, forms a white powder. It is a constituent of baking powder and is used in some antacids. When heated, it gives a compound Q, which is anhydrous and absorbs water to become a hydrated salt. When this salt is kept in open air, it loses water molecules in efflorescence. When dissolved in water, it forms a strong base and weak acid, R.

    Answer the following questions. [5]

    (a) What is the compound P?

    (b) Identify the compound Q.

    (c) What is the nature of the solution formed by dissolving Q in water? Name and explain the type of salt Q.

    (d) Identify the compound R.

    (e) Explain water of crystallisation using the compound 'Q'.

OR

Answer the following:

(a) Differentiate between soap and detergent. [3]

(b) Sarah has a habit of eating milk chocolates, which results in severe tooth decay. The dentist examined her teeth and suggested cleaning her teeth twice a day with basic toothpaste. Sarah wants to understand the importance of pH in case of tooth decay. Can you explain? [2]

35. [5]

(a) Draw a neat and well-labelled diagram of a developing pollen grain.

(b) What is triple fusion? What is its importance?

(c) Explain the mechanism of pollination in the *Hibiscus* flower.

OR

(a) State the sequence of changes that take place in the human body when it prepares itself to protect from a scary or dangerous situation.

(b) Why can you not taste food properly when you have a cold?

(c) Why does the stem of a plant always show negative geotropism?

36. [5]

(a) What should be the position of the object when a concave mirror is to be used:

(i) as a shaving mirror

(ii) in torches producing parallel beam of light?

(b) A man standing in front of a mirror finds his image having a very small head and legs of normal size. What types of mirrors are used in designing such a mirror?

(c) Do the laws of reflection change, when we use a spherical mirror instead of a plane mirror?

OR

Sohan observed that some objects in the night sky were twinkling while others were not. He learned that the twinkling objects were stars, and the non-twinkling objects were planets. Can you explain why planets do not twinkle like stars and the difference between point-sized and extended light sources?

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. Salt of a strong acid and strong base is neutral with a pH of 7. Common salt, NaCl, is formed by a combination of hydrogen chloride and sodium hydroxide solution. This is the salt that is used in food. Some use salt which is called rock salt. Beds of rock salt were formed when seas of bygone ages dried up. The common salt thus obtained is an important raw material for various materials of daily use, such as sodium hydroxide, baking soda, washing soda, bleaching powder.

(a) Write the products of chlor-alkali process at both electrodes and balanced reaction for the same. [2]

(b) Write uses of baking soda. [2]

OR

(b) What is meant by acidic and basic salt? Write example for the same. [2]

38. Mendel blended his knowledge of science and mathematics to keep a count of the individuals exhibiting a particular trait in each generation. He observed several contrasting visible characters controlled in pea plants in a field. He conducted many experiments to arrive at the laws of inheritance. [4]

(a) What do the F_1 progeny of tall plants with round seeds and short plants with wrinkled seeds look like?

(b) What are recessive traits?

(c) Mention the type of new combinations of plants obtained in F_2 progeny along with their ratio, if F_1 progeny was allowed to self-pollinate.

OR

(c) If 1600 plants were obtained in F_2 progeny. Write the number of plants having traits

(i) Tall with round seeds

(ii) Short with wrinkled seeds

Write the conclusion of the above experiment.

39. Analyse the given table and answer the following questions based on it:

Substance	Resistivity
A	$1.6 \times 10^{-8}\ \Omega$ m
B	$44 \times 10^{-8}\ \Omega$ m
C	$2.63 \times 10^{-8}\ \Omega$ m
D	$2300\ \Omega$ m
E	$10^{17}\ \Omega$ m

(a) Which of the above substances can be used as an insulator? [1]

(b) Which of the above substances can be used for the purpose of domestic wiring? [1]

(c) Which of the above substances is used for making solar cells and transistors? Give Reason. [2]

OR

(d) Which of the above substances is an alloy? Why [2]

Solution

SECTION - A

1. Correct option – a: A- no change; B- becomes dark red, C- becomes blue
Red litmus paper changes to blue in alkaline solution.

2. Correct option – d: ii and iii
Most of the carbon compounds are poor conductors of heat and electricity and force of attraction between molecules of carbon compounds is weak since they are covalent compounds.

3. Correct option – d: Brass
Brass is an alloy of copper and zinc which is used to make scientific instruments.

4. Correct option – c: aldehydes
-CHO represent aldehyde functional group.

5. Correct option – a: Propene
If the carbon chain is unsaturated, then the final 'ane' in the name of the carbon chain is substituted by 'ene' or 'yne'. Thus, a three-carbon chain with a double bond would be called propene and if it has a triple bond, it would be called propyne.

6. Correct option – a: Water is polar, and kerosene is non-polar.
Water is polar covalent compound. Common salt is ionic polar compound; hence it dissolves in polar covalent water.

7. Correct option – a: Aluminium
Aluminium reacts with steam to form aluminium oxide and hydrogen gas.

8. Correct option – c: IV only
Stomata are present in the lower epidermis of the leaf. Maximum exchange of gases occurs through the stomata situated in the lower epidermis.

9. Correct option- b: To absorb the incoming carbon dioxide from the air
Soda lime is used to absorb the incoming carbon dioxide from the air so that it does not interfere with the experiment to prove that carbon dioxide is necessary for photosynthesis.

10. Correct option – d: 100%
Inflated pea pods are dominant over constricted pea pods. Hence, according to the law of dominance, all pea plants will bear inflated pods in the F_1 generation.

11. Correct option – c: Wastage of pollen does not occur.
The given figure depicts cross–pollination. In cross pollination, pollen grains are being wasted in significant quantities.

12. Correct option – c: Auxin
Auxin is a plant hormone produced in the stem and root tip that promotes cell elongation, stem and root growth.

13. Correct option – c: Iris
The size of the pupil of the eye is adjusted by the iris.

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 – c: II and III
Tigers are carnivores. So, removing 80% of tigers will result in an increase of herbivores which can result in greatly decreased growth of vegetation.
The energy available at any trophic level in a food chain is 10% of the previous trophic level. This loss of energy at successively higher trophic levels limits the length of the food chains in an ecosystem to 3-4 trophic levels only.

16. Correct option – c: Can cause infection
During recycling, decomposition of paper releases methane. Thus, recycled paper should not be used for food packaging to avoid the possibility of an infection.

17. A is true but R is false.
Non-metals such as C and N do not react with dil. HCl and dil. H_2SO_4. So, the assertion is true. Metals such as sodium, potassium, and calcium react with H_2SO_4 and HCl. So, the reason is false.

18. A is true but R is false.
Contraception is a method to prevent unwanted pregnancies. Contraceptives can be broadly grouped into barrier methods, lUDs, oral contraceptives, injectables, implants and surgical methods. Therefore, the assertion is true, but the reason is false.

19. A is true but R is false.

Deer occupies second trophic level in a food chain as it is a primary consumer and directly feeds on plants. Lion occupies a higher trophic level since it is a carnivore and acts as a secondary or tertiary consumer. Energy available for a deer in a food chain is more as compared to that available for a lion because energy keeps on decreasing from one trophic level to another due to loss of energy in the form of heat. Thus, although the assertion is true, the given reason is false.

20. A is false, but R is true.

Fuse wire is connected in series with mainline and fuse wire melts when current greater than specified value flows through circuit.

SECTION - B

21. Quick lime (calcium oxide) reacts vigorously with water to produce slaked lime (calcium hydroxide), releasing a large amount of heat.

$CaO\ (s) + H_2O\ (l) \rightarrow Ca(OH)_2\ (aq) + Heat$

In this reaction, calcium oxide and water combine to form a single product: calcium hydroxide. Therefore, it is a combination reaction.

22. <u>Contraception is the need of the hour due to the following reasons:</u>

- To prevent unwanted pregnancies
- To prevent sexually transmitted diseases
- To allow spacing between children
- To ensure sound health of the mother

23. Boiling of the leaf will ensure that the cells are dead. Dead cells of the leaf will enable the plasma membrane of the cells to let the pigment molecules out of the cell. Hence, it is necessary to boil the leaf in water after destarching it.

OR

The large surface area of the gills in fish enables oxygen to diffuse easily and rapidly into the gills. Thin gills facilitate easy exchange of gases between blood and water.

24.

a) The diagram given in the question represents electric generator.

b) Electric generator works on Faraday's law of electromagnetic induction.

25.

a) The phenomenon is known as dispersion of light.

b) Violet light travels with the minimum speed in the glass prism.

OR

a) If the object is moved to F_1, the image will be formed at infinity, and the nature of the image is real, inverted and highly magnified.

b) If the magnification of the lens is –2 cm, then it means that the image is real, inverted and magnified.

26. Pesticides kill insects and pests thereby protecting the crops, but these pesticides remain on the crops and later enter the food chain. They get accumulated in the organisms and reach the top-most trophic level resulting in biomagnification. When washed away by rain, these pesticides cause pollution of water. Hence, although pesticides are useful to farmers, yet they are considered as pollutants.

SECTION - C

27. Sodium hydrogen carbonate on heating decomposes to give sodium carbonate with the release of hydrogen gas.
Recrystallisation of sodium carbonate gives washing soda.
$2NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$
$Na_2CO_3 + 10H_2O \rightarrow Na_2CO_3.10H_2O$

28. Each crop grows better in a particular pH range.

- For example, rice grows better in slightly acidic soil, sugarcane in neutral and citrus fruits in alkaline soil.
- Most of the plants grow best when the pH of the soil is close to 7.
- The pH of acidic soil can reach as low as 4 and that of the basic soil can go up to 8.3.
- If the soil is too acidic, then it is treated with quicklime (calcium oxide), slaked lime (calcium hydroxide) or chalk (calcium carbonate).
- If the soil is too alkaline, then its alkalinity is reduced by adding decaying organic matter which contains acidic materials.

OR

(a) $CH_2=CHCH_2CH_2Br$: 4-bromo-but-1-ene
(b) $(CH_3)_2CHCH_2CH_3$: 2-methylbutane
(c) $CH_3OCH_2CH_3$: Methoxyethane

29.

(a)

(i) Contraction of eye pupil is a sudden, quick, and instantaneous response of the body when a person is exposed to sudden bright light. Hence, it is classified as a reflex action.

(ii) Breathing is an involuntary action which is not under the control of our will.

(b) Differences between reflex actions and involuntary actions:

Reflex actions	Involuntary actions
1. Rapid automatic responses to a stimulus without the conscious involvement of the brain	1. Actions which are not controlled by our will or volition
2. Controlled by spinal cord	2. Controlled by midbrain or medulla oblongata
3. Very quick and instantaneous	3. Relatively slower
4. May involve a muscle or a gland	4. Involves only smooth muscles
5. Examples: Blinking of eyes, salivation	5. Examples: Beating of heart, blood circulation

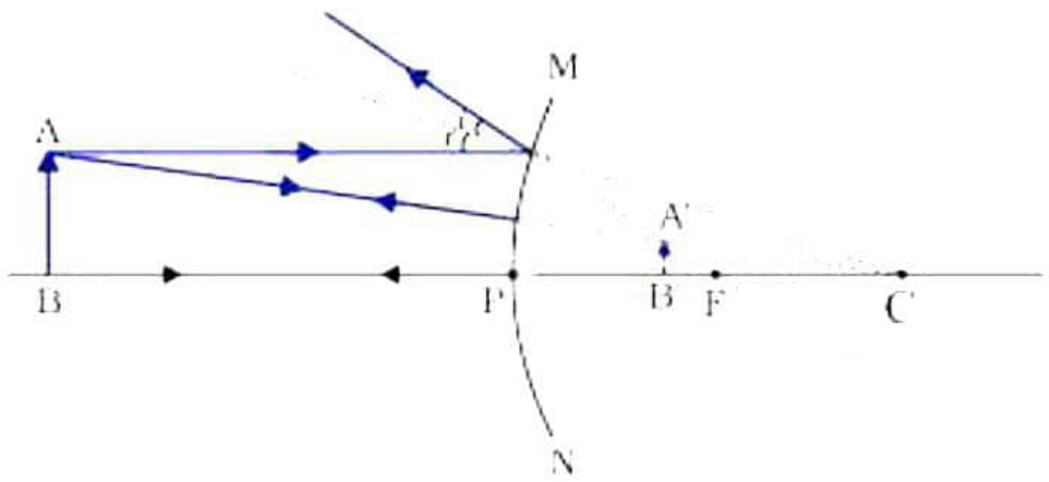
30. <u>Environmental cues for sex determination:</u>

- In some animals, the temperature at which fertilised eggs are kept determines whether the developing animal in the egg is a male or a female, e.g., lizard.
- In some animals like the snail, an individual can change sex under different stresses and environmental conditions.

<u>Genetic cues for sex determination:</u>

- In humans, a child who inherits an X chromosome from the father will be a girl and the one who inherits a Y chromosome from the father will be a boy.
- In humans, males are heterogametic (XY), and females are homogametic (XX). The type of sperm fertilising the egg, determines the gender of the unborn child.

31.



When an object is placed between infinity and the pole of a convex mirror, the image formed is:

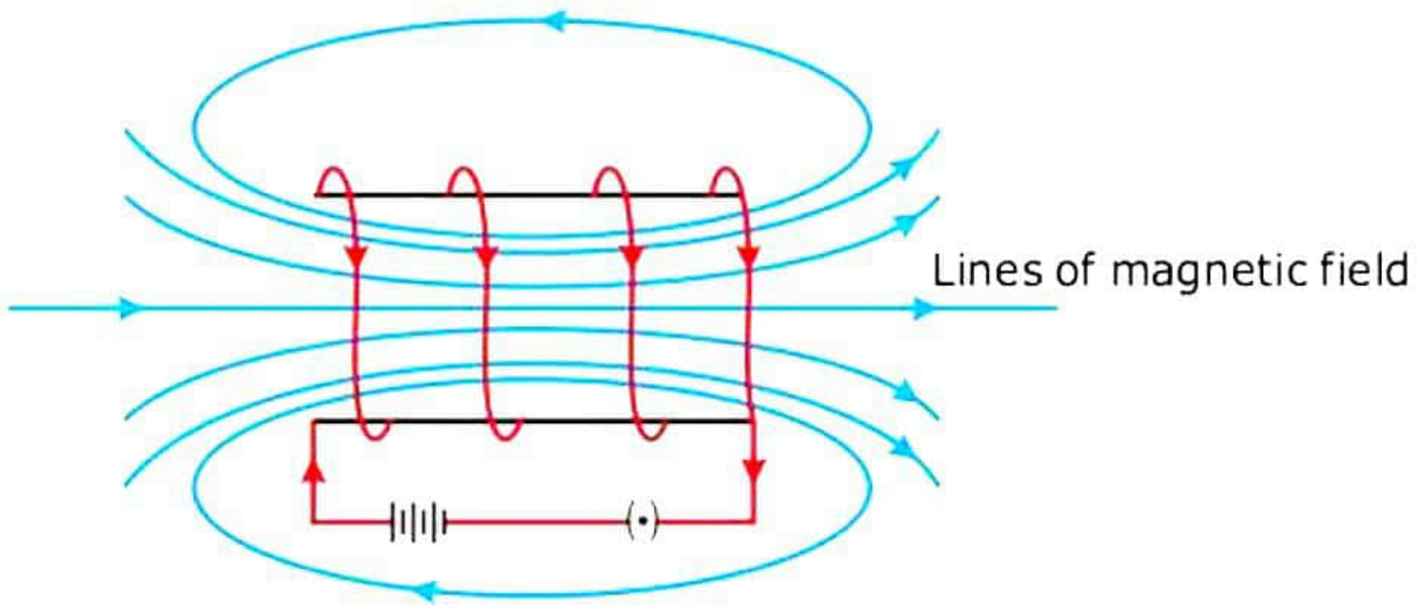
(a) Behind the mirror at the focus (F)

(b) Virtual and erect

(c) Highly diminished

32.

(a)



(b) The **magnitude of a magnetic field** at the centre of the coil is:

i. Directly proportional to the current flowing through it

ii. Inversely proportional to the radius of the coil

iii. Directly proportional to the number of turns of the coil.

33. Focal length of a convex mirror, f = 200 cm

Distance of the scooter from the mirror, u = –600 cm

By the mirror formula,

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

$$\therefore \frac{1}{v}=\frac{1}{f}-\frac{1}{u}=\frac{1}{200}-\frac{1}{-600}=\frac{1}{200}+\frac{1}{600}$$

$$\therefore \frac{1}{v}=\frac{4}{600}$$

$$\therefore v=150 \text{ cm}$$

Hence, the image is located 150 cm from the mirror. As the image distance is positive, it is a virtual image.

Magnification produced by the mirror is

$$m=-\frac{v}{u}$$

$$\therefore m=\frac{-150}{-400}=+0.375 \text{ cm}$$

SECTION - D

34.

(a) The compound of sodium that is a constituent of baking powder and is used in antacids, is sodium hydrogen carbonate ($NaHCO_3$), hence 'P' is $NaHCO_3$.

(b) When 'P' i.e., $NaHCO_3$ is heated, it forms 'Q' i.e. anhydrous sodium carbonate i.e. Na_2CO_3.

$$2NaHCO_3 \xrightarrow{Heat} Na_2CO_3 + CO_2 + H_2O$$

(P)	(Q)
Sodium Hydrogen Carbonate	Anhydrous Sodium carbonate

(c) Sodium hydroxide (NaOH) ionises completely to give a large amount of OH^- ions whereas H_2CO_3 ionises partially to give a small amount of H^+ ions. Hence, the solution is overall alkaline. The type of salt Q that is sodium carbonate, is basic. This is because, it is a salt formed by the combination of weak acid and strong base.

$$Na_2CO_3 + 2H_2O \longrightarrow \underset{\text{Strong base}}{2NaOH} + \underset{\text{Weak acid}}{H_2CO_3}$$

(d) 'R' is carbonic acid i.e., H_2CO_3, a weak acid formed when Na_2CO_3 is dissolved in water.

$$Na_2CO_3 + 2H_2O \longrightarrow \underset{\text{Strong base}}{2NaOH} + \underset{\text{Weak acid}}{H_2CO_3}\ (R)$$

(e) Sodium hydrogen carbonate on heating decomposes to give sodium carbonate with the release of hydrogen gas. Recrystallisation of sodium carbonate creates washing soda.

$$Na_2CO_3 + 10H_2O \longrightarrow \underset{\text{washing soda}}{Na_2CO_3.10H_2O}$$

In the chemical formula for washing soda, 10 molecules of water are the water of crystallization. Each molecule of Na_2CO_3 is combined with 10 molecules water of crystallization to form washing soda.

OR

(a)

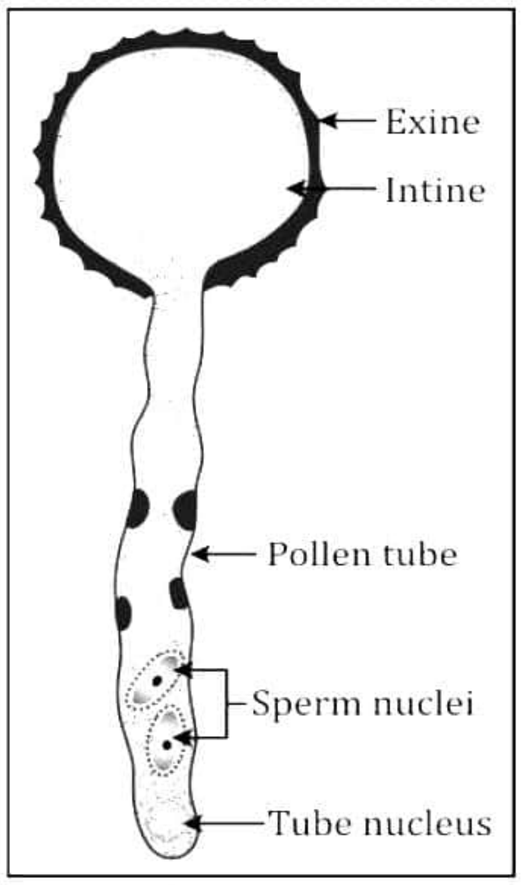
Soap	**Detergent**
Soaps are made from fat and alkali by specification method.	Detergents are carbonic compounds which are not alkaline
They are cheap.	They are costly.
They are not suitable for delicate clothes.	They are suitable for delicate clothes.
They are clean better in hot water.	They clean both in hot and cold water.
They need lot of water to remove soap from the cloth.	They are removed very easily so less quantity of water is needed.
They don't produce lather with hard water so not able to clean the cloth.	They clean the cloth even in hard water.

(b) Tooth decay starts when the pH in the mouth falls below 5.5.

- Tooth enamel is the hardest substance in the human body. It is made of calcium phosphate.
- It is insoluble in water but gets corroded when the pH in the mouth falls below 5.5.
- Bacteria present in the mouth produce acids due to the degradation of sugar and food particles after eating.
  Prevention of tooth decay - Clean the mouth after eating food and use toothpaste (which is basic) for cleaning teeth to neutralise the excess acid.

35.

(a) <u>Developing pollen grain</u>:



(b) <u>Triple fusion</u>: It is the process in which one of the sperm nuclei unites with the secondary nucleus (two polar nuclei). Together, these nuclei form the triploid nucleus of the cell, from which the nutritive endosperm develops, that will provide energy for the embryo's growth and development.

(c) <u>Mechanism of pollination in the *Hibiscus* flower</u>:

- *Hibiscus* is a flower with colourful corolla.
- Insects get attracted to the nectar and the coloured corolla. Hence, they act as agents of pollination for the *Hibiscus* flower.
- When insects suck the nectar, pollen grains stick to their legs and are carried to other plants where they germinate.

OR

(a) When a person confronts any scary situation, adrenaline is secreted from the adrenal gland and sent directly into the blood which is then circulated to various parts of the body, resulting in the following :-

- The main target organs include the heart. The heart beats faster resulting in a greater amount of oxygen being supplied to the muscles.
- The blood supply to the digestive system and the skin is reduced due to contraction of muscles around small arteries. This diverts the blood to the skeletal muscles.
- The breathing rate also increases because of the contractions of the diaphragm and rib muscles.

(b) The sense of smell helps in getting the complete taste of food. In case of common cold, our nose is blocked, which blocks the sense of smell. That is why we are unable to taste food properly in case of a cold.

(c) The stem of a plant always shows negative geotropism i.e., it grows upwards against the pull of gravity. This movement of the stem facilitates the leaves to get exposed so that they can attain maximum sunlight.

36.

(a) (i) Object should be between pole and focus

(ii) At the focus.

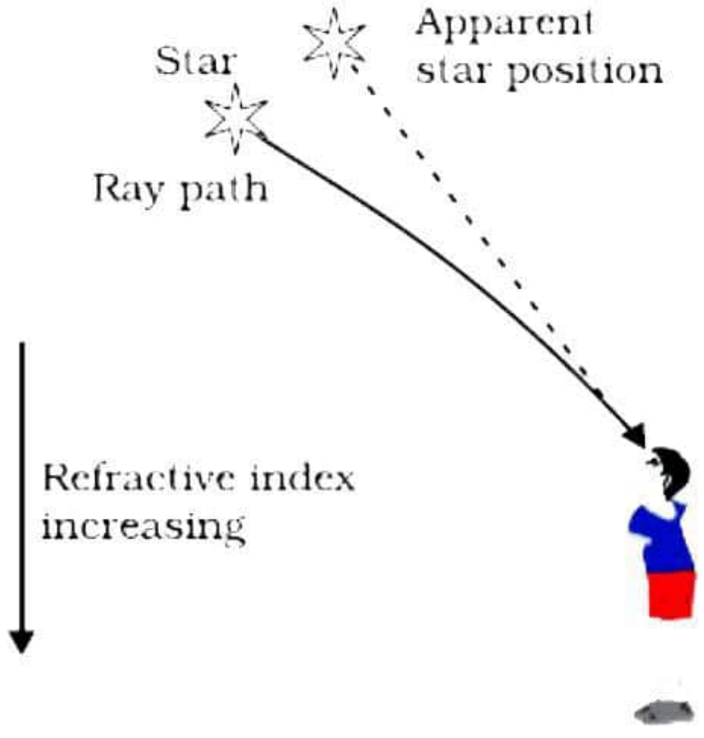
(b) (i) Small head - convex mirror,

(ii) Legs of normal size - plane mirror

(c) No, the laws of reflection do not change. They are applicable to spherical mirrors also.

OR

The twinkling of stars is caused by atmospheric refraction, which occurs when light bends through Earth's atmosphere due to changes in the refractive index.



This bending causes the star's apparent position to fluctuate, causing the twinkling effect.

Conversely, planets do not twinkle like stars due to their proximity to Earth and appearance as extended sources. The twinkling effect is nullified by averaging the variation from individual point-sized sources to zero.

As a result, planets do not twinkle like stars.

SECTION – E

37.

(a) The products of chlor-alkali process are as follows:

$$2NaCl_{(aq)} + 2H_2O_{(aq)} \rightarrow 2NaOH_{(aq)} + H_{2(g)} + Cl_{2(g)}$$

Brine Near Cathode Cathode Anode

(b) Uses of Baking soda:

- Used as an antacid to alleviate stomach acidity. It is weakly basic and hence can neutralise excess acid in the stomach.
- Used in making baking powder which is used in making cakes and breads.
- On heating or mixing baking powder with water, carbon dioxide is evolved which causes breads and cakes to rise, making them soft and spongy.
  $NaHCO_3 + H^+ \rightarrow CO_2 + H_2O$ + Sodium Salt of Acid
  (From Acid)
- Used in soda-acid fire extinguishers.

OR

(c)

- Salt of a strong acid and a weak base is termed as acidic salt, with a pH value less than 7.
  Example: Ammonium chloride solution has a pH value of 6.
- Salt of a weak acid and a strong base is termed as basic salt, with a pH value of more than 7.
  Example: Sodium carbonate solution has a pH value of 9.

38.

(a) The given traits are-

Tall plants with round seeds (TTRR)

Short plants with wrinkled seeds (ttrr)

Parental generation: TTRR × ttrr

Gametes: TR, tr

F_1 progeny: TtRr (Tall plants with round seeds)

Thus, F_1 progeny of tall plants with round seeds and short plants with wrinkled seeds will be tall plants with round seeds as tallness and round seed shape are dominant traits which will be expressed in the F_1 generation.

(b) Recessive traits are traits that are expressed only when the genotype is homozygous. Otherwise, their expression is masked by the dominant traits. Although the traits are present in a population of heterozygotes, they will not be expressed in the presence of a dominant trait.

(c) If F_1 progeny was allowed to self-pollinate, the following combinations of plants will be obtained:

F_1 progeny — TtRr

self pollination

♂ TtRr × ♀ TtRr

Gametes — (TR) (tR) (Tr) (tr)

F_2 progeny

♂ \ ♀	TR	tR	Tr	tr
TR	TTRR (Tall round)	TtRR (Tall round)	TTRr (Tall round)	TtRr (Tall round)
tR	TtRR (Tall round)	ttRR (short round)	TtRr (Tall round)	ttRr (short round)
Tr	TTRr (Tall round)	TtRr (Tall round)	TTrr (Tall wrinkled)	Ttrr (Tall wrinkled)
tr	TtRr (Tall round)	ttRr (short round)	Ttrr (Tall wrinkled)	ttrr (short wrinkled)

Phenotypic ratio — Tall round : short round : Tall wrinkled : short wrinkled

9 : 3 : 3 : 1

The different types of combinations obtained in F_2 progeny are-

Tall plants with round seeds – 9

Short plants with round seeds – 3

Tall plants with wrinkled seeds – 3

Short plants with wrinkled seeds – 1

The phenotypic ratio of F_2 progeny is 9 : 3 : 3 : 1.

OR

(c) If 1600 plants were obtained in F_2 progeny, the number of plants with the given traits-

(i) Tall with round seeds = $\frac{9}{16} \times 1600 = 900$

(ii) Short with wrinkled seeds = $\frac{1}{16} \times 1600 = 100$

39.

(a) Substance E can be used as an insulator.

(b) Substances A and C can be used for the purpose of domestic wiring.

(c) Substance D can be used to make solar cells. The substance which is used in making the solar cells and transistors are semiconductors. The resistivity of the semiconductor devices lies between resistivity of conductor and insulator. So correct option is substance D.

OR

(d) An alloy has resistivity higher than a pure metal but lesser than a semiconductor. Thus, substance B is an alloy.