

**PRE-BOARD SOLUTION**

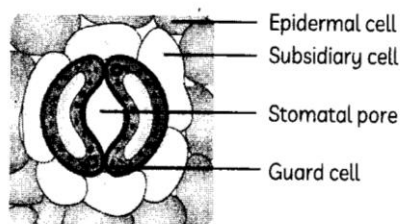
**SECTION - A**

1. (a) Sodium reacts violently with cold water.

**Explanation:** Metals like sodium and potassium react violently with cold water and the reaction is so exothermic that the hydrogen evolved may even catch fire. Therefore, small pieces of sodium are not thrown into a sink in the laboratory.

2. (b) A – Epidermal cell, B – Subsidiary cell, C – Stomatal pore, D – Guard cell

**Explanation:** Structure of Stomata



 **Related Theory**

- ↳ **Stomatal pore:** These are tiny pores present on leaf surface and green parts of plants, that help in gaseous exchange, transpiration and photosynthesis.
- ↳ **Guard cell:** Helps in opening and closing of stomatal aperture.
- ↳ **Subsidiary cells:** These are the cells that surround guard cells and may provide mechanical support to guard cell that facilitates guard cell movements. They can also act as a reservoir for water and ions.
- ↳ **Epidermal cell:** Forms the outermost layer of plants. The epidermis and its waxy cuticle provide protection against mechanical injury, water loss, and infection.

As pancreas releases enzyme and hormone so it is termed as endocrine gland.

 **Related Theory**


- ↳ Human gonads testes and ovary perform two functions – laying of gametes (in females, it is ovum and in male it is sperm) and secretion of hormones – testosterone in males and oestrogen in females.

- (c) Both (a) and (b)

**Explanation:** Ionic compounds are generally crystalline solids and hard due to the strong force of attraction between the positive and negative ions. They are generally brittle.

**Related Theory**

Ionic compounds are formed by the transfer of electrons from one atom to another.

 **Caution**

- ↳ Students should know that ionic compounds consist of ions and not molecules. They have strong forces of attraction between the oppositely charged ions and hence are generally crystalline solids.

4. (h)  $C_2H_4$ ;  $C_3H_6$ ;  $C_4H_8$ ;  $C_5H_{10}$

**Explanation:**  $C_2H_4$ : The next homologue will be  $C_3H_6$ . As it is in the form of  $C_nH_{2n}$ .

$C_4H_8$ : Here it will be  $C_5H_{10}$  as it is in the form of  $C_nH_{2n-2}$ .

So a simple logic is to find the relationship between the subscript of carbon and hydrogen and then increase the value of n(subscript of carbon) by 1 to get the homologue series.

5. (d) Multiple fission

→ **Explanation:** Multiple fission involves the ability of a cell to divide into several cells during

reproduction. *Plasmodium* divides by repeated division of cell to produce many daughter cells simultaneously.



**Related Theory**

→ **Budding:** A mode of asexual reproduction in which a new organism develops from a small part of the parent's body, which is termed as a bud. The bud which is formed, detaches from the parent's body to develop into a new organism.

→ **Binary fission:** A type of asexual reproduction, usually found in prokaryotes like bacteria and a few single-celled eukaryotes. In this, there is a division of the parent cell into two new daughter cells.

→ **Spore formation:** It is a method of asexual reproduction, which involves formation of spores stored in sacs called sporangia. When these sporangia burst, minute single-celled, thin or thick-walled structures called spores are dispersed and these develop into a new plant under suitable conditions.

6. (b) 8 Ohm-metre

**Explanation:** Resistance  $R$  of a wire of length  $l$ , area of cross section  $A$  and resistivity  $\rho$  is

given by  $R = \rho \frac{l}{A}$ .

Therefore,  $\rho = RA/l$ .

Here,  $R = \frac{V}{I} = \frac{200}{5}$  Ohm

$= 40$  Ohm

$\rho = \frac{RA}{l} = 40 \times \frac{2}{10}$

$= 8$  Ohm-m

7. (c) (II) and (III)

**Explanation:** It is observed that as the object is brought closer to the principal focus from infinity, the image distance also increases.

Also, the image distance is equal to the object distance when object distance is  $2f$ , where  $f$  is the focal length of the mirror.

8. (c) to provide efficient supply of oxygen

**Explanation:** Mammals and birds have high energy needs for their life processes and hence the separation of oxygenated and deoxygenated blood allows a highly efficient supply of oxygen to the body.

9. (a) Hotter air is lighter than the cooler air.

**Explanation:** The hotter air in the atmosphere

is lighter than the cooler air and has a refractive index slightly less than that of the cooler air. The refractive index of the upper hotter atmosphere is therefore less than the cooler layers of atmosphere below it.

10. (b) Pepsin: Produced by gastric gland; Trypsin: Produced by pancreas

**Explanation:** Pepsin is produced in the stomach by gastric glands. It acts in an acidic medium. Trypsin is produced by the pancreas which acts in an alkaline medium.



**Caution**

→ Students usually make mistake and write option (a) as answer. Trypsin works in small intestine but is produced by pancreas not small intestine.

11. (c) Cerebellum

**Explanation:** Cerebellum maintains the posture and balance of body. Hypothalamus and pituitary gland of mid brain help in chemical co-ordination whereas fore-brain is associated with the voluntary action of muscles.

12. (c) Third

**Explanation:** The food chain can be represented as : Grass → Insect → Frog → Snake. Frog occupies the third trophic level.

13. (d) (II) and (IV)

**Explanation:** Some ways to reduce the problem of waste disposal are as follows:

- (1) By proper segregation of waste before disposing off.
- (2) By usage of more biodegradable waste.
- (3) By composting of biodegradable waste.
- (4) By recycling the non biodegradable waste

14. (d) Both (II) and (IV)

**Explanation:** As the resistance is given by  $R = \rho \frac{l}{A}$ , where  $l$  is the length of the wire and  $A$  is

the area of cross section,  $R = \rho \frac{l}{\pi r^2}$ .

This shows that  $R \propto L$  and  $R \propto \frac{1}{r^2}$

15. (b) 80 ml

**Explanation :** 50 ml of NaOH neutralizes 40 ml of HCl solution.

Therefore, 100 ml of NaOH will neutralize

$$= \frac{40}{50} \times 100 = 80 \text{ ml}$$

16. (c)  $4l$

**Explanation:** Let  $l'$  be the length of the other wire of cross section radius  $2r$ . As both the wires are of same material, their resistivity will be equal.

$R = \rho \frac{l}{A}$  for wire with cross section  $r$  and length  $l$

$$R = \rho \frac{l}{\pi r^2} \quad \dots(i)$$

For wire with cross section ' $2r$ ' and length ' $l'$ '

$$R = \rho \frac{\rho l_1}{\pi(2r)^2} \quad \dots(ii)$$

$$\text{So, } \frac{\rho l}{r^2} = \frac{\rho l_1}{(2r)^2}$$

$$l_1 = 4l$$

17. (b) Both A and R are true but R is not the correct explanation of the A.

**Explanation:** Concave mirrors are used as reflectors because when a lighted bulb is placed at the focus of a concave mirror, then

the concave mirror produces a powerful beam of parallel light rays. This helps us see things upto a considerable distance in the darkness of night.

18. (d) A is false R is true

**Explanation:** The currents in each of the solenoid's turns are parallel and flow in the same direction when the solenoid is operating. The turns of the solenoid will attract each other because the currents flowing through parallel wires in the same direction cause a force of attraction between them. As a result, the solenoid tends to contract.

19. (a) Both A and R are true and R is correct explanation of the A.

**Explanation:** Charges (or electrons) in motion are equivalent to an electric current. These charges interact magnetically. The magnetic needle interacts with the magnetic field created by the current and is deflected.

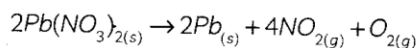
20. (c) A is true but R is false.

**Explanation :** Inheritance from the previous generation provides both a common body design and subtle changes in it due to inaccuracies during DNA copying. However, greater diversity will be generated if sexual reproduction is involved.

## SECTION - B

21. The white compound is lead nitrate and brown fumes are of nitrogen dioxide and yellow residue is lead oxide.

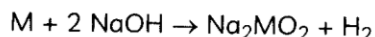
The chemical equation of the reaction taking place is :



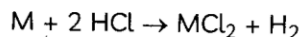
The type of reaction is decomposition reaction.

22. The gas that is released is hydrogen gas, to be precise. Bring a burning matchstick close to the gas being evolved to check for the presence of hydrogen gas; if the matchstick burns with a pop sound, the gas is present. It demonstrates how hydrogen gas has evolved.

Reaction with NaOH:



Reaction with HCl:



23. The colour of the scattered light depends on the size of the scattering particle.

Very fine particles scatter mainly light of shorter wavelengths such as blue light

whereas particles of larger size scatter light of longer wavelengths such as red light.

OR

Danger lights are red in colour as red light is least scattered by fog or smoke particles present in atmosphere due to longer wavelength of red.

If danger lights were blue in colour, they would be easily scattered by the smoke, dust and other fine particles present in the atmosphere due to which they would not be seen at a distance.

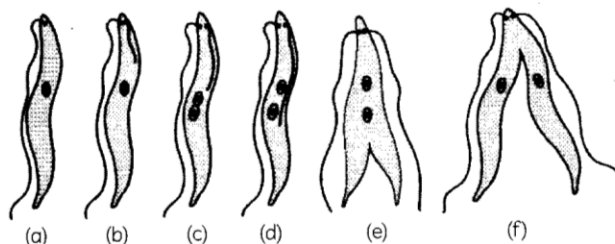
24. Variations refers to the differences in traits among the individuals of a species.

Variations are beneficial to the species and not necessarily for the individual because

- (1) It gives better chance of survival to some organisms in changing environment as they may have favourable variations.
- (2) It forms the basis for heredity.
- (3) It ultimately leads to formation of new species.

OR

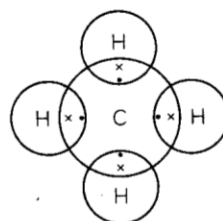
- (A) The organism which causes Kala-azar is *Leishmania*. *Leishmania* reproduces asexually by binary fission.
- (B) Diagram showing binary fission in *Leishmania*:



25. Although in  $F_1$  generation only the tall plants appear, both the tallness and dwarfness

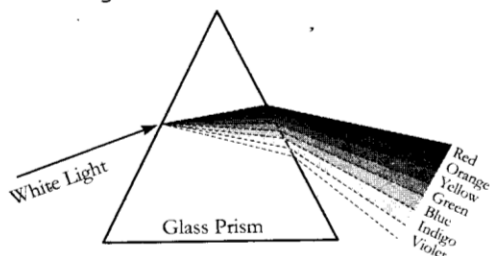
traits are inherited in the  $F_1$  plants but as the tallness trait is dominant, it is expressed, whereas, dwarfness trait being recessive is not expressed. It is expressed in  $F_2$  generation. The phenotypic ratio of tallness and dwarfness in  $F_2$  generation is 3 : 1.

26. Example of organic compound which is present in biogas is methane ( $CH_4$ ).  
Electron dot structure of methane ( $CH_4$ ):



## SECTION - C

27. A beam of white light falling on a glass prism gets split up into seven colours as shown in the diagram:



- (A) The colours at position marked 3 and 5 are yellow and blue respectively whereas the student identified them as blue and yellow. Hence, the statement made by the student is incorrect.

Different colours of light bend through different angles with respect to the incident ray, as they pass through the prism. The red light bends the least while the violet the most.

- (B) (i) Position 7 is the position of violet colour, which corresponds to the colour of a solution of potassium permanganate.
- (ii) Position 1 is the position of red colour, which corresponds to the colour of 'danger' or stop signal lights.

OR

The speed of light is minimum in medium D and maximum in A.

This is because the refractive index of a medium is the ratio of speed of light in vacuum to the speed of light in that medium.

So, refractive index of a medium is inversely proportional to the speed of light.

As refractive index of D is the maximum, speed of light in D will be minimum.

Similarly, as refractive index of A is minimum, speed of light will be maximum in A.

Refractive index of medium 2 with respect to

$$\text{medium 1 is given by } n_{21} = \frac{n_1}{n_2}$$

Therefore, refractive index of A with respect to B is given by  $n_{BA} = 0.92$

28. (A) As the surface area of a big piece of zinc is less as compared to zinc granules.
- (B) No reaction will take place as copper is less reactive than zinc and hydrogen gas will not evolve.
- (C) Hydrogen gas is not evolved when a metal reacts with nitric acid because  $HNO_3$  is a strong oxidizing agent. It oxidizes the  $H_2$  produces to water and itself gets reduced to any of the nitrogen oxides ( $N_2O$ ,  $NO$  or  $NO_2$ )
29. (A) Digestion of food in our body is decomposition reaction. A decomposition reaction is a type of reaction in which a single compound breaks down into two or more elements or a new compound.

### Related Theory

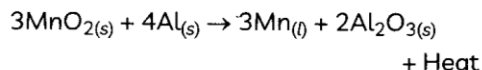
→ Digestion is considered a decomposition reaction because enzymes in the stomach and small intestine break down larger molecules into smaller molecules.

- (B) Rusting of iron is an oxidation reaction. Oxidation is the process which involves gain of oxygen or loss of hydrogen or which involves loss of electrons during a reaction.

## ☞ Related Theory

- ☞ Rusting of iron is considered an oxidation reaction, because iron reacts with oxygen molecules of air in the presence of moisture/water and rust is formed. Rust consists of hydrated iron (III) oxides  
i.e.  $Fe_2O_3 \cdot nH_2O$ .

(C) Heating of manganese dioxide with aluminium powder is single displacement reaction. A reaction in which more reactive element displaces the less reactive element from its compound is known as single displacement reaction.



In this reaction Al is used as reducing agent as it displaces Mn from  $MnO_2$  and Al metal is also more reactive than Mn metal.

**30.** (A) Resistors in the circuit are connected in parallel combination.

(B) (i) Let  $I_1$  be the current flowing through  $R_1 = 10 \text{ Ohm}$

$$\text{Now } I_1 R_1 = V$$

$$I_1 = \frac{V}{R_1} = \frac{5}{10} = 0.5A$$

(ii) Let  $I_2$  be the current flowing through  $R_2 = 15 \text{ Ohm}$

$$\text{Now } I_2 R_2 = V$$

$$I_2 = \frac{V}{R_2} = \frac{5}{15} = 0.33A$$

(C) Ammeter reading will be 0.83 A, which is the sum of currents flowing through  $R_1$  and  $R_2$  as they are connected in parallel.

This can also be done like this:

Since resistors are connected in parallel

$$\begin{aligned} \frac{1}{R} &= \frac{1}{R_1} + \frac{1}{R_2} \\ &= \frac{1}{10} + \frac{1}{15} \\ &= \frac{3+2}{30} \\ &= \frac{5}{30} \text{ or } \frac{1}{6} \Omega \end{aligned}$$

As per Ohm's law  $V = IR$

$$I = \frac{V}{R} = \frac{5}{6} = 0.83A$$

**31.** (A) The type of seeds produced in  $F_1$  generation is  $RrYy$  or Round, Yellow seeds.

(B) The type of seeds that were in the ratio 9 : 3 : 3 : 1 in  $F_2$  generation is given below:

Round Yellow: 9

Round Green: 3

Wrinkled Yellow: 3

Wrinkled Green : 1

(C) The cross obtained after self pollination of  $F_1$  progeny is as follows :

|                |                         |                         |                            |                            |
|----------------|-------------------------|-------------------------|----------------------------|----------------------------|
|                | Round Yellow            |                         | Wrinkled Green             |                            |
|                | P                       | RRYY                    | x                          | rryy                       |
|                | Gametes                 | (RY)                    |                            | (ry)                       |
|                | F <sub>1</sub>          | RrYy                    |                            |                            |
|                |                         | (Dihybrid)              |                            |                            |
|                | Gametes                 | (RY)                    | (Ry)                       | (rY)                       |
|                |                         | (ry)                    |                            |                            |
| F <sub>2</sub> | Round Yellow (selfed)   |                         |                            |                            |
|                | RY                      | Ry                      | rY                         | ry                         |
| RY             | RRYY<br>Round<br>Yellow | RRYy<br>Round<br>Yellow | RrYY<br>Round<br>Yellow    | RrYy<br>Round<br>Yellow    |
| Ry             | RRYy<br>Round<br>Yellow | RRyy<br>Round<br>Green  | RrYy<br>Round<br>Yellow    | Rryy<br>Round<br>Green     |
| rY             | RrYY<br>Round<br>Yellow | RrYy<br>Round<br>Yellow | rrYY<br>Wrinkled<br>Yellow | rrYy<br>Wrinkled<br>Yellow |
| ry             | RrYy<br>Round<br>Yellow | Rryy<br>Round<br>Green  | rrYy<br>Wrinkled<br>Yellow | rryy<br>Wrinkled<br>Green  |

**32.** (A) First identify the waste as biodegradable and non-biodegradable waste and use two different dustbins according to being biodegradable or not. We can take blue for non-biodegradable and green for biodegradable. Biodegradable waste can be composted and turned into manure as it is decomposed by micro organisms easily.

Non-biodegradable waste should be collected and disposed off at right place so that it can be recycled.

(B) **Biodegradable waste**      **Non-biodegradable waste**

Used tea leaves      Plastic bag

Leather bag

Jute bag

**33.** (A) The functions of kidneys are :

- (1) To remove nitrogenous waste from the blood.
- (2) To maintain salt and water balance in the body.

- (B) The filtration units present in the kidneys are nephrons.
- (C) Two substances which are selectively

reabsorbed from nephric filtrate into the blood are glucose, amino acids, salts and a major amount of water.

## SECTION - D

34. (A) Thyroid secretes thyroxin.

Function: It plays an important role in the regulation of the basal metabolic rate.

Parathyroid secretes Parathyroid hormone (PTH, also known as parathormone).

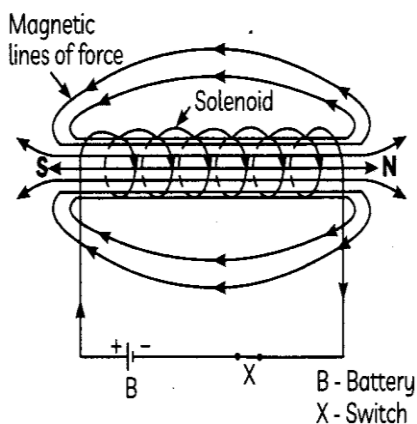
Function: The maintenance of the parathyroid hormone is necessary for the proper operation of the nervous and muscular systems. It regulates the levels of calcium and potassium in the blood.

Pancreas secrete insulin and glucagon. Function of insulin: Insulin is essential for maintaining the homeostasis of blood glucose levels.

Function of glucagon: it aids in keeping blood sugar levels normal.

- (B) One of the important parts of hind brain is cerebellum that controls and coordinates the movements of our body and helps in adjusting the posture. It functions even when the person is asleep.

35. The magnetic field lines around a current carrying solenoid is shown in the figure:

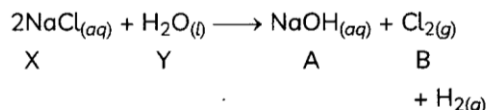


The field inside the solenoid is uniform as the field lines are in the form of parallel straight lines inside the solenoid. Magnetic field is the

same at all points inside the solenoid.

Solenoid can be used to magnetize a piece of magnetic material such as soft iron, when placed inside the coil due to the strong magnetic field produced inside the solenoid. The magnet so formed is called an electromagnet.

36. When electricity is passed through an aqueous solution of sodium chloride (called brine), it decomposes to form sodium hydroxide. The process is called the chlor-alkali process because of the products formed- chlor for chlorine and alkali for sodium hydroxide.



Chlorine gas is given off at the anode, and hydrogen gas at the cathode. Sodium hydroxide solution is formed near the cathode. The compound X is NaCl or sodium chloride, Y is NaOH or sodium hydroxide, which is a strong base.

Gas A is hydrogen gas and gas B is chlorine gas, which is used in the manufacture of bleaching powder.

Bleaching powder is produced by the action of chlorine on dry slaked lime  $[\text{Ca}(\text{OH})_2]$ . Chemical equation for formation of bleaching powder is :

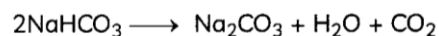


OR

- (A) The sodium compound which is also used in soda-acid fire extinguisher is sodium hydrogencarbonate or  $\text{NaHCO}_3$ . Therefore, X is  $\text{NaHCO}_3$ .

When sodium hydrogencarbonate is heated, it gives sodium carbonate,  $\text{Na}_2\text{CO}_3$ .

The reaction taking place is:

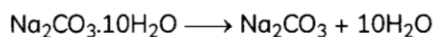


Therefore, Y is  $\text{Na}_2\text{CO}_3$ .

Sodium carbonate on crystallization forms washing soda or  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$  or Z.



(B) We can obtain Y from Z by heating Y:



(C) Uses of washing soda :

(1) It is used in the manufacture of sodium compounds such as borax.

(2) It is used for removing permanent hardness of water.

## SECTION - E

**37.** (A) A parabolic mirror is a type of concave mirror which does not suffer from any spherical aberrations and the rays of light which are parallel to the principal axis converge at a point called the principal focus, which lies in front of the mirror.

(B) Principal focus: It is the point on the principal axis of the mirror at which the rays of light incident on the mirror in a direction parallel to the principal axis meet after reflection (in case of concave mirror) or appear to diverge after reflection (in case of convex mirror). It is represented by the letter F.

Pole : The centre of a spherical mirror is called its pole (P).

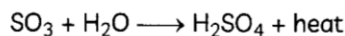
OR

(B) Centre of curvature : It is the centre of the hollow sphere of glass of which the mirror is a part. It lies in front of a concave mirror and behind a convex mirror.

Focal length : It is the distance between the pole and principal focus of the mirror

**38.** (A) Sulphuric acid

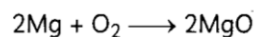
The reaction involved is:



(B) Element 'X' is carbon. Carbon forms

$\text{CO}_2$  on reaction with oxygen. During photosynthesis plants take in  $\text{CO}_2$ .

(C) Non-metals act as oxidising agents since they can accept electrons. Magnesium, being a metal, produces basic oxide in reaction with oxygen.



OR

(C) Carbon, nitrogen and sulphur are non-metals hence, they form covalent hydrides.

**39.** (A) The transport of soluble products of photosynthesis is called translocation and it occurs in phloem.

(B) Statement is false. Transpiration is a universal process that occurs in all plants. It does not involve root pressure but the water comes out from a plant in the form of water vapour.

(C) The effect of root pressure in transport of water is more important at night as during the day, transpiration pull is the major driving force in the movement of water in xylem.

OR

(C) Phloem transports soluble products of photosynthesis in plants. Translocation of food and other substances takes place in sieve tubes. Translocation in phloem is achieved by utilizing energy.