

#### SECTION - A

1. The F1 generation shows the dominant trait out of the parents' traits. Out of the given flower colours, violet is dominant. Hence, the F1 progeny will have violet flowers. **1 Mark**

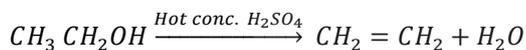
2. In a hydropower plant, water falls from a great height, and achieves a high speed before hitting the turbine. Hence the energy conversion is Potential to Kinetic to Electrical. **1 Mark**

3. X: Ethanol -  $CH_3CH_2OH$

Y: Ethene -  $CH_2 = CH_2$

Z: Hydrogen gas -  $H_2$

Formation of ethene:

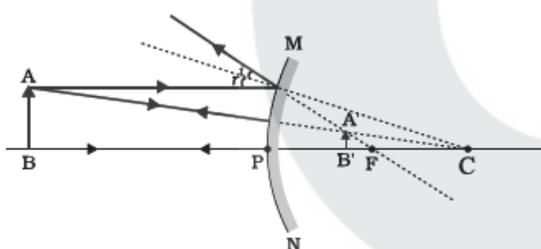


In the above reaction, conc. sulphuric acid is a dehydrating agent. **2 Marks**

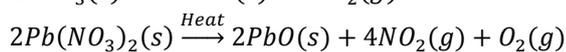
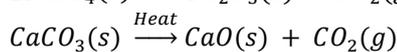
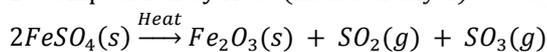
4. a) Gustatory receptor – tongue **½ Marks**  
 Olfactory receptor – nose **½ Marks**  
 b) a: cell body **½ Marks**  
 b: axon **½ Marks**

5. Convex mirror – as it always forms virtual images for objects placed anywhere.

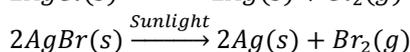
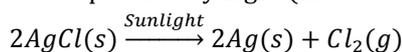
Ray diagram:



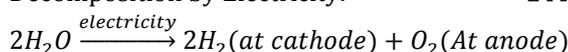
6. Decomposition by Heat (mention any 1): **1 Mark**



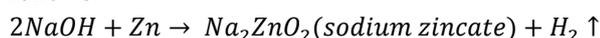
Decomposition by Light (mention any 1): **1 Mark**



Decomposition by Electricity: **1 Mark**

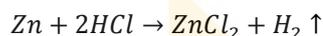


7. The reaction that takes place can be written as follows.



The gas evolved is  $H_2$ . It is bubbled through soap solution, and tested by bringing a burning candle close to a gas filled bubble. Pop sound indicates the presence of Hydrogen gas, as it burns with a pop sound.

If  $Zn$  reacts with a dilute solution of a strong acid, Hydrogen gas is released. The reaction is as shown below:



OR

The salt used in making pakoras crispy is Baking Soda ( $NaHCO_3$  or Sodium bicarbonate). Its formation occurs by the following equation -



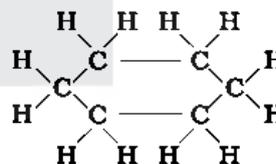
Uses of baking soda (mention any 2) -

- I. For making baking powder, which is used to make bread or cake soft and spongy.
- II. It also an ingredient in antacids. Being alkaline, it neutralises excess acid in the stomach and provides relief.
- III. It is also used in soda-acid fire extinguishers.

**3 Marks**

8. a) Most carbon compounds are covalent. In covalent bonds, since the electrons are shared between atoms and no charged particles are formed, covalent compounds are generally poor conductors of electricity.

- b) Cyclohexane: It has the formula  $C_6H_{12}$  and the following structure:



The number of single bonds in this structure are **24**. **3 Marks**

9. a. Thyroid secretes thyroxin hormone. Thyroxin regulates carbohydrate, protein and fat metabolism in the body so as to provide the best balance for growth.
- b. Pituitary gland secretes the growth hormone. Growth hormone regulates growth and development of the body.
- c. Pancreas secretes insulin. Insulin helps in regulating blood sugar levels. **1 Mark each**

10. Asexual reproduction involves only one parent, while sexual reproduction involves two parents.

Species reproducing sexually have a better chance of survival.

The sexual mode of reproduction incorporates a process of combining DNA from two different individuals during reproduction. Combining variations from two or more individuals would thus create new combinations of variants. Now in a population, variations are useful for ensuring the survival of the species. Therefore, sexual reproduction, that allows more and more variation, creates higher chances of survival. **3 Marks**

11. The following are the laws of refraction of light.

i) The incident ray, the refracted ray and the normal to the interface of two transparent media at the point of incidence, all lie in the same plane.

ii) The ratio of sine of angle of incidence to the sine of angle of refraction is a constant, for the light of a given colour and for the given pair of media. If medium 1 is vacuum or air, then the refractive index of medium 2 is considered with respect to vacuum. This is called the absolute refractive index of the medium. It is simply represented as  $n_2$  or  $n_m$

If  $c$  is the speed of light in vacuum and  $v$  is the speed of light in the medium, then, the refractive index of the medium  $n_m$  is given by

$$n_m = \frac{\text{Speed of light in air}}{\text{Speed of light in the medium}} = \frac{c}{v} \quad \mathbf{3 \text{ Marks}}$$

**OR**

The degree of convergence or divergence of light rays achieved by a lens is expressed in terms of its power. The power of a lens is defined as the reciprocal of its focal length. The SI unit of power of a lens is dioptre or D.

Lens 1:

$$f_1 = 40 \text{ cm} = 0.4 \text{ m}$$

Since the value of  $f$  is positive, the lens is converging in nature. Its power will be:

$$P_1 = \frac{1}{f_1} = \frac{1}{0.4} = 2.5D$$

Lens 2:

$$f_2 = -20 \text{ cm} = -0.2 \text{ m}$$

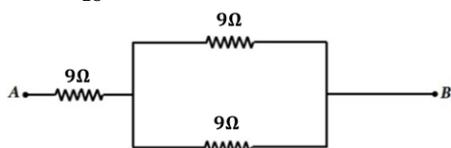
Since the value of  $f$  is negative, the lens is diverging in nature. Its power will be:

$$P_2 = \frac{1}{f_2} = -\frac{1}{0.2} = -5D$$

12. (i) When two  $9\Omega$  resistors are connected in parallel and the third resistor is connected in series to them, the equivalent resistance will be  $13.5\Omega$ .  **$\frac{1}{2}$  Mark**

This can be seen as:

$$\begin{aligned} R \text{ (resultant resistance)} &= 9 + \frac{(9 \times 9)}{9+9} \\ &= 9 + \frac{81}{18} = 9 + 4.5 = 13.5\Omega \end{aligned}$$

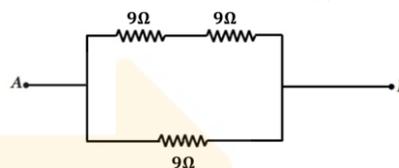


**1 Mark**

- ii. When two  $9\Omega$  resistors are connected in series and the third resistor is connected in parallel to them, the equivalent resistance will be  $6\Omega$ .  **$\frac{1}{2}$  Mark**

This can be seen as:

$$R \text{ (resultant resistance)} = \frac{18 \times 9}{18+9} = \frac{162}{27} = 6\Omega$$



**1 Mark**

**OR**

a) Joule's law of heating implies that heat produced in a resistor is (i) directly proportional to the square of current for a given resistance, (ii) directly proportional to resistance for a given current, and (iii) directly proportional to the time for which the current flows through the resistor.

b) We know that  $P = VI$

$$\text{So, } I = \frac{P}{V}$$

$$\text{Hence, } I_1 = \frac{P_1}{V} = \frac{100}{220} = \frac{5}{11} \text{ A}$$

$$\text{And, } I_2 = \frac{P_2}{V} = \frac{60}{220} = \frac{3}{11} \text{ A}$$

13. a. Resistance of a uniform metallic conductor is directly proportional to its length ( $l$ ) and inversely proportional to the area of cross-section ( $A$ ). **1 Mark**

b. In circuits using metallic wires, electrons constitute the flow of charges. Metals have loosely-held electrons within their atoms and the current flows because of the motion of these electrons in the metal. Glass, on the other hand, does not have any ions or electrons that can move to create a current. **1 Mark**

c. the resistivity of an alloy is generally higher than that of its constituent metals. Alloys do not oxidise (burn) readily at high temperatures. For this reason, they are commonly used in electrical heating devices, like electric iron, toasters etc. **1 Mark**

14. a. All garbage generated in an area should be collected properly;

Treating the biodegradable and non-biodegradable wastes separately **1 Mark**

b. Reducing usage of plastic disposables;

Using cloth shopping bags

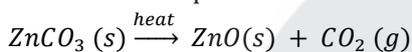
1 Mark

c. Eco-friendliness, responsibility, collaboration 1 Mark

15. A dam is a large water reservoir built over rivers for irrigation. Large dams can ensure the storage of adequate water not just for irrigation, but also for generating electricity. Canal systems leading from these dams can transfer large amounts of water great distances.

Main problems to be addressed during construction of large dams -

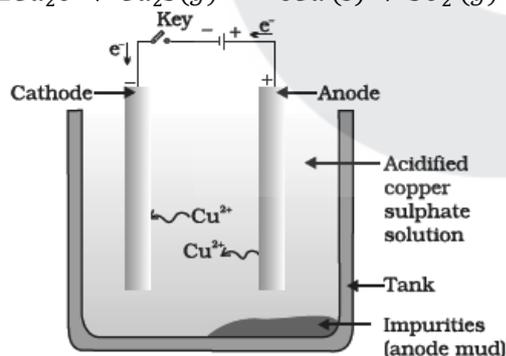
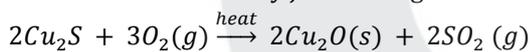
- Social problems because they displace large number of peasants and tribals without adequate compensation or rehabilitation,
  - Economic problems because they swallow up huge amounts of public money without the generation of proportionate benefits,
  - Environmental problems because they contribute enormously to deforestation and the loss of biological diversity.
16. a) Prior to reduction, the metal carbonates must be converted into metal oxides. The carbonate ores are changed into oxides by heating strongly in limited air. This process is known as calcination.



The metal oxides are then reduced to the corresponding metals by using suitable reducing agents such as carbon.



- b) Copper is found as  $\text{Cu}_2\text{S}$  in nature and can be obtained from its ore by just heating in air.



17. a) Limitations of Dobereiner's Triads: Dobereiner could arrange only 9 elements in triads and other elements could not be arranged.

Advantage - It was the first attempt at classifying elements

Limitations of Newlands octaves: It was assumed by Newlands that only 56 elements existed in nature and no more elements would be discovered in the future. But, later on, several

new elements were discovered, whose properties did not fit into the Law of Octaves.

Advantage - it could classify more elements than Dobereiner

Limitations of Mendeleev: No fixed position could be assigned to hydrogen in the table.

Advantage - he predicted the existence of some elements, which could easily be placed in his table later on

b) Henry Moseley

c) 'Properties of elements are a periodic function of their atomic number.'

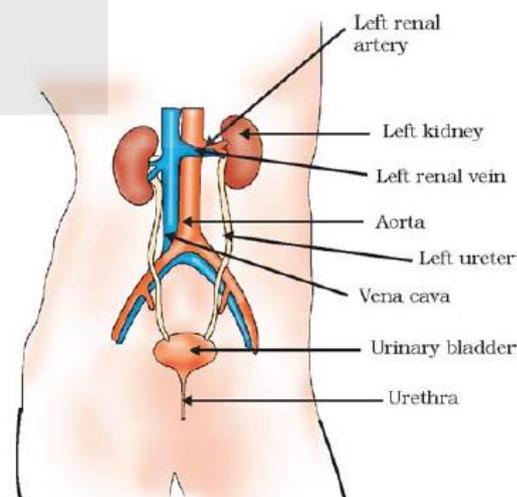
18. a) Platelets, white blood cells
- b) Oxygen-rich blood from the lungs comes to the thin-walled upper chamber of the heart on the left, the left atrium. While collecting blood, the left atrium relaxes. It then contracts, while the left ventricle, expands, so that the blood is transferred to it. When the muscular left ventricle contracts in its turn, the blood is pumped out to the body.
- c) Valves ensure that blood doesn't flow backwards, from ventricles to atrium.

d)

Arteries	Veins
1. They have thick elastic walls.	1. These have thinner walls compared to arteries.
2. These do not have valves.	2. They have valves.

OR

- a) The biological process involved in removal of harmful metabolic waste like excess of water, salts and toxic wastes (like urea and uric acid) from the body is called excretion.
- b) Nephrons
- c)



i) Kidneys

ii) Ureter

iii) Urinary bladder

19. a) i) Functions of human ovary:

- It produces female gamete (ovum).
- It secretes female hormones (estrogen and progesterone).

ii) Oviduct – help in transporting the egg

iii) Uterus – Supports the baby by giving it nutrition

b) Placenta is a disc- like special tissue embedded in the uterine wall through which the embryo gets nutrition from the mother's blood.

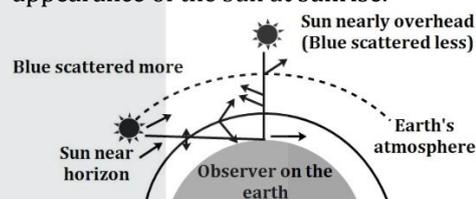
Placenta contains villi on the embryo's side of the tissue and blood spaces on the mother's side. This provides a large surface area for glucose and oxygen to pass from the mother to the embryo. The developing embryo generates waste substances which can be removed by transferring them into the mother's blood through the placenta.

20. a) Myopia. This defect may arise due to (i) excessive curvature of the eye lens, or (ii) elongation of the eyeball. This defect can be corrected by using a concave lens of suitable power.

b) The twinkling of a star is due to atmospheric refraction of starlight. The apparent position of the star is slightly different from its true position due to atmospheric refraction of starlight. Since, the atmosphere bends starlight towards the normal, the star appears slightly higher (above) than its actual position when viewed near the horizon. Further, this apparent position of the star is not stationary, but keeps on changing slightly, since the physical conditions of the earth's atmosphere are not stationary. Since the stars are very distant, they approximate point-sized sources of light. As the path of rays of light coming from the star goes on varying slightly, the apparent position of the star fluctuates and the amount of starlight entering the eye flickers – the star sometimes appears brighter, and at some other time, fainter, which is the twinkling effect.

OR  
a)

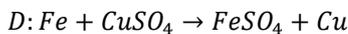
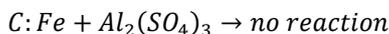
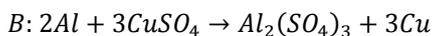
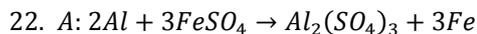
- I. Cornea: It is a transparent spherical membrane covering the front part of the eye. Light enters the eye through this membrane.
  - II. Iris: It is dark muscular diaphragm between the cornea and the lens. It controls the size of the pupil. It is the colour of the iris that we call the colour of the eye.
  - III. Eye lens: The eye lens is a transparent, biconvex structure in the eye that, along with the cornea, helps to refract light to be focused on the retina.
  - IV. Ciliary Muscle: They hold the lens in position and help in modifying the curvature of the lens.
- b) The reddish appearance of the sun at sunrise is due to scattering of light by the molecules of air and other fine particles in the atmosphere having size smaller than the wavelength of visible light. Light from the sun near the horizon passes through thicker layers of air and covers the larger distance in the earth's atmosphere before reaching our eyes and most of the blue light and shorter wavelengths are scattered away by the particles. So, only red light, being of higher wavelength reaches us which gives reddish appearance of the sun at sunrise.



This phenomena will not be observed on Moon, as there is no atmosphere hence no scattering.

21. a) Fleming's left-hand rule states that if you stretch the thumb, forefinger and middle finger of your left hand such that they are mutually perpendicular; and if the first finger points in the direction of magnetic field and the second finger in the direction of current, then the thumb will point in the direction of motion or the force acting on the conductor.
- b) An electric motor is based on the principle that when a rectangular coil is placed in a magnetic field and current is passed through it, two equal and opposite forces (on opposite sides) act on the coil which rotate it continuously.
- c) i) Armature: It is a rectangular coil ABCD having a large number of turns of thin insulated copper wire wound over a soft iron core. The armature is placed between the poles of the magnet and it can be rotated about an axis perpendicular to the magnetic field lines
- ii) Brushes: Two graphite or flexible metal rods maintain a sliding contact with split rings  $S_1$  and  $S_2$ , alternately.

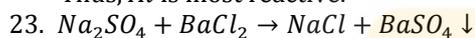
iii) Split ring commutator: As the coil rotates, the split rings also rotate about the same axis of rotation. The function of the split ring commutator is to reverse the direction of current in the coil after every half rotation



Out of the given elements, we can say about reactivity:



Thus, Al is most reactive.



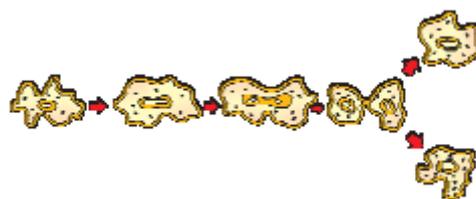
A white precipitate of  $BaSO_4$  is formed.

It is a double displacement and precipitation reaction.

24. Here are the steps that need to be taken:

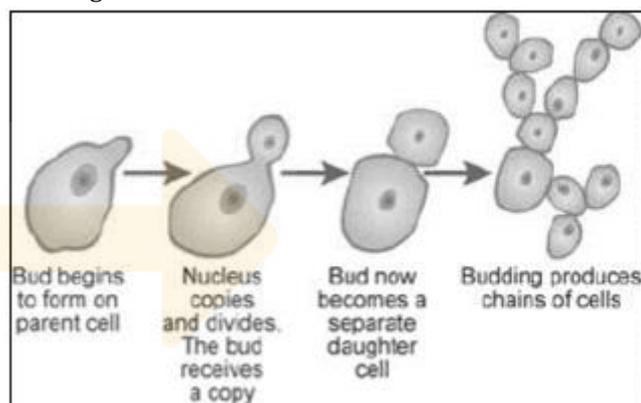
1. Pluck a fresh leaf from a balsam plant.
2. Fold the leaf and carefully tear along the bruised area of the lower side of the leaf.
3. We can see a colourless narrow border along the torn edge.
4. Carefully pull out the thin membranous transparent layer from the lower epidermis using a forceps.
5. Put the epidermis into a watch glass containing distilled water.
6. Take few drops of Safranin solution using a dropper and transfer this into another watch glass.
7. Using a brush transfer the epidermis into the watch glass containing the Safranin solution.
8. Keep the epidermis for 30 sec in the Safranin solution to stain the peel.
9. To remove excess stain sticking to the peel, place it again in the watch glass containing water.
10. Place the peel onto a clean glass slide using the brush.
11. Take a few drops of glycerine using a dropper and pour this on the peel.
12. Using a needle, place a cover slip over the epidermis gently.
13. Drain out the excess glycerine using a blotting paper.
14. Take the glass slide and place it on the stage of the compound microscope.
15. Examine the slide through the lens of the compound microscope.

25. Amoeba reproduces by binary fission. First, the nucleus divides followed by division of cytoplasm. This gives rise to two daughter cells.



OR

Budding in Yeast -



26.  $u = -30 \text{ cm}$

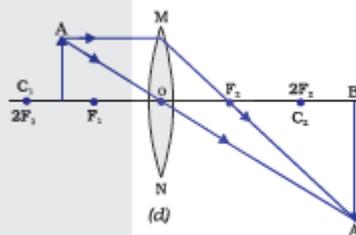
$f = +20 \text{ cm}$

$h = +4 \text{ cm}$

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

We get  $\frac{1}{v} = \frac{1}{20} - \frac{1}{30} = \frac{5}{60} \Rightarrow v = 12 \text{ cm}$

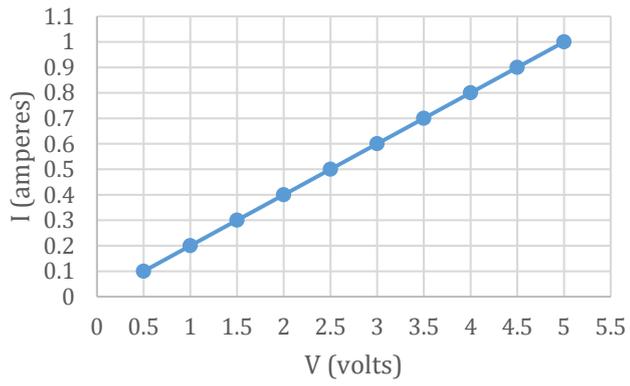
$\frac{h'}{h} = \frac{v}{u} = \frac{12}{30} = \frac{2}{5}$



27. We are given -

V	I
0.5	0.1
1	0.2
1.5	0.3
2	0.4
2.5	0.5
3	0.6
3.5	0.7
4	0.8
4.5	0.9
5	1

Graph V vs I



Resistance =  $\frac{V}{I} = \frac{5}{1} = 5\Omega$  (this can be found from any two values of  $V$  and  $I$ ).

