

# UNIQUE STUDY POINT

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**Class 10 - Science**

**Sample Paper - 01 (2022-23)**

**Maximum Marks: 80**

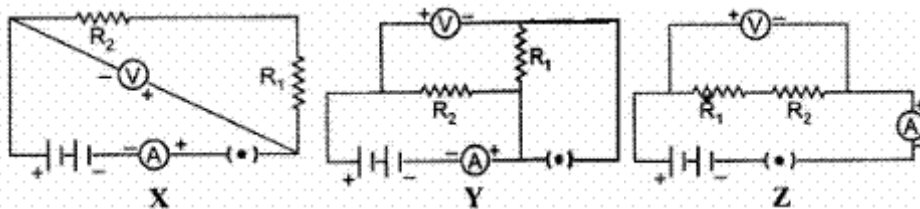
**Time Allowed: : 3 hours**

## General Instructions:

- This question paper consists of 39 questions in 5 sections.
- All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
- Section A consists of 20 objective type questions carrying 1 mark each.
- Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should in the range of 30 to 50 words.
- Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should in the range of 50 to 80 words.
- Section D consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.
- Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

## Section A

1. For determining the equivalent resistance of two resistors  $R_1$  and  $R_2$  connected in series, three student X, Y and Z set up their circuits as shown below.

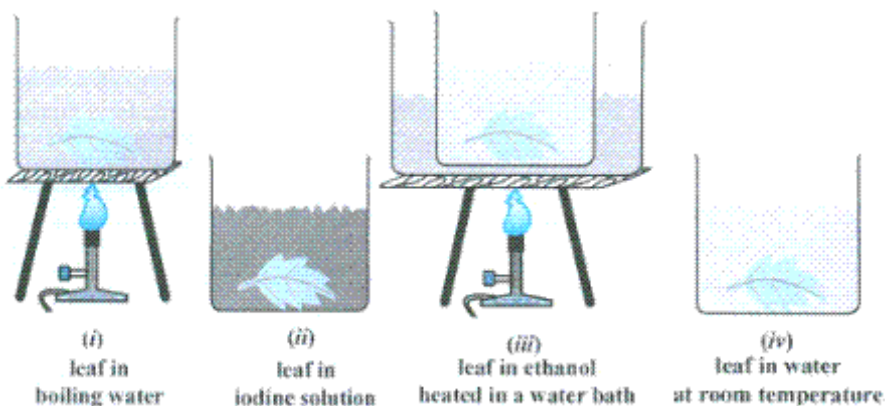


The correct set-up is that of

- Student X only
  - Student Y only
  - Student X and Z
  - Student Z only
2. Which plant was chosen by Mendel to work upon?
- Pea
  - Gram

- c) Rose  
d) All of these.

3. A student performed the starch test on a leaf. Some steps involved are shown below.



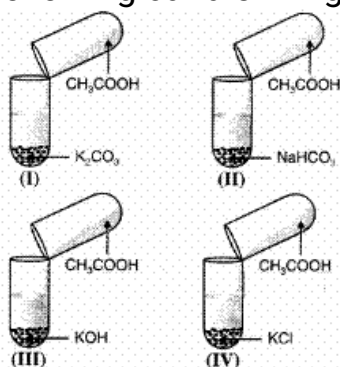
The correct sequence of steps should be

- a) (i), (iii), (iv), (ii)  
b) (iv), (iii), (ii), (i)  
c) (i), (ii), (iii), (iv)  
d) (ii), (iii), (iv), (i)
4. What are the constituents of Alnico?  
a) Al, Ni, Na  
b) Al, Ni, Co  
c) Mg, Mn, Al, Zn  
d) Zn, Pb, Al, Ni
5. Which one of the following is metal?  
a) C  
b) N  
c) Na  
d) O
6. Match the following with the correct response:

| Column A       | Column B             |
|----------------|----------------------|
| (i) Catenation | (a) Butene           |
| (ii) Alkane    | (b) Carbon compounds |
| (iii) Alkene   | (c) Ethyne           |
| (iv) Alkyne    | (d) Ethane           |

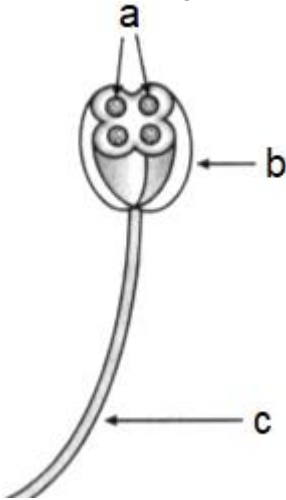
- a) (i) - (d), (ii) - (a), (iii) - (c), (iv) - (b)  
b) (i) - (c), (ii) - (b), (iii) - (d), (iv) - (a)  
c) (i) - (a), (ii) - (c), (iii) - (b), (iv) - (d)  
d) (i) - (b), (ii) - (d), (iii) - (a), (iv) - (c)

7. If burning candle is brought near each of the following test tube, in which of the following candle will get extinguished?



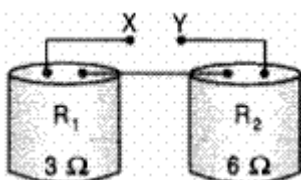
- a) I and III
- b) II and III
- c) III and IV
- d) I and II

8. From the figure identify parts labeled a, b and c.

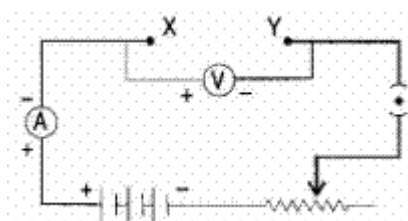


- a) Filament, anther, pollen grains
  - b) Filament, pollen grains, anther
  - c) Anther, pollen grains, filament
  - d) Pollen grains, anther, filament
9. Baking soda is a
- a) mild non-corrosive base
  - b) strong corrosive base
  - c) mild corrosive base
  - d) mild non-corrosive acid
10. Name the body parts which human beings can regenerate.
- a) Hair and liver
  - b) Lungs and nails
  - c) Liver and lungs
  - d) Hair and nails
11. Find the correct statement:
- A. Chromosomes are the bearers of hereditary factors.
  - B. The wing of a bird and the bat are homologous organs.
  - C. J. B. S. Haldane suggested that life has evolved from simple organic molecules.
  - D. A child who inherits an X – chromosome from his father will be a boy.
- a) (A)
  - b) (B)
  - c) (C)
  - d) (D)

12. The values of resistance marked on the coils  $R_1$  and  $R_2$  are found to be correct. A student connects the given resistors in the following manner.

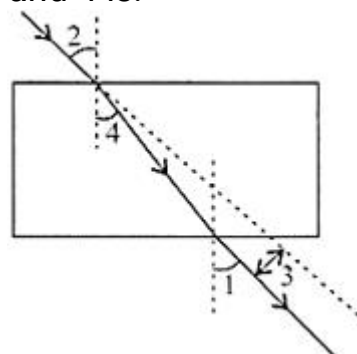


He then connects the terminals marked X and Y above to the terminals marked X and Y in the circuit.

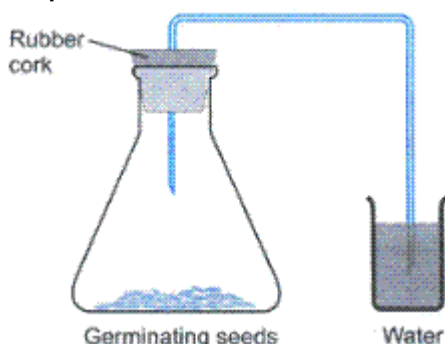


The average value of the ratio  $V/I$  in the observations recorded in the circuit would be :

- a)  $2 \Omega$
  - b)  $6 \Omega$
  - c)  $9 \Omega$
  - d)  $3 \Omega$
13. The correct sequencing of angle of incidence, angle of emergence, angle of refraction and lateral displacement shown in the following diagram by digits 1, 2, 3 and 4 is:



- a) 2, 1, 3, 4
  - b) 1, 2, 1, 4, 3
  - c) 2, 4, 1, 3
  - d) 2, 1, 4, 3
14. Which of the following non-metals is a liquid?
- a) Carbon
  - b) Phosphorus
  - c) Sulphur
  - d) Bromine
15. The following experiment was set-up to show that gas is given out during respiration. But there was no rise in the level of water. this was because



- a) no substance is kept in the flask to absorb the gas given out by the seeds
- b) germinating seeds have not been kept under water in the flask
- c) water is kept in the beaker instead of limewater
- d) the cork on the flask is made of rubber

16. The given slides A and B were identified by four students I, II, III and IV as stated below



|     | Slide A                  | Slide B                  |
|-----|--------------------------|--------------------------|
| I   | Binary fission in Amoeba | Daughter cells of Amoeba |
| II  | Budding in Yeast         | Buds of Yeast            |
| III | Binary fission in Amoeba | Buds of Yeast            |
| IV  | Budding in Yeast         | Daughter cells in Amoeba |

17. Of the above mentioned identification of slides A and B, which one is correct?
- IV
  - I
  - III
  - II
18. **Assertion (A):** Electric appliances with metallic body have three connections, whereas an electric bulb has two pin connections.  
**Reason (R):** Three-pin connections reduce heating of connecting wires.
- Both A and R are true and R is the correct explanation of A.
  - Both A and R are true but R is not the correct explanation of A.
  - A is true but R is false.
  - A is false but R is true.
19. **Assertion (A):** The chemical formula of bleaching powder is  $\text{CaOCl}_2$ .  
**Reason (R):** Calcium oxide react with chlorine to form bleaching powder.
- Both A and R are true and R is the correct explanation of A.
  - Both A and R are true but R is not the correct explanation of A.
  - A is true but R is false.
  - A is false but R is true.
20. **Assertion (A):** Unlike cabbage, sunflower plant has long internode with leaves that are far apart.  
**Reason (R):** Sunflower produces sufficient amounts of Gibberellins during its growing period.
- Both A and R are true and R is the correct explanation of A.
  - Both A and R are true but R is not the correct explanation of A.
  - A is true but R is false.
  - A is false but R is true.
21. **Assertion (A):** Green plants of the ecosystem are the transducers.  
**Reason (R):** Producers trap the radiant energy of the sun and the change it into chemical energy.
- Both A and R are true and R is the correct explanation of A.
  - Both A and R are true but R is not the correct explanation of A.
  - A is true but R is false.
  - A is false but R is true.

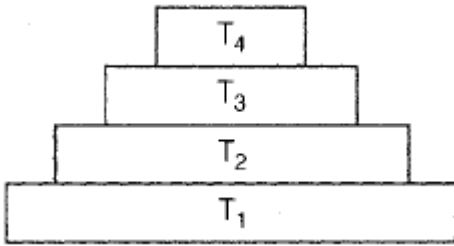
## Section B

- 21 Give the molecular formula and electron dot structure of ethyne and ethene.

OR

What is meant by denatured alcohol? What is the need to denature alcohol?

22. Differentiate between tropic and nastic movements in plants.  
23. In the given figure, the various trophic levels are shown in a pyramid. At which trophic level is maximum energy available?



24. Give some methods that could be applied to reduce our intake of pesticides.  
25. What is the nature of the mirror having focal length – 15 cm ?

**OR**

How is focal length related to radius of curvature of the mirror ?

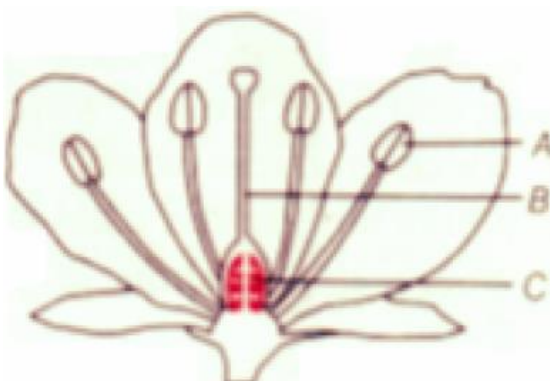
26. A gas is evolved when ethanol reacts with sodium. Name the gas evolved and also write the balanced chemical equation of the reaction involved.

### **Section C**

27. A solution of a substance 'X' is used for whitewashing
- Name the substance 'X' and writes its formula.
  - Write the reaction of the substance 'X' named in (i) above with water.
28. One-half of a convex lens is covered with a black paper. Will this lens produce a complete image of the object? Verify your answer experimentally. Explain your observations.
29. Rohini's parents received a proposal for her marriage from a boy living in UK. Before everything could get finalised, Rohini asked her parents to ask the boy to get his blood test report.
- Do you think it was right on the part of Rohini's parents to do so?
  - What moral values did Rohini showed?
  - Name two STDs along with their causative organisms.

**OR**

Name the parts A, B and C shown in the following diagram and state one function of each.



30. A camera in many ways is similar to the human eye, still, there are some basic differences in image formation between the two. Explain.
31. 2g of silver chloride is taken in a china dish and the china dish is placed in sunlight for some time. What will be your observation in this case? Write the chemical reaction involved in the form of a balanced chemical equation. Identify the type of chemical reaction.
32. In human beings blue eye colour is recessive to brown eye colour. A brown eyed man has a blue eyed mother.
- What is the genotype of man and his mother?
  - What are possible genotypes of his father?
  - If man marries a blue eyed woman, what are the possible genotypes of their offsprings?

**OR**

Give the respective scientific terms used for studying

- The mechanism by which variations are created and inherited.
  - the development of new types of organisms from the existing ones.
33. How can changes of size of eyeball be one of the reason for
- myopic and
  - hypermetropic eye?
- Compare the size of eyeball with that of a normal eye in each case. How does this changes of size affect the position of image in each case?

### **Section D**

34. Explain the following
- Reactivity of Al decreases if it is dipped in  $\text{HNO}_3$
  - Carbon cannot reduce the oxides of Na or Mg
  - NaCl is not a conductor of electricity in solid state whereas it does conduct electricity in aqueous solution as well as in molten state
  - Iron articles are galvanised.
  - Metals like Na, K, Ca and Mg are never found in their free state in nature.

**OR**

- Write the electron-dot structures for sodium, oxygen and magnesium.
  - Show the formation of  $\text{Na}_2\text{O}$  and  $\text{MgO}$  by the transfer of electrons.
  - What are the ions present in these compounds?
- 35.
- Why is there a difference in the rate of breathing between aquatic organisms and terrestrial organisms? Explain.
  - Draw a diagram of human respiratory system and label - pharynx, trachea, lungs, diaphragm and alveolar sac on it.

**OR**

- i. Define excretion.
  - ii. Name the basic filtration unit present in the kidney.
  - iii. Draw excretory system in human beings and label the following organs of excretory system which perform the following functions:
    - a. forms urine
    - b. is a long tube which collects urine from the kidney.
    - c. Store urine until it is passed out.
36. Draw an appropriate schematic diagram showing common domestic circuits and discuss the importance of fuse. Why is it that a burnt out fuse should be replaced by another fuse of identical rating?

## Section E

37. **Read the text carefully and answer the questions:**

We know that a battery or a cell is a source of electrical energy. The chemical reaction within the cell generates the potential difference between its two terminals that sets the electrons in motion to flow the current through a resistor or a system of resistors connected to the battery. To maintain the current, the source has to keep expanding its energy. Where does this energy go? A part of the source energy in maintaining the current may be consumed for useful work (like in rotating the blades of an electric fan). The rest of the source energy may be expended in heat to raise the temperature of the gadget. We often observe this in our everyday life. For example, an electric fan becomes warm if used continuously for a long time, etc. On the other hand, if the electric circuit is purely resistive, that is, a configuration of resistors only connected to a battery; the source energy continually gets dissipated entirely in the form of heat. This is known as the heating effect of electric current. This effect is utilized in devices such as an electric heater, electric iron, etc.



- i. Explain Joule's heating law.
- ii. In practical situations, when an electric appliance is connected to a known voltage source, then how does the heating effect of electric current can be calculated?

**OR**

Write the relation between heat energy produced in a conductor when a potential difference  $V$  is applied across its terminals and a current  $I$  flows through for  $t$ .

38. **Read the text carefully and answer the questions:**

We have seen that the different parts of our body have specific functions. Our mouth



waters when we see the food we like without our meaning to. Our heart's beat without our thinking about it. In fact, we cannot control these actions easily by thinking about them even if we wanted to. So, in between the simple reflex actions like change in the size of the pupil, and the thought out actions such as moving a chair, there is another set of muscle movements over which we do not have any thinking control. Many of these involuntary actions are controlled by the mid-brain and hind-brain. All these involuntary actions including blood pressure, salivation and vomiting are controlled by the medulla in the hind-brain. Think about activities like walking in a straight line, riding a bicycle, picking up a pencil. These are possible due to a part of the hind-brain called the cerebellum. It is responsible for the precision of voluntary actions and maintaining the posture and balance of the body. Imagine what would happen if each of these events failed to take place if we were not thinking about it.



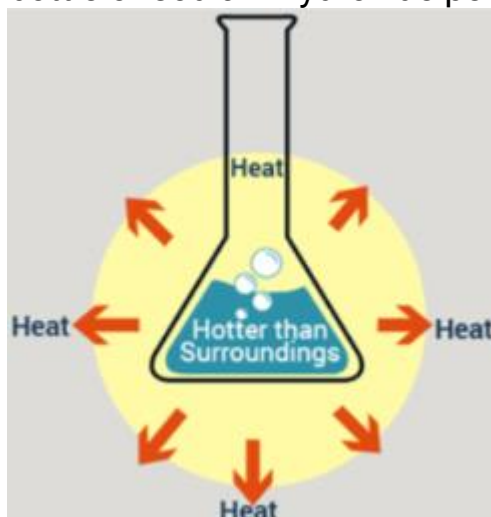
- i. Identify the part of the nervous system which controls the reflex action.
- ii. Does reflex action involve all parts of the voluntary nervous system?
- iii. Identify the part of the autonomic nervous system which controls involuntary actions.

**OR**

**Beating of heart muscles**, which type of action is this? Out of voluntary and involuntary action which is slower?

39. **Read the text carefully and answer the questions:**

The dissolving of an acid or a base in water is a highly exothermic reaction. Care must be taken while mixing concentrated nitric acid or sulphuric acid with water. The acid must always be added slowly to water with constant stirring. If water is added to a concentrated acid, the heat generated may cause the mixture to splash out and cause burns. The glass container may also break due to excessive local heating. Look out for the warning sign on the can of concentrated sulphuric acid and on the bottle of sodium hydroxide pellets.



- i. What is the exothermic reaction?

- ii. Write an example of an exothermic reaction.
- iii. How will you obtain sulphuric acid from an acidic oxide?

**OR**

While diluting an acid, why is it recommended that the acid should be added to water and not water to the acid ?

**Class 10 - Science**  
**Sample Paper - 01 (2022-23)**

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**Solution**

**Section A**

1. (d) Student Z only

**Explanation:** Student Z has kept 1 common point not shared by any other device between  $R_1$  and  $R_2$  with the correct polarity of ammeter and voltmeter.

2. (a) Pea

**Explanation:** Mendel selected *Pisum sativum* (a pea plant) of his ground to observe the characteristics of progeny produced.

3. (a) (i), (iii), (iv), (ii)

**Explanation:** Boiling kills the cells, chlorophyll leaches out when boiled in ethanol, but the leaf becomes brittle, made normal by washing it in water. Starch, gets stained with iodine.

4. (b) Al, Ni, Co

**Explanation:** Alnico is the name for an iron alloy that primarily consists of iron (Fe), aluminum (Al), nickel (Ni), and cobalt (Co). That is why it is called al-ni-co. It can also be spelled AlNiCo. Sometimes, it may also contain Copper, Niobium, and Titanium. Alnico alloys are used as permanent magnets, as they are ferromagnetic.

5. (c) Na

**Explanation:** Na

6. (d) (i) - (b), (ii) - (d), (iii) - (a), (iv) - (c)

**Explanation:**

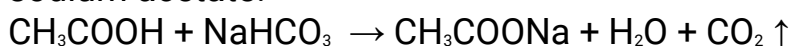
- Carbon forms a large number of compounds due to the property of catenation. Catenation is the linkage of atoms of the same element into longer chains. Catenation occurs most readily in carbon.
- Ethane is an alkane (saturated hydrocarbon with single bonds between the two carbon atoms).
- Butene is an alkene (unsaturated hydrocarbon with double bonds between two carbon atoms).
- Ethyne is an alkyne (unsaturated hydrocarbon with triple bonds between the two carbon atoms).

7. (d) I and II

**Explanation:** In I and II gas evolved will be  $\text{CO}_2$  which is non supporter of combustion, therefore candle will get extinguished.



Sodium bicarbonate reacts with acetic acid to form water, carbon dioxide and sodium acetate.

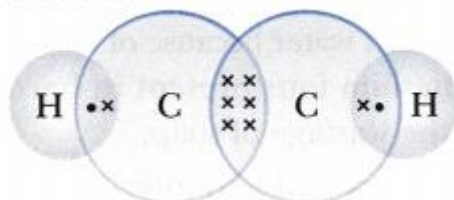


8. (d) Pollen grains, anther, filament  
**Explanation:** Pollen grains, anther, filament
9. (a) mild non-corrosive base  
**Explanation:** Baking soda(sodium bicarbonate) is a mild non-corrosive base because it is a weak base and do not cause burns or damage to living tissue and is used in the preparation of cakes. When it is heated, it decomposes to sodium carbonate carbon dioxide and water molecules.
10. (d) Hair and nails  
**Explanation:** Hair and nails have a protein called keratin which allows them to grow. The process of growing nails and hair is known as keratinization.
11. (a) (A)  
**Explanation:** This statement is correct that chromosomes are bearers of hereditary units or genes and each chromosome carries hundreds or thousands of genes.
12. (c)  $9\ \Omega$   
**Explanation:**  $R_s = R_1 + R_2 = 3 + 6 = 9\ \Omega$  as he has connected resistance  $R_1$  and  $R_2$  in series.
13. (d) 2, 1, 4, 3  
**Explanation:** 2, 1, 4, 3
14. (d) Bromine  
**Explanation:** Bromine is a fairly abundant element but has a rare property. It is the only nonmetal to exist in liquid form at room temperature, and one of only two elements (the other being mercury) that is liquid at room temperature and pressure.
15. (a) no substance is kept in the flask to absorb the gas given out by the seeds  
**Explanation:** KOH solution to absorb the gas is absent.
16. (b) I  
**Explanation:** In binary fission of Amoeba, nucleus divides first, then the cytoplasm and daughter cells are formed.
17. (b) Both A and R are true but R is not the correct explanation of A.  
**Explanation:** The metallic body of the electrical appliance is connected to the third pin which is connected to the earth. This is a safety precaution and avoids eventual electric shock. By doing this the extra charge flowing through the metallic body is passed to earth and avoid shocks. There is nothing such as reducing the heating of connecting wires by three-pin connections.
18. (c) A is true but R is false.  
**Explanation:** Bleaching powder is produced by the action of chlorine on slaked lime.
19. (a) Both A and R are true and R is the correct explanation of A.  
**Explanation:** Both A and R are true and R is the correct explanation of A.
20. (a) Both A and R are true and R is the correct explanation of A.  
**Explanation:** Both A and R are true and R is the correct explanation of A.

## Section B

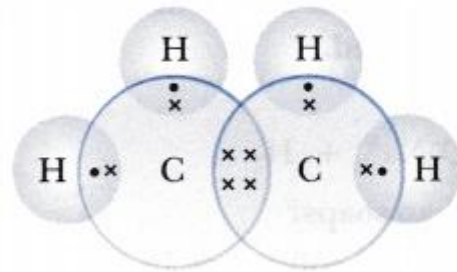
- 21.
- i. **Ethyne:** The molecular formula is  $C_2H_2$

**Electron-dot structure:**



ii. **Ethene:** The molecular formula is  $C_2H_4$

**Electron-dot structure:**



**OR**

Denatured alcohol is ethyl alcohol which has been made unfit for drinking purposes by adding small amount of poisonous substances like copper sulphate, methanol pyridine.

**The need of denature alcohol is to :-** To prevent from the misuse of the industrial alcohol for drinking purposes.

22.

| Tropic movements  | Nastic movements  |
|---|---|
| 1. It can be easily observed in stems and roots.  | 1. It is clearly observed in bilaterally symmetrical organs such as leaves and petals of flowers.                                   |
| 2. It is due to unilateral stimulus which causes unequal growth on the two sides of a stem, root and tendril.   | 2. The movements occur due to stimulus of light and temperature.  |
| 3. Movement is related to stimulus, i.e., plant organs either move towards source of stimulus or away from it. Stimuli which causes movements in plants are gravity, light, touch, water and chemical substances. | 3. Opening and closing of flowers of evening primrose and tobacco at the night and day respectively. This is due to unequal growth. |
| 4. Example: Bending of root towards gravity and shoot towards light.  | 4. Example: Leaves of 'touch-me-not' plant bend and droop on touching.  |

23. The maximum energy is available at  $T_1$  trophic level and least at  $T_4$ . There is a progressive decline in the amount of energy available from producer to higher trophic levels, i.e.  $T_1 > T_2 > T_3 > T_4$  (energy). This is because at each trophic level, a large portion of energy is utilised for the maintenance of organisms at that trophic level and some are lost as heat and only about 10 percent is available to next trophic level and stored as biomass.

24. Following methods could be applied to reduce the intake of pesticides:

- i. Minimise the use of pesticides, and use other methods to control pests
- ii. Consuming washed fruits and vegetables which will wash away the harmful pesticides
- iii. Developing vegetarian feeding habits as biological magnification of a harmful chemical increases with increasing trophic level. (i.e. feed upon plants as plants belong to lower trophic level so, they have less accumulation of insecticides, whereas organisms of higher trophic level have higher concentration of insecticides and pesticides).

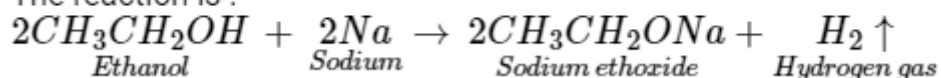
25. It is a concave mirror having focal length – 15 cm and radius of curvature – 30 cm.

**OR**

$$R = 2f \text{ or } f = \frac{R}{2}$$

The gas evolved is hydrogen.

The reaction is :



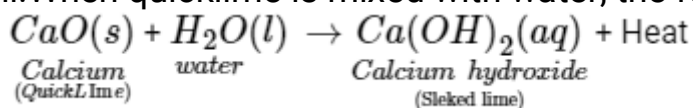
26.

### Section C

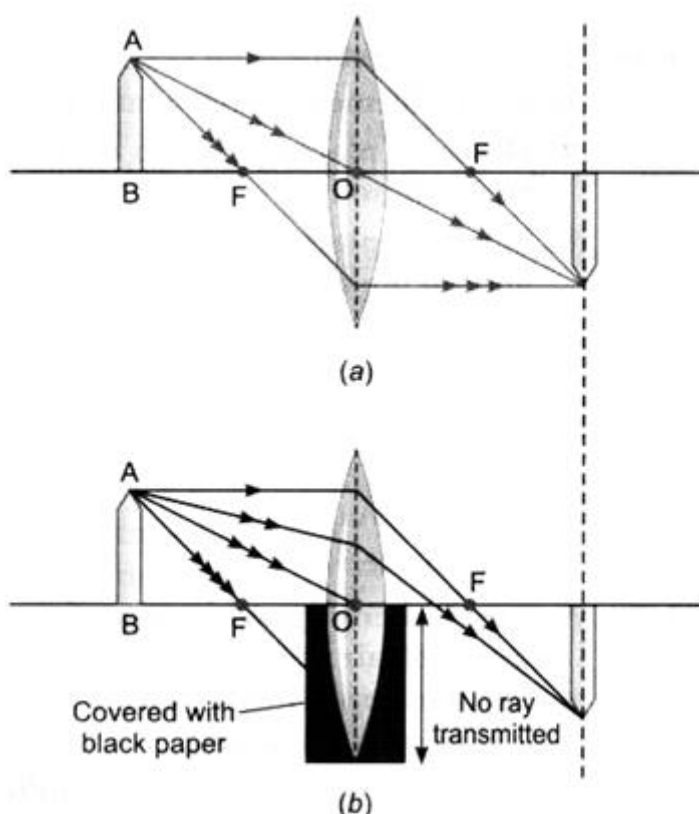
27.

- i. The substance whose solution in water is used for white washing is calcium oxide. Its formula is **CaO**.

ii. When quicklime is mixed with water, the following reaction takes place:



28.



Yes, even when one-half of a convex lens is covered with a black paper, the lens will produce a complete image.

Take a live candle, keep it in front of a convex lens mounted on an optical bench. Move the candle along the axis of bench and take its full image on a screen. Now cover the lower half of lens with a black paper without changing the positions of candle, lens and screen.

You will observe that full image of candle is still seen on the screen, but the intensity of image is reduced. The reason is that a large number of rays incident on the lens are blocked. In the case of covered lower half of lens with black paper, the rays that

are emerging from candle and incident on lens are refracted from upper part only and form the full image.

29.

- i. Yes, it is necessary to go through the blood reports of the boy. It indicates about his physical fitness and ensures that he is free of any STD.
- ii. Rohini is vigilant, cautious, intelligent, and sensible.
- iii. Gonorrhoea caused by *Neisseria gonorrhoeae*, AIDS caused by HIV (Human Immunodeficiency Virus), Syphilis caused by *Treponema pallidum* are common STDs.

OR

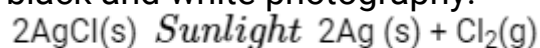
| Part      | Function   |
|-----------|--|
| A- Anther | Formation of pollen grains and storing it till pollination starts.   |
| B- style  | Connecting stigma to ovary. Where pollen grains stuck to stigma, grows its pollen tube to facilitate the movement of 2 male gametes. |
| C- Ovary  | Contains ovule which develop into seeds after fertilization of male and female gamete, while ovary forms the fruit.                  |

30. A camera in many ways is similar to the human eye as both eye and camera has convex lens. But, there are some basic differences in image formation between the two as follows:

- i. In camera, the distance between the lens and the screen can be adjusted but not the focal length of the lens. However, in eye, the ciliary muscles adjust the focal length keeping the distance between the lens and the retina constant.
- ii. The image formed on the retina is temporary and its impression is recorded in the brain as memory. However, the image formed on the film of camera is a permanent record.

31.

- In this reaction, we will observe that the white colour of Silver chloride changes to Greyish white due to the formation of Silver metal. The decomposition of silver chloride is caused by light. This reaction is used in black and white photography.

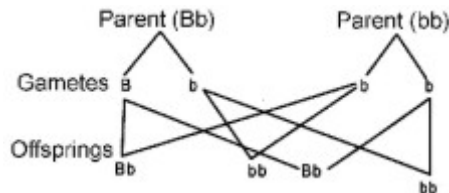


- Decomposition reaction / Photolytic decomposition.

32.

- a. Genotype of man: Bb (Heterozygous)  
Genotype of mother: bb  
(homozygous recessive)
- b. Possible genotype of his father: Bb (Heterozygous) or BB (homozygous dominant)
- c. Cross between heterozygous man and homozygous recessive blue-eyed woman Bb x bb  
50% Blue-eyed  
50% Brown eyed.

The ratio obtained is 1 : 1 it is an example of test cross also.



OR

- i. Genetics is the study of mechanism by which variations are created and inherited. These variations are far more in sexual reproduction due to crossing over in meiosis and also new diploid recombination.
- ii. Evolution is used for studying the development of new species of organisms from the existing ones through accumulation of variation.

33.

- i. The eye suffering from myopia or short-sightedness, has long eyeball than that of normal eye due to which the retina is at a larger distance from the eye lens thus image formation occurs before retina rather than onto it.
- ii. The eye suffering from hypermetropia or long-sightedness has short eyeball than that of normal eye due to which the retina is at smaller distance from the eye lens thus, the formation of the image occurs behind the retina and not on retina.

### Section D

34.

- a. When aluminium (Al) is placed in nitric acid ( $\text{HNO}_3$ ), a layer of aluminium oxide is formed on the metal. This happens because nitric acid is a strong oxidizing agent. The layer of aluminium oxide prevents further reaction of aluminium. This is the reason why the reactivity of aluminium decreases.
- b. Sodium and magnesium have a tendency to react with oxygen rather than carbon because these are highly reactive metals. Hence, carbon cannot reduce the oxides of Na or Mg.
- c. Ionic compounds do not conduct electricity in the solid-state but they conduct electricity in aqueous solution and in the molten state due to high concentration of free electrons. This property is shown by sodium chloride as it is an ionic compound.
- d. Iron articles are galvanized to prevent them from rusting. After galvanization, the layer of zinc works as a protective layer. The most common type is hot-dip galvanizing. In this process, iron parts are submerged in a bath of molten zinc.
- e. Metals such as Na, K, Ca and Mg are highly reactive metals and hence they are not found in their free state in nature.

OR

i.

| Metal  | Symbol | Atomic number | Electronic configuration K, L, M, N | No. of outermost electrons | Electron dot structures |
|--------|--------|---------------|-------------------------------------|----------------------------|-------------------------|
| Sodium | Na     | 11            | 2, 8, 1                             | 1                          | Na.                     |

| Metal     | Symbol | Atomic number | Electronic configuration K, L, M, N | No. of outermost electrons | Electron dot structures |
|-----------|--------|---------------|-------------------------------------|----------------------------|-------------------------|
| Oxygen    | O      | 8             | 2,6                                 | 6                          | :O::                    |
| Magnesium | Mg     | 12            | 2,8, 2                              | 2                          | Mg:                     |

### Formation of $Na_2O$ :

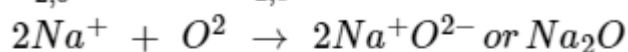
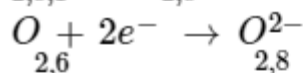
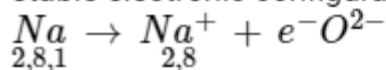
The atomic number of sodium is 11 and it has only one valence electron.

Hence, electronic configuration of  ${}_{11}Na$  is 2, 8, 1.

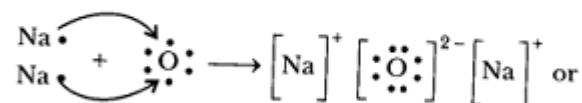
The atomic number of oxygen is 8 and it has 6 electrons in its valence shell.

Hence, electronic configuration of  ${}_8O$  is 2, 6.

Sodium has a tendency to lose the valence electron and oxygen has a tendency to gain the electron lost by sodium. Since, sodium can lose only one electron of the valence shell, and oxygen atom needs two electrons to complete its octet in the valence electron, two atoms of sodium combine with one atom of oxygen. By losing valence electron, sodium is changed into  $Na^+$  and by gaining two electrons lost by two sodium atoms, oxygen atom is changed into an oxide anion,  $O^{2-}$ . In this process, both the atoms, sodium and oxygen, obtain the stable electronic configuration of the noble gas neon.



The oppositely charged sodium ion,  $Na^+O^{2-}$  and oxide ion,  $O^{2-}$  are now held together by electrostatic force of attraction or by ionic or electrovalent bond.  $Na_2O$  is, therefore, an ionic or electrovalent compound.



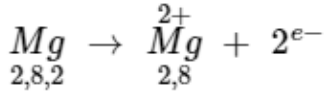
### Formation of $MgO$ :

The atomic number of magnesium = 12

Its electronic configuration is  $K, L, M$   
2, 8, 2



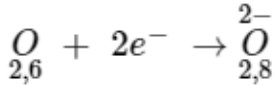
It has two electronic in its outermost shell. So, the magnesium atom donates its 2 valence electrons and forms a stable magnesium ion,  $Mg^{2+}$  to attain the electronic arrangement of neon atom.



The atomic number of oxygen = 8

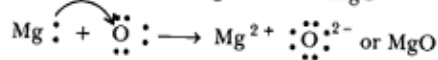
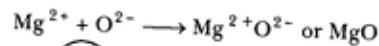
Electronic configuration =  $K, L$   
 $\begin{matrix} 2 & 6 \end{matrix}$

It has 6 electrons in its valence shell. Therefore, it requires 2 more electrons to attain the stable electronic arrangement of neon gas. Thus, oxygen accepts 2 electrons donated by magnesium atom and forms a stable oxide ion,  $O^{2-}$



The oppositely charged magnesium ions,  $Mg^{2+}$ , and oxide ions, are held together by a strong force of electrostatic attraction to form magnesium oxide compound.

$Mg^{2+} O^{2-}$  or  $MgO$ .

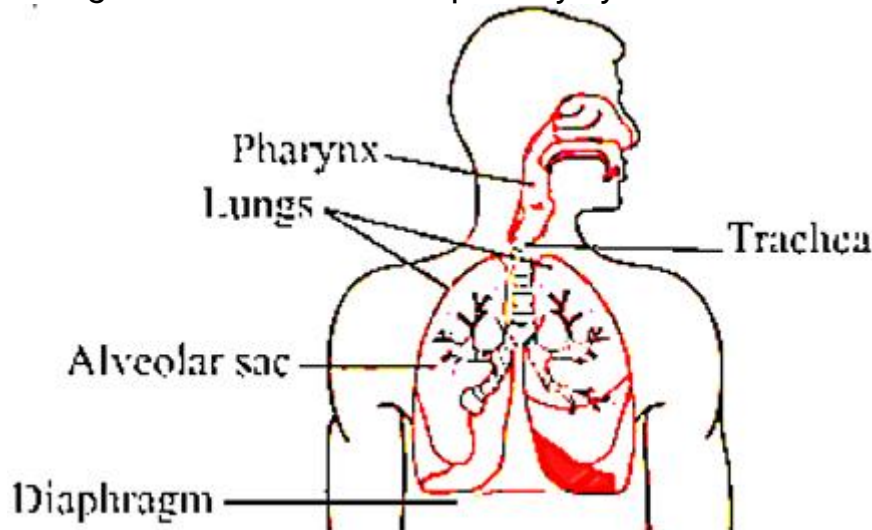


MgO is ionic compound.

- iii. The ions present in  $Na_2O$  are sodium ions ( $2Na^+$ ) and oxide ion  $O^{2-}$ .  
 The ions present in  $MgO$  are magnesium ion ( $Mg^{2+}$ ) and oxide ion  $O^{2-}$ .

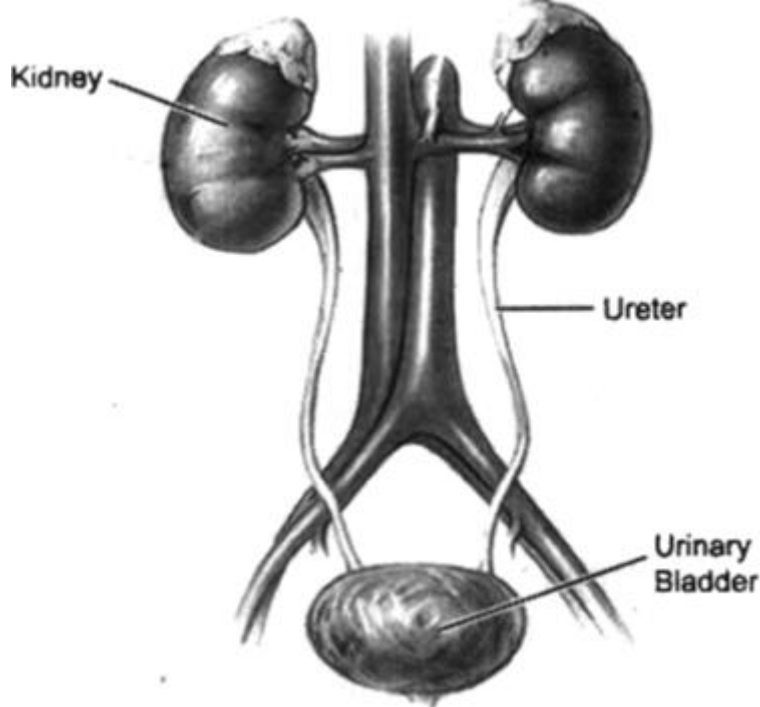
35. i) Aquatic animals take in the oxygen dissolved in water. The amount of dissolved oxygen in water is fairly low compared to the amount of oxygen in the air. Therefore, the rate of breathing in aquatic organisms is much faster than in terrestrial organisms because the amount of dissolved oxygen in the water is much less than the amount on land, So they have to breathe more in order to get more oxygen.

ii. Diagram of the human respiratory system



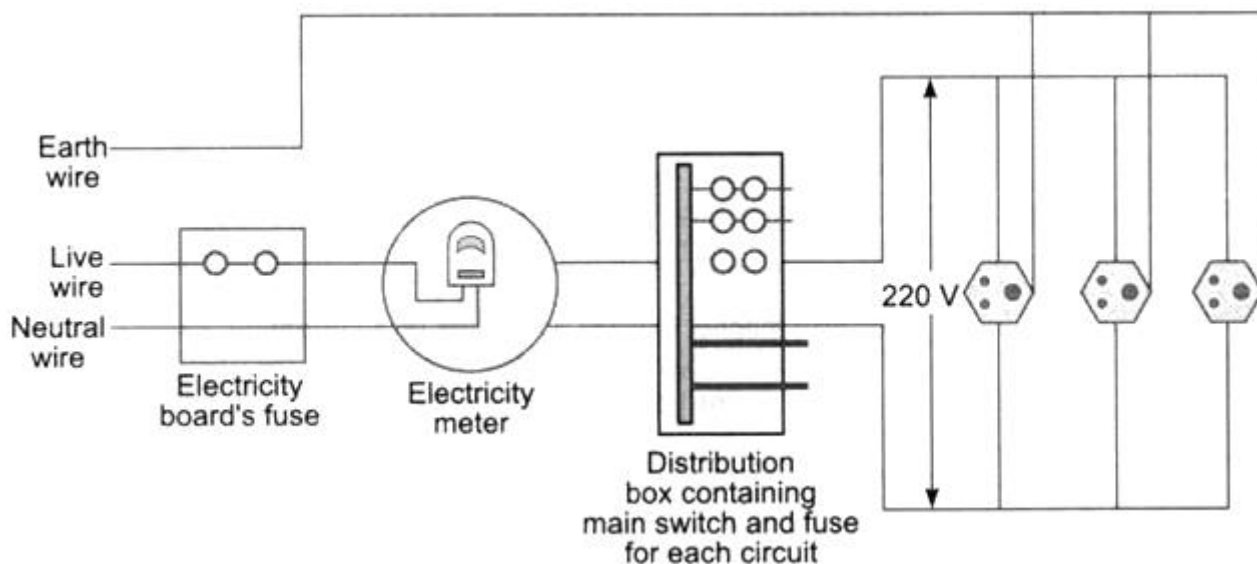
OR

- i. The process of removing toxic waste from the human body is called excretion.
- ii. The nephron is the basic filtration unit present in the kidney.



iii.

- a. Kidney
- b. Ureter
- c. Urinary Bladder



36. A fuse in a circuit prevents damage to the appliances and the circuit due to overloading. Otherwise, the appliances or the circuit may be damaged. When current in the circuit exceeds the value of fuse rating, the fuse wire burns due to overloading. This causes a gap in the circuit and the current stops flowing in the circuit. This is done due to the reason so that the circuit or the appliances to be connected in the circuit continue functioning without any damage in future.

## Section E

- 37.
- i. The law implies that heat produced in a resistor is
    - a. directly proportional to the square of current for a given resistance,
    - b. directly proportional to resistance for a given current, and
    - c. directly proportional to the time for which the current flows through the resistor.

- ii. Firstly, we calculate the current flowing through it, using the relation  $I = V/R$ . Then we apply the formula  $H = I^2Rt$  to calculate the heating effect.

**OR**

Heat produced,  $H = VIt$

38.

i. Reflex Action is an unconscious, automatic and involuntary response of efforts, i.e., muscles and glands, to a stimulus, which is monitored through the spinal cord. Reflex action is controlled by the spinal cord.

ii. Yes, reflex action involves all parts of the voluntary nervous system.

iii. The part of the autonomic nervous system that controls involuntary actions are controlled or regulated by medulla (hindbrain).

**OR**

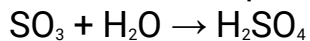
'Beating of heart muscle' is an example of involuntary action. Involuntary actions are slower than reflex actions.

39.

i. An exothermic reaction is a chemical reaction that releases energy through light or heat.

ii. Mixing of acid with water is a highly exothermic reaction.

iii. When sulphur trioxide (acidic oxide) is dissolved in water, an exothermic reaction takes place with the formation of sulphuric acid.



**OR**

Since the process of dissolving an acid in water is exothermic, it is always recommended that acid should be added to water. If it is done the other way, then it is possible that because of the large amount of heat generated, the mixture splashes out and causes burns.