

## Solution

### SECTION A

1. S.I unit of current is Ampere (A). One ampere is defined as flow of one coulomb of charge per second i.e.  
 $1A=1C/1s$  (1)
2. The main constituents of biogas are as follows:  
Methane - 75%  
Carbon dioxide - 15-20% (½)  
Hydrogen - 5-10%  
Hydrogen sulphide - 0.01% (Traces) (½)

### SECTION B

3. Atomic number 11 = Sodium (1)  
Symbol = Na  
Electronic configuration of Na (11) = 2, 8, 1 (K, L, M shells) (1)

OR

- a) (Atomic mass of Na + Atomic mass of Cl)/2 :  
 $(23+35)/2 = 29 \sim$  atomic mass of Si i.e. 28  
No, because all these elements do not have similar properties although the atomic mass of Silicon (Si) is average of atomic masses of Sodium (Na) and Chlorine (Cl). (1)
  - b) (Atomic mass of Be + Atomic mass of Ca)/2:  
 $9+40/2 = 49/2 = 24.5 \sim$  Atomic mass of Mg i.e. 24  
Yes, this group of elements can be classified as Dobereiner's triads because they have similar properties and the mass of Magnesium (Mg) is roughly the average of the atomic masses of Be and Ca. (1)
4. Oxygen ( $O_2$ ) and carbon dioxide ( $CO_2$ ) is transported by blood. Oxygen is transported in the form of oxyhaemoglobin (97%) and dissolved in plasma (3%) . Carbon dioxide is transported as in the form of bicarbonates (70%), carbonic acid(7%), and carbaminohaemoglobin(23%). (1)  
Oxygen is picked up by blood from lungs. In body tissues, oxygen separates from blood and passes into cells through tissue fluid. Blood picks up carbon dioxide from cells and transports it to lungs for removal. (1)

5. Eye lens is a biconvex structure, located behind the iris. The eye lens is composed of fibrous, jelly like material. The crystalline lens provides finer adjustment of focal length required to focus objects at different distances on retina. (1)

Ciliary muscles help to modify the curvature of the eye lens, thus modifying the focal length of the lens. Following changes happen in lens due to ciliary muscles:

Muscles relaxed: - Lens becomes thin, focal length increases

Muscles contract: - Lens becomes thick, focal length decreases (1)

### SECTION C

6. Sodium hydrogen carbonate ( $\text{NaHCO}_3$ ) is formed by the reaction of Ammonia and sodium chloride along with carbon dioxide and water. (1)

Chemical equation:  $\text{NaCl} + \text{H}_2\text{O} + \text{CO}_2 + \text{NH}_3 \rightarrow \text{NH}_4\text{Cl} + \text{NaHCO}_3$

This compound is basic. (1)

pH value of  $\text{NaHCO}_3$  is 9. (1)

7. (i) Formula :  $\text{M}_2\text{O}$

(M= first group element)

Group 1 elements have valency 1 and oxygen that reacts is in the form of Oxide ( $\text{O}^{2-}$ ), hence valency is 2. (1)

- (ii) Formula:  $\text{MX}_3$

(M = group 13 elements, X = halides)

Group 13 elements have valency +3 and those of group 17 have -1. (1)

- (iii) Formula:  $\text{AB}_2$

(A = group 2 element, B= group 17 element)

Valency of group 2 elements is 2 and valency of group seventeen elements is -1. (1)

8. When silver chloride is placed in sunlight for the sometime, it turns grey due to the decomposition of silver chloride into silver and chlorine. (1½)

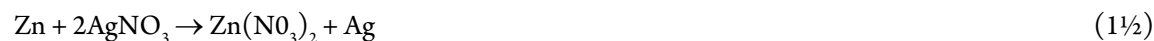
Balanced chemical equation:



This is a type of Decomposition reaction. (½)

OR

- a) This is a type of displacement reaction.



- b) This is a type of precipitation reaction



9. The loss of water in the form of vapour from all the aerial parts of the plant is known as transpiration. (1)

Experiment to demonstrate Transpiration:

- Take two small pots of approximately same size and having the same amount of soil. One should have a plant in it. Place a stick of the same height as the plant in the other pot.
- Cover the soil in both pots with a plastic sheet so that moisture cannot escape by evaporation.
- Cover both sets, one with the plant and the other with the stick, with plastic sheets and place in bright sunlight for half an hour.
- The internal surface of the plastic sheet belonging to the set having potted plant becomes wet. There is no change in the second set.
- Wet sheet is due to transpiration from aerial parts of the plants and soil does not lose any water, as demonstrated from second set. (2)

10. Feedback mechanism of harmonic regulation is a mechanism to regulate the secretion of hormones. It is very important that hormones should be secreted in precise quantities. So, the timing and amount of hormone released are regulated by presence of certain level of substances. (2)

**Example** - If the sugar levels in blood rise, they are detected by the cells of the pancreas which respond by producing more insulin. As the blood sugar level falls, insulin secretion is reduced. (1)

11. Plant hormones are chemical substances which help to coordinate growth, development and responses to the environment. They are synthesized at places away from where they act and simply diffuse to the area action. (1)

Hormones responsible:

- Gibberellins (Growth of stem)
- Cytokinins (Promotion of cell division) (1)
- Abscisic acid (Inhibition of growth)
- Auxin (Elongation of cells) (1)

12. Mendel used garden pea for his experiment.

When he crossed the tall and short plants; all plants were tall in the  $F_1$  progeny. There were no halfway characteristics or medium height plants. (1)

$TT \times tt \rightarrow Tt$  (All Tall)

These  $F_1$  plants were made to reproduce by self pollination. The progeny of second generation or  $F_2$  plants were not all tall. One quarter of them was short. This indicates that both the tallness and shortness traits were inherited in the  $F_1$  plants, but only the tallness trait was expressed. (1)

$Tt \times Tt \rightarrow TT$  (Tall),  $Tt$ (Tall),  $Tt$ (Tall),  $tt$ (Short)

A single copy of T is enough to make the plant tall, while both copies have to be 't' for the plant to be short.

Ratio obtained in  $F_2$  generation plants is 3:1 (Tall : short) (1)

OR

ACQUIRED TRAITS	INHERITED TRAITS
They develop during the lifetime of an individual	They are obtained from the parents
They are not passed on to the next generation	They are passed on to the next generation
Example- A cut on the face of a person	Example- Hair colour, eye colour

(1 + 1 + 1)

13. There should be equitable distribution of resources so that all, and not just a handful of rich and powerful people, benefit from the development of these resources. (1½)

Three forces working against an equitable distribution of our resources:

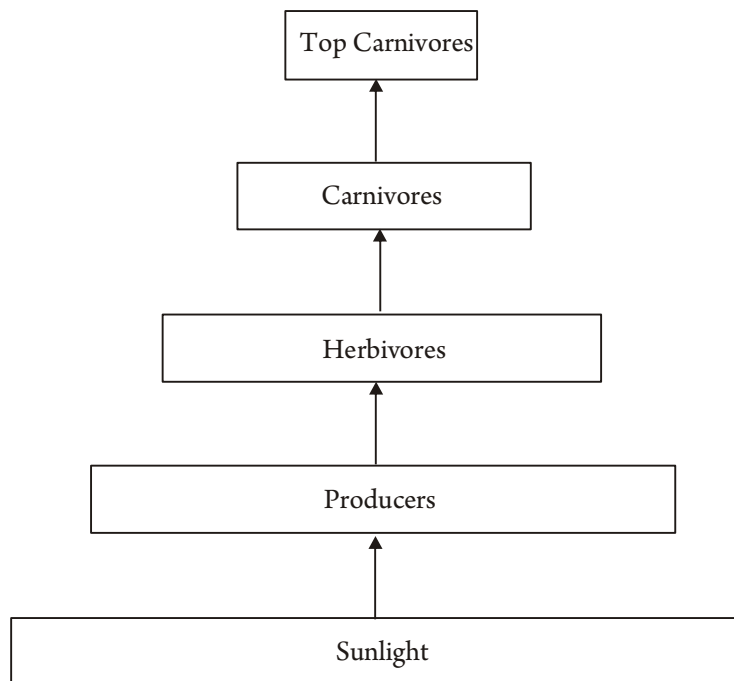
- Limited availability of resources
- Excessive consumption of resources
- Corruption and greed (1½)

14. We can help in reducing the problem of waste disposal by following three methods:

- **Reuse:** In this strategy, we use things again and again. Instead of throwing away envelopes, you can reverse it and use it again. The plastic bottles in which we buy various food items like jam or pickle can be used for storing things in the kitchen. (1)
- **Repurpose:** This means when a product can no more be used for the original purpose, we can use it for some other purpose. For example, cracked crockery, or cups with broken handles can be used to grow plants and as feeding vessels for birds. (1)
- **Recycle:** This means that you collect plastic, paper, glass and metal items and recycle these materials to make required things instead of synthesizing or extracting fresh plastic, paper, glass or metal. (1)

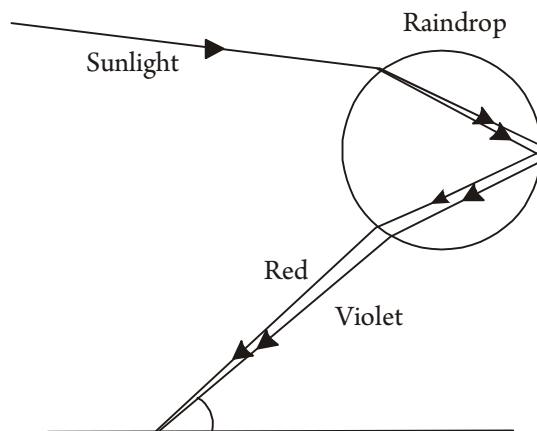
OR

ECOSYSTEM: All the interacting organisms in an area together with the non-living constituents of the environment form an ecosystem. Thus, an ecosystem consists of biotic components as well as abiotic components such as temperature, rainfall, wind, soil etc. (1)



(2)

15. A rainbow is a natural spectrum appearing in the sky after a rain shower. It is caused by the dispersion of sunlight by tiny water droplets, present in the atmosphere. A rainbow is always formed in a direction opposite to that of the Sun. The water droplets act like small prisms. They refract and disperse the incident light, then reflect it internally, and finally refract it again when it comes out of the raindrop. Due to the dispersion of light and internal reflection, different colors reach the observer's eye. (1½)



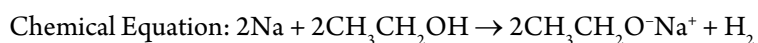
(1½)

## SECTION D

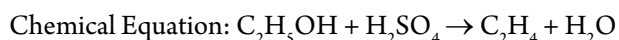
16. Active ingredient of all alcoholic drinks is Ethanol ( $C_2H_5OH$ ) (1)

Uses: (1)

- Being soluble in water, it is used in medicines such as tincture iodine, cough syrups and many tonics. (1)
- It is also used in medical wipes and hand sanitizers.



Name of product: Sodium ethoxide (1)

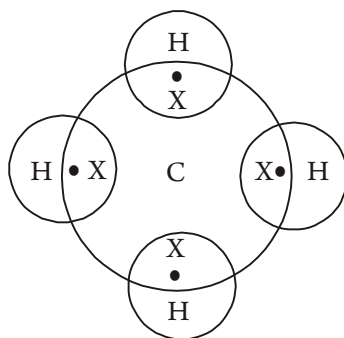


Name of product: Ethene (1)

OR

Methane is one of the simplest compounds formed by carbon and is a highly flammable gas which is widely used as a fuel and is a major component of bio gas and CNG. (1)

Electron dot structure:



(1)

Type of bond formed in this compound is covalent bonds between four H atoms and single C atom.

- Such compounds are poor conductors of electricity because in covalent bonds, no free electrons are present in the molecule which may help in conduction of the electricity. (1)
- These compounds have low melting and boiling points because they have low intermolecular forces of attraction. (1)

When methane burns in Oxygen, it forms  $CO_2$  and water as a product.



17. a) Chemical equations:



b) An alloy is a homogenous mixture of two or more metals, or a metal and a non-metal. It is first prepared by first melting the primary metal, and then, dissolving the other elements in it in definite proportions. (1)

PROPERTIES OF ALLOYS:

- The electrical conductivity and melting point of an alloy is less than that of pure metals.
- They are more resistant. (1)

18.  $u = -30 \text{ cm}$ ,  $f = -30 \text{ cm}$ ,  $v = ?$

i. LENS FORMULA:  $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

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

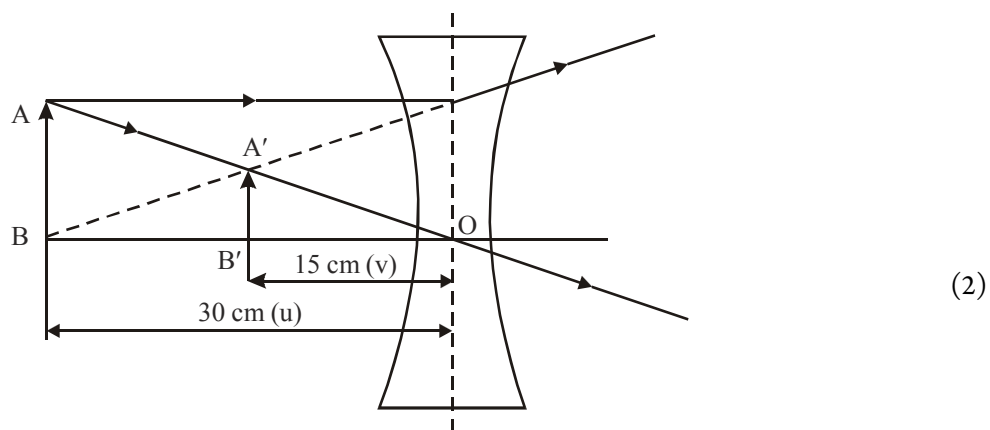
$$\frac{1}{v} = \frac{1}{-30} + \left(\frac{-1}{30}\right) = \frac{1}{v} = \frac{-2}{30}$$

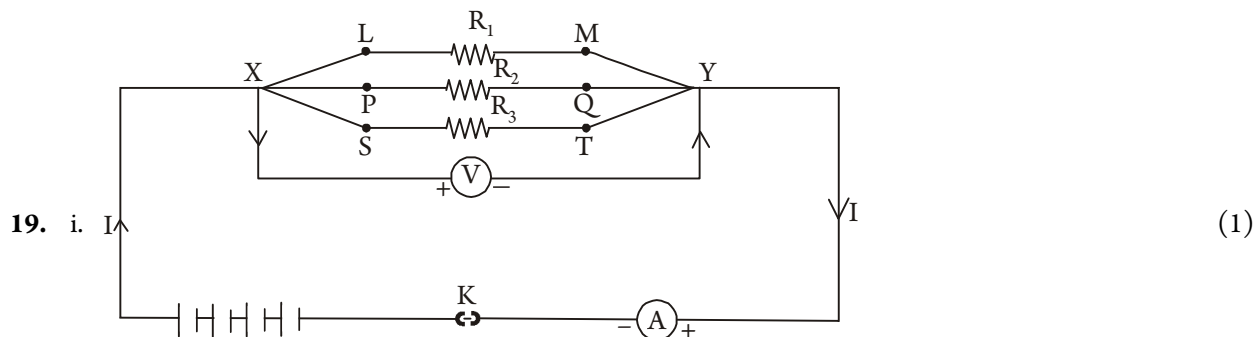
$v = -15 \text{ cm}$ . (1)

ii. Characteristics of the image in this case:

1. Nature- virtual
2. Position  $\rightarrow$  15 cm from the lens (on the same side as of object)
3. Size  $\rightarrow$  Diminished
4. Erect image formation (2)

iii. RAY DIAGRAM:





It is observed that total current  $I$ , is equal to the sum of the separate currents through each branch of the combination.

$$I = I_1 + I_2 + I_3 \quad \text{----- (1)}$$

Let  $R$  be the equivalent resistance of the parallel combination of resistors. By applying Ohm's law,  $I = V/R$

$$I_1 = V/R_1; I_2 = V/R_2; I_3 = V/R_3 \quad \text{----- (2)}$$

From equation 1 and 2

$$V/R = V/R_1 + V/R_2 + V/R_3$$

$$\text{or } 1/R = 1/R_1 + 1/R_2 + 1/R_3.$$

Hence proved that reciprocal of the equivalent resistance of a group of resistances joined in parallel is equal to the sum of the reciprocals of the individual resistances. (2)

(ii) Let total resistance be  $R_p$

$$\frac{1}{R_p} = \frac{1}{12} + \frac{1}{12} = \frac{2}{12}$$

$$\therefore R_p = 6 \Omega$$

$$V = 6V \text{ (given)}$$

$$I = V/R_p$$

$$= 6/6$$

$$I = 1 \text{ A} \quad (2)$$

**OR**

Resistance of lamp =  $20 \Omega$ , Resistance of conductor =  $4 \Omega$ , Voltage =  $6V$

i. Total resistance of the circuit =  $20 + 4 = 24 \Omega$  (1)

ii. Current ( $I$ ) =  $V/R = 6/24 = 0.25 \text{ A}$  (1)

iii. Potential difference across



a) ELECTRIC LAMP

$$V = I \cdot R$$

$$= 0.25 \cdot 20$$

$$= 5V$$

(1)

b) ELECTRIC CONDUCTOR

$$V = 0.25 \cdot 4$$

$$= 1V$$

(1)

iv. Power of the lamp =  $V^2/R$

$$= 5^2/20$$

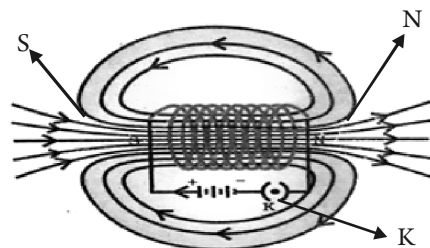
$$= 25/20$$

$$= 1.25 W$$

(1)

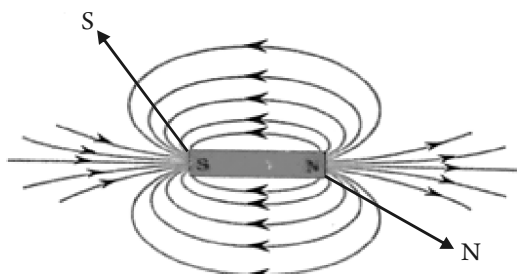
20. A coil of many circular turns of insulated copper wire wrapped closely in the shape of a cylinder is called a solenoid. (1)

i. Magnetic field lines



Field lines of the magnetic field through and around a current carrying solenoid.

(1)



Field lines around a bar magnet

(1)

Two distinguishing feature between the two fields is:

- Magnetic field outside then solenoid is negligible as compared to the bar magnet. (1)
- Magnetic field of solenoid can be changed by changing the core of the solenoid while it is not possible to do so in bar magnet. (1)

21. The process of transfer of pollen grain from the stamen to stigma of the flower is termed as pollination. (1)

Pollination can be classified into two types:

- SELF POLLINATION - If the transfer of pollen occurs in the same flower, it is referred to as self-pollination.
- CROSS POLLINATION - If the pollen is transferred from one flower to another, it is known as cross pollination. (2)

Agents of pollination - Wind, water or animals (1)

- Suitable pollination leads to fertilization as after the pollen lands on a suitable stigma, it has to reach the female germ cells which are in ovary. For this, a tube grows out of the pollen grain and travels through the style to reach the ovary, thus leading to fertilization. (1)

**OR**

I. Diagram - Human female reproductive system

1. Oviduct or fallopian tube (½)
2. Ovary (½)
3. Uterus (½)
4. Cervix (½)
5. Vagina (½)

II. Contraception may be defined as prevention of pregnancy in women by avoiding the fertilization to happen. (1)

Advantages of adopting contraceptive measures:

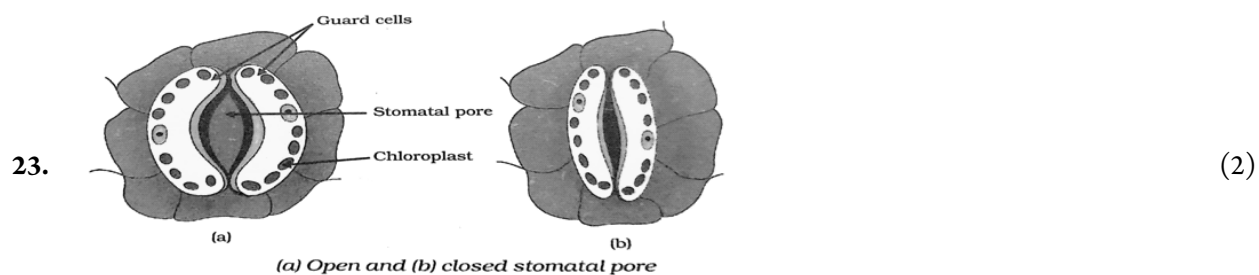
- Protection from sexually transmitted diseases such as AIDS (½)
- Birth control (½)
- Maintaining the sound health of the body and mind of the woman. (½)

## SECTION E

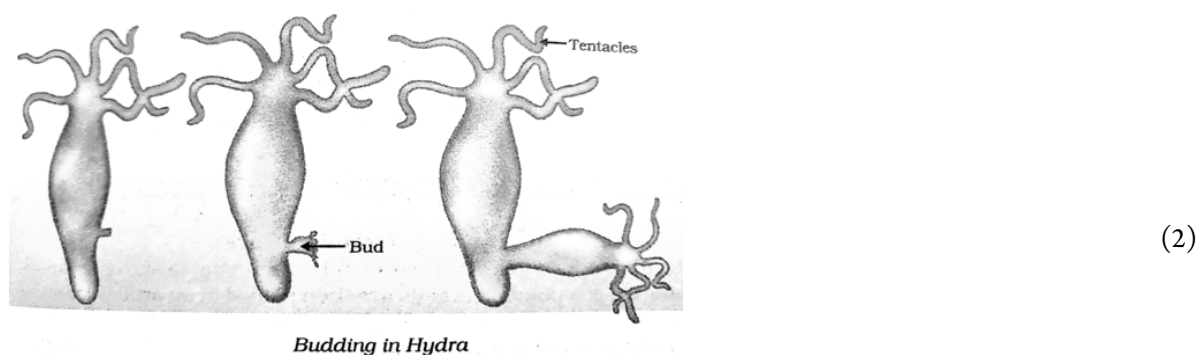
22. In the above stated experiment, the substance in the small test tube is KOH solution. (1)

Function - It creates a vacuum in the conical flask, as the  $\text{CO}_2$  produced by respiring germinating seeds is absorbed by KOH solution.

Consequence of use - This leads to pulling up of the level of water in the bent tube because the air from the glass tube moves into conical flask. (1)



OR



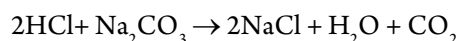
24. • Lens and screen should be at the same level. (1/2)
- Lens should be fixed vertically in the lens holder (1/2)
  - Distance should only be measured when a well defined sharp image is formed. (1/2)
  - Meter scale should be kept horizontal and parallel to the ground. (1/2)
25. Straight line signifies that I and V are directly proportional to each other and I increases with V and it follows Ohm's law. (1)
- Ratio of V/I (slope of the graph) which remains constant is defined as the resistance. (1)

OR

This condition is termed as zero error of the scale of ammeter or voltmeter. This error is subtracted from the value that is depicted during closed circuit. (2)

26. The length of the foam will be longest in test tube A because distilled water is free from any ions and won't form any scum, while in test tube B and C, presence of ions like  $Mg^{2+}$ ,  $Ca^{2+}$  will lead to formation of scum, which is insoluble in water. (2)
27. Color change will be observed in test tube A. (1)
- Reason:- HCl is an acid and acid turns blue litmus to red. (1)

OR



When dilute HCl is added to sodium carbonate, carbon dioxide will be formed and will result in production of brisk effervescence. (2)