Solution

Section A

1. $O_2 \xrightarrow{UV} O + O$ (½ + ½)

$O + O_2 \longrightarrow O_3$

2. Oxidising agent → SO_2 (1)

Reducing agent → H_2S

Section B

3. (a) 2, 8, 5 (c) Non-metal (½ × 4 = 2)

(b) Group No.15 (d) X_2O_5

4. • Concave mirror

• Object is placed at centre of curvature (1+1)

5. (i) $\underset{\text{green}}{FeSO_4.7H_2O} \xrightarrow{\Delta} \underset{\text{white}}{FeSO_4} + 7H_2O\uparrow$ (2)

$\underset{\text{white}}{FeSO_4(s)} \xrightarrow{\Delta} \underset{\substack{\text{reddish}\\ \text{brown}}}{Fe_2O_3(s)} + SO_2\uparrow + SO_3\uparrow$

(ii) $\underset{(aq)}{BaCl_2} + \underset{(aq)}{Na_2SO_4} \rightarrow 2NaCl + \underset{\text{white ppt.}}{BaSO_4}\downarrow$

OR

(i) When zinc sulphide is heated in presence of air, it forms zinc oxide and sulphur dioxide.

$$2ZnS(s) + 3O_2(g) \rightarrow 2ZnO(s) + 2SO_2(g)$$ (1)

(ii) When zinc carbonate is calcinated, it forms zinc oxide and carbon dioxide gas.

$$ZnCO_3(s) \xrightarrow{heat} ZnO(s) + CO_2(g)$$ (1)

Section C

6. (a) It is important that slag is disposed of safely. It can be used in industries like glass, cement etc. (½ + ½)

(b) Equitable distribution of resources is important so that not just a handful of rich and powerful people benefit from these resources. Every citizen has equal rights to use these resources. (½ + ½)

Forces working against it

- Corruption
- Poverty
- Illiteracy and unawareness
- Unequal topographical distribution of the resources

(*any two points*) (½ + ½)

7. $NaCl + H_2O \xrightarrow{E.C.} NaOH + H_2 + \underset{(X)}{Cl_2}$ (1)

$\underset{dry}{Ca(OH)_2} + Cl_2 \rightarrow \underset{(Y)}{CaOCl_2} + H_2O$ (1)

$X = Cl_2$ (1)

$Y = CaOCl_2$

OR

(*a*) Electrolysis of brine to get NaOH. Since in this reaction NaOH and Cl_2 is formed so it is called chloralkali process. (1½)

$$NaCl + H_2O \xrightarrow{E.C} NaOH + H_2O + Cl_2$$

(*b*) Cl_2 gas. $Ca(OH)_2 + Cl_2 \longrightarrow CaOCl_2 + H_2O$ slaked linse. (1½)

8. (a)

Walking	Reflex Action	
• It is voluntary	• It is involuntary	(½ + ½)
• Controlled by cerebellum	• Controlled by spinal cord	(½ + ½)

(b) (i) Diabetes (½)

(ii) Lack/deficiency of hormone insulin (½)

9. (a) Focus of convex lens is a point on the principal axis through which all the refracted rays pass when the incident rays are parallel to the principal axis. (1 + 2)

(b)

Real Image	Virtual Image
(i) Formed at a point where the rays actually meet after reflection or refraction.	Formed at a point where the rays appear to meet after reflection or refraction.
(ii) Inverted.	Erect.
(iii) Can be taken on a screen.	Cannot be taken on a screen. *(any two)*

10. (a) Electromagnetic Induction is the principle which states that if a conductor is moved in a magnetic field cutting the lines of force, then current is induced in the wire. (1)

(b) Vertically downwards (1)

(c) (i) Magnetic field can be stronger (1)

(ii) Wire can move with more speed

(iii) Greater length of wire can move in the magnetic field *(any one)*

11. (a)
- Live wire (½)
- In series to live wire (½)
- So that when fuse melts the incoming of current should stop (½)

(b) The device will not be able to work as fuse will melt. (½)

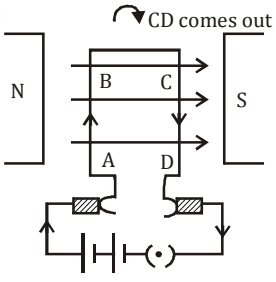
$$I = \frac{P}{V} = \frac{2200\ W}{220\ V} = 10\ A$$ (1)

So current exceeds the fuse limit.

OR

(a) Electrical to mechanical

(b) (1 + 2)



12. To receive the zygote

(i)
- The lining of the uterus thickens and gets richly supplied with blood to nourish the growing embryo (½ + ½)
- A disc shaped structure placenta develops in the uterine wall for nourishing embryo (½)

(ii) If zygote is not formed
- Unfertilized egg remains for a day, uterine lining slowly breaks and comes out through the vagina and as blood and mucous (½ + ½ + ½)

13. (a) (i) Chlorine (Cl) (2)

(ii) Sodium (Na)

(iii) Silicon (Si)

(iv) Chlorine (Cl)

(b) Down the group, number of shell increases, shielding factors increases, so the effective nuclear charge on the valence electron decreases and the size increases down the group. (1)

14. (a) Vegetative propagation has the following advantages
- plants grown by vegetative propagation can bear flowers and fruits earlier that those produced from seeds
- plants which have lost the capacity of producing seeds can be grown by vegetative propagation
- All plants produced are genetically similar to the parent plant
- faster rate of multiplication and disease free varieties can be produced.

(any two points) (½ + ½)

(b)

Binary fission	Multiple fission
• Parent cell splits into two daughter cells	• Parent cell produces more than two daughter cells
• No cyst is formed	• Cyst is formed
• Takes place in favourable conditions	• Occurs in unfavourable conditions

(½ + ½ + ½ + ½)

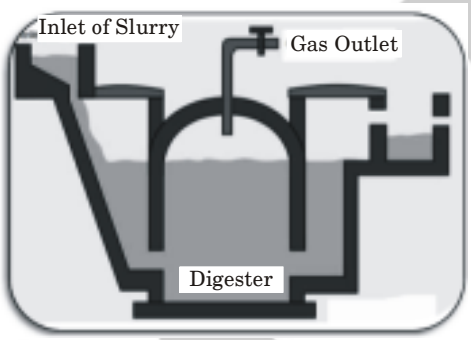
15. (a) Methane (1)

(b) High calorific value, no residue (½ + ½)

(c) Responsibility, care

OR

The following is the diagram of a biogas plant:-



(3)

Section D

16. (a) (i) $2C_2H_5OH + 2Na \rightarrow 2C_2H_5ONa + H_2$ (1)

(ii) $CH_4 + Cl_2 \xrightarrow{\text{sunlight}} CH_3Cl + HCl$ (1)

(iii) $HCOOH + C_2H_5OH \rightarrow HCOOC_2H_5 + H_2O$ (1)

(b) (i) $NaHCO_3$ test : $CH_3COOH + NaHCO_3 \rightarrow CH_3COONa + H_2O + CO_2\uparrow$ (1)

brisk effervescence
CO_2 gas changes
lime water milky

$C_2H_5OH + NaHCO_3 \rightarrow$ No Reaction

(ii) Br_2 Water Test (1)

ethene decolourizes reddish brown colour of bromine water.

$$CH_2 = CH_2 + Br_2 \rightarrow \underset{\text{water}}{\underset{\text{reddish}}{\underset{\text{brown}}{}}} \underset{\displaystyle Br}{\overset{\displaystyle CH_2}{|}} - \underset{\displaystyle Br}{\overset{\displaystyle CH_2}{|}}$$

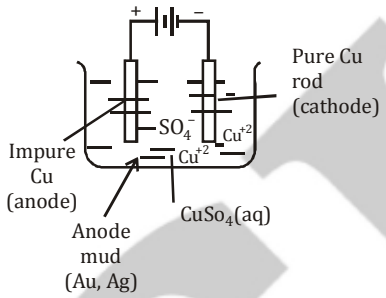
1, 2 - dibromoethane.

In C_2H_6 (ethane), Br_2 water retains its colours.

17. (a) Cathode → Pure Cu rod

Anode → Impure Cu rod

Electrolyte → aq. $CuSO_4$ (1 + 1)



At cathode: $Cu^{+2} + 2e^- \rightarrow Cu$

At anode: $Cu - 2e \rightarrow Cu^{+2}$

As reaction proceeds, thickness of pure rod (cathode) increases and impure copper rod thickness decreases. (1)

The impurities of Au, Ag falls down below anode and collect as anode mud.

(b) $Al + Fe_2O_3 \xrightarrow[\text{molten}]{\Delta} Fe + Al_2O_3 + \text{Heat}$ (1)

(c) (i) Brass → Cu + Zn (1)

(ii) Solder → Pb + Sn

OR

(a) Diamond and graphite are the two main allotropes of carbon. Diamond is the hardest allotrope while graphite is soft. On the other hand, graphite is a very good conductor of electricity while diamond is not. (1)

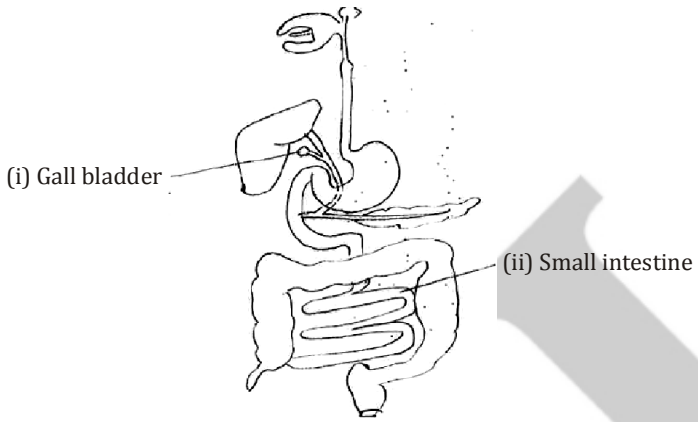
(b) Aluminium is highly reactive metal. It reacts with oxygen and creates a thick layer of aluminium oxide. This layer protects the aluminium from corrosion. This is the process of anodizing. Also, this layer is lustrous in nature and it makes the metal shiny. That is why aluminium articles have a longer life and attractive finish as compared to other metals. (1)

(c) (i) Ore: Ores are the minerals which contain a large amount of a specific metal. Those metals can be extracted from their respective ores through various scientific processes. (1)

(ii) Gangue: When the ores are mined from the earth, they contain some impurities like rock, soil, sand etc. There impurities are called gangue. (1)

(d) The metals have a nature to lose electrons. It means they have electropositive character. So, all the metals get positive charge on them after losing electrons. (1)

18. (a) (2)



* Student must write (i) & (ii) along with labelling

(b) **Significance of HCl**

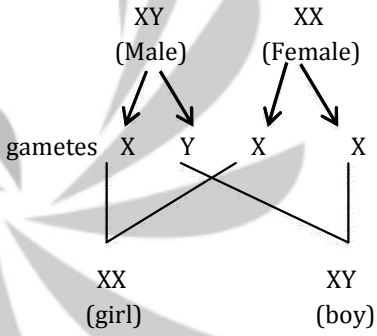
- Creates acidic medium which facilitates action of pepsin (½)
- Prevents growth of harmful microbes in food (½)

(c) **Lymph** – Tissue fluid in intercellular spaces, consisting of some plasma, proteins & blood cells (½ + ½)

Functions –

- Carries digested and absorbed fat from intestine (½)
- Drains excess fluid from extra cellular spaces back into the blood (½)

19. (a) (3)



OR

If explained the cross.

(b) **Fossils** – preserved traces of living organisms are called fossils (1)

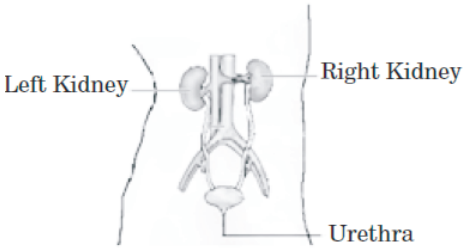
Age of fossils

- Relative method – fossils closer to the surface are more recent than fossils which are in deeper layers (½)
- By detecting the ratios of different isotopes of the same element in fossil (½)

OR

(a) (i) Produces Urine- Kidney [1]

(ii) Releases urine to outside- Urethra [1]



[2]

(b) Fatty acids and glycerol are the end products after digestion of fats whereas for the digestion of proteins, it is amino acids. [1]

20. (a) Dispersion of light is the splitting of light into its constituent colours. (1)

(b) Colours travel with different speeds in glass and so bend by different amount and separate out. (1)

(c) Red (½)

As red has maximum speed in glass, so refractive index of glass is minimum for red, making it bend the least. (1)

(d) If we look through a water fall or a fountain. (1)

The sun should be behind the observer. (½)

21. (a) $I_1 = \frac{P_1}{V_1} = \frac{22}{220} = \frac{1}{10} A$ (½)

$I_2 = \frac{P_2}{V_2} = \frac{22}{220} = \frac{1}{10} A$ (½)

Total current = $\frac{2}{10} = \frac{1}{5} A$

Ammeter reading = $\frac{1}{5} A$ (1)

Voltmeter reading = 220 V (1)

(b) Total power = $P_1 + P_2 = 22 + 22 = 44$ W (1)

or $P = IV = \frac{1}{5} \times 220 = 44$ W

(c) Reading of ammeter will increase. (½)

Reading of voltmeter will remain same. (½)

OR

(a) The new fuse wire should have large radius because current is inversely proportional to the resistance of the conductor and resistance of a conductor decreases on increasing the radius of conductor. (2½)

(b) Resistance of a conductor wire = $\frac{\rho L}{A}$. Where ρ = resistivity, L = length, A = cross section Area. So, if radius is halved, Area becomes $\frac{1}{4}$th and so resistance becomes 4 times.

So current becomes $\frac{1}{4}$th, if the potential difference across the conductor remains same. (2½)

Section E

22. (a) Ohm's law states that the current flowing through a conductor is directly proportional to the potential difference across it, provided temperature remains constant. (1)

(b) A corresponds to higher resistance. (1)

OR

(a) To study the dependence of current (I) on the potential difference (V) across a resistor in acircuit, ammeter is always connected in series and voltmeter is connected in parallel across the points between which potential difference is to be measured. Also, for the circuit to work, the positive terminal of the ammeter and the voltmeter is connected to the positive terminal of the battery. (1)

Hence, option (b) is correct.

(b) Consider the figure of milliammeter. There are 10 intervals between 100mA and 200 mA readings. Therefore, the value of each interval will be:

$$\frac{200-100}{10} = \frac{100}{10} = 10\text{mA}$$

Because the needle is at the third interval, so the reading will be:

$$100 + 30 = 130 \text{ mA} \quad (½)$$

Now, consider the voltmeter. There are 10 intervals between 0V and 2 V readings. Therefore, the value of each interval will be:

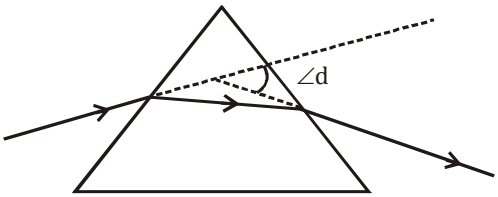
$$\frac{2-0}{10} = \frac{2}{10} = 0.2\text{V}$$

Because the needle is at the sixth interval, so the reading will be:

$$0.2 \times 6 = 1.2 \text{ V} \quad (½)$$

Hence, option (b) is correct.

23. (2)



24. (i) $Ca(HCO_3)_2$ $Mg\,SO_4$ (2)

$Ca\,Cl_2$ $Mg\,Cl_2$

OR

(a) Acetic acid turns blue litmus paper into red. (1)

(b) Acetic acid is miscible in water in all proportions and form homogeneous solution. (1)

25. (i) Colourless liquid, soluble in water in all proportions. (2)

(ii) Changes blue litmus red.

(iii) Freezes during winters as temperature falls below 17°C.

26. I – Chloroplast II – Nucleus (½ + ½ + ½ + ½)

III – Stoma or Stomatal pore IV – Guard cell

27. • Budding (1)

• An outgrowth called bud arises from the yeast cell which later grows into a new yeast cell. (½ + ½)

OR

In most of the single celled organisms like amoeba, cell division and reproduction is done by binary fission method. In this process, one parent cell is involved and as a result two daughter cells are formed. The amoeba cell is first reproduced into two nuclei and then those nuclei get divided and start moving to opposite directions. After that, proteins and nutrients are produced by the cell for the preparation of binary fission. When the environmental conditions are suitable, the process of binary fission occurs and in that stage, two daughter cells are formed. (2)