Solutions

(*Ref. Question Paper Code 31/2/1*)

SECTION A

1. Due to weak intermolecular forces.

2. Two: Lithium and Beryllium.

3. (*a*) Geothermal energy hotspots are deeper hot regions of earth's crust where molten rocks are formed.

(*b*) New Zealand, United States of America, China, Indonesia, Philippines and Turkey. **(Any two)**

(*c*) Electric generator work, on Electromagnetic Induction.

(*d*) In case of AC, transmission of power (electricity) takes place without much loss of energy.

4. (*a*) In the neck region.

(*b*) Thyroxine regulates carbohydrate, proteins and fat metabolism in the body. It promotes growth of body tissue.

(*c*) Excess of secretion of thyroxine in the body, *i.e.,* overactivity of the thyroid gland.

(*d*) Can be controlled by including iodised salt in our diet.

5. (*b*) B, C and D.

OR

(*d*) opaque eye lens.

6. (*c*) 8 Ω.

7. (*d*) $R_2 > R_1 > R_3$.

8. (*c*) Sugarcane and rice.

OR

(*c*) Carbon monoxide.

9. (*b*) Maharashtra.

10. (*d*) *x* = Physical state of $KClO_3$ and KCl

y = Reaction condition

z = Physical state of O_2

11. (*b*) Clove oil

12. (*b*) Group 13 period 2

OR

(*b*) X_2Y

13. (*a*) Both (A) and (R) are true and (R) is the correct explanation of the assertion.

14. (*d*) (A) is false but (R) is true.

SECTION B

15. (*i*) A = CaO/Quick lime/Calcium oxide.

B = $Ca(OH)_2$/Slaked lime/Calcium hydroxide.

(*ii*) $CaO + H_2O \rightarrow Ca(OH)_2$ + heat or energy

(*iii*) Combination reaction and Exothermic reaction

16. (*i*) 2 formula units of $CaSO_4$ (Calcium sulphate) share 1 molecule of water of crystallisation.

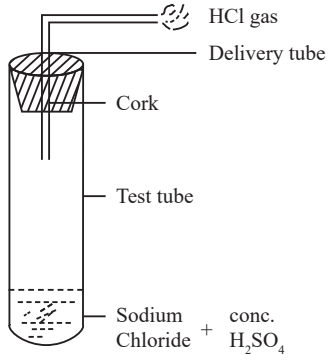
(*ii*) Due to its alkaline nature.

(*iii*) $\underset{\text{(Blue)}}{CuSO_4 . 5H_2O} \rightarrow \underset{\text{(white)}}{CuSO_4} + 5H_2O$

Due to loss of water of crystallisation.

OR

(*i*)



(*ii*) Wet litmus paper changes colour.

(*iii*) HCl solution, it is due to the formation of H^+ ion in the water/H_3O^+ (Hydronium ions).

17. (*a*) A (*b*) D

(*c*) B (*d*) C

(*e*) A_2C (*f*) B and D

18. (*a*) Grass → Grasshopper → Frog → Snake

(Or any other relevant example)

(*b*) Transfer of food energy to the next higher level will not take place, then the organisms of the upper trophic levels will be affected, increase in the population of the organisms belonging to the previous trophic level and imbalance in the food chain.

(*c*) 2,000 J $\xrightarrow{\text{10\% Law}}$ 200 J $\xrightarrow{\text{10\% Law}}$ 20 J

II Trophic Level III Trophic Level IV Trophic Level

OR

(*a*) (*i*) O_2

(*ii*) O_3

(*iii*) Breathing/Respiration

(*iv*) Absorbs harmful ultra violet (UV) radiations.

(*b*) $O_2 \xrightarrow{uv} O + O$

$O + O_2 \rightarrow O_3$

19.

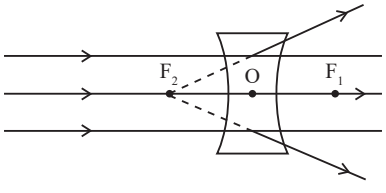
Secretions	Functions
(*a*) mucus	(*d*) Protects the inner lining of stomach from the acid; helps in softening of food.
(*b*) HCl (Hydrochloric acid)	(*e*) Provides the acidic medium for action of enzyme; kills the germs.
(*c*) Pepsin	(*f*) Digest proteins

20. (*i*) **Homologous organs:** Mammals have forelimbs as do birds, reptiles and amphibians. The basic structure of the limbs is similar though it has been modified to perform different functions in various vertebrates. Therefore, these are homologous organs.

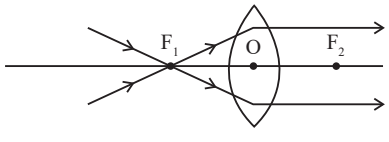
(*ii*) **Fossils:** Study of fossils of Archeopteryx. Dinosaurs show the presence of feathers used for insulation in cold weather but later became useful for flight. So, birds have evolved from reptiles.

21.
- Chromosomes are thread-like structures present in nucleus containing genetic material/DNA.
- Number of chromosomes are reduced to half during gametes/germ cell formation. After fertilisation of germ cells the number of chromosomes is maintained in progeny.

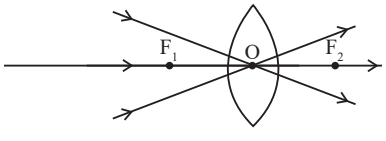
22. (*i*) Rays parallel to the principal axis diverge after being refracted from a concave lens and a virtual, erect and diminished image is formed at F_2.



(*ii*) Rays of light, incident through the focal point F_1 of a convex lens get refracted parallel to the principal axis.



(*iii*) Rays of light going through the optical centre of a convex lens pass without any deviation.



23. (*i*) Galvanometer (G) shows deflection (for very short time)

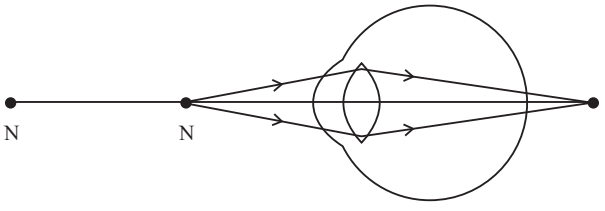
(*ii*) Galvanometer (G) shows deflection for a very short time in opposite direction to the previous observation.

Common Reason: Due to variation in current flowing through coil 1, magnetic field associated with coil 2 changes. Due to which an induced current will generate, consequently galvanometer shows momentary deflection.

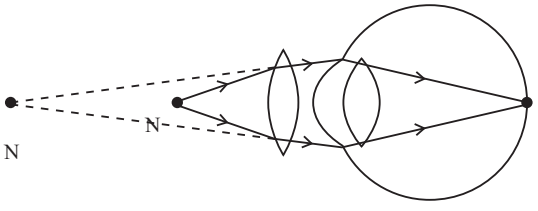
24. (*a*) (*i*) Size of eyeball decreases

(*ii*) Focal length of eye lens is too long, *i.e.,* power of eye lens decreases.

(*b*)



Hypermetropic Eye



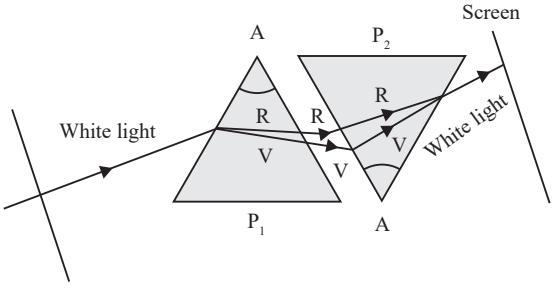
Corrected Eye

OR

(*a*) Small-sized particles scatter shorter wavelength (violet) and large-sized particles scatter larger wavelength (Red).

(*b*) Due to variation in physical condition of hot air.

(*c*)



SECTION C

25. (*a*) Metals high up in reactivity series cannot be obtained from their compounds by heating with carbon as carbon cannot reduce the oxides of these elements while those in the middle of the reactivity series are extracted first by converting their sulphides or carbonates into oxides and then reducing by carbon. The same process cannot be applied for them because metals high up in the series have high affinity for oxygen than carbon.

Electrolytic reduction is used for extraction of sodium as shown below:

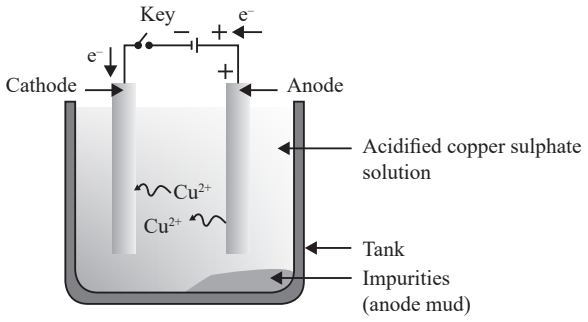
Sodium is obtained from its molten chloride by passing electricity.

Reactions:

at Cathode : $Na^+ + e^- \rightarrow Na$

at Anode : $2Cl^- \rightarrow Cl_2 + 2e^-$

(*b*)



(*i*) $2Cu + O_2 \rightarrow 2CuO$

(*ii*) $Al_2O_3 + 6HCl \rightarrow 2AlCl_3 + 3H_2O$

(*iii*) $2K + 2H_2O \rightarrow 2KOH + H_2 + \text{heat}$

(*iv*) $2HgS + 3O_2 \xrightarrow{\text{Heat}} 2HgO + 2SO_2$

(*v*) $Al_2O_3 + 2NaOH \rightarrow 2NaAlO_2 + H_2O$

26. (*a*) **Homologous series** is a group of compounds which have the same functional group, same general formula and where two successive member differ by $-CH_2$ in the molecular formula.

Example: CH_3-OH, CH_3-CH_2-OH

Functional group: –OH, General Formula: $C_nH_{2n+1}OH$

(*b*) **Esterification:**

The reaction of carboxylic acid with an alcohol in the presence of H_2SO_4 yields an ester.

$$CH_3COOH + C_2H_5OH \xrightarrow[\text{Heat}]{\text{Conc. } H_2SO_4} \underset{\text{Ester}}{CH_3COOC_2H_5} + H_2O$$

Addition Reaction: A reaction in which two or more atoms are added across a double or triple bond, in presence of catalyst, is called addition reaction.

$$CH_2 = CH_2 + H_2 \xrightarrow{\text{Pt./Pd or Ni}} CH_3-CH_3$$

27. (*a*) **Structure:** A nephron is the basic structural and functional unit of kidney. They are the microscopic structure composed of a renal corpuscle and a renal tubule. It is a long tube-like structure. At one end, the tube is closed, folded and expanded, into a double-walled, cup-like structure called the Bowman's capsule, which encloses a cluster of microscopic blood vessels called the glomerulus. This capsule and glomerulus together constitute the renal corpuscle.

Function: It collects the filterate and reabsorbs useful substances like glucose, amino acids, salts and water from filterate and forms urine.

(*b*) Amount of excess water in the body and amount of wastes dissolved.

28. (*a*)
- Chemical Method
- Barrier Method
- Surgical Method

(*b*) Government of India has prohibited prenatal sex determination by law to reduce the indiscrimination of female foeticide, because of which the child sex ratio was declining at an alarming rate in some sections of our society.

Benefit: Maintaining male-female sex ratio for a healthy society.

(*c*) Bacterial → Gonorrhoea, Syphilis

Viral → Warts, AIDS

OR

(*a*) (*i*) Ovary → They produce oocytes (eggs) for fertilisation and, they produce the reproductive hormones, estrogen and progesteron. **(Any one)**

(*ii*) Oviduct → It provide a site for fertilisation of egg by a sperm.

(*b*) (*i*) Thickening of the uterus lining happens.

(*ii*) Wall of uterus breaks and menstruation occurs.

(*c*) Provides nutrition (O_2) to the developing embryo (foetus) and removes waste from the foetus.

29. (*a*) The resistance R of any rod of length *l*, resistivity ρ and area A is given as

$$R = \rho\frac{1}{A}$$

Let the resistance, resistivity, length and area of copper rod X be R_X, ρ, l_X and A_X respectively. It is given that l_X = 30 cm and A_X can be calculated as the radius is given as 2 cm. So;

$$R_X = \rho\frac{1_X}{A_X} = \frac{30}{\pi \times 2 \times 2}$$

Similarly, let the resistance, length and area of rod *Y* (copper again) be R_Y, l_Y and A_Y respectively. (Resistively = ρ) So;

$$R_Y = \rho\frac{1_Y}{A_Y} = \rho\frac{10}{\pi \times 1 \times 1}$$

Hence,
$$\frac{R_X}{R_Y} = \frac{\rho.1_X}{A_X} \times \frac{A_Y}{\rho.1_Y}$$

$$= \frac{30}{\pi \times 2 \times 2} \times \frac{\pi \times 1 \times 1}{10}$$

$$\frac{R_X}{R_Y} = \frac{3}{4}$$

$R_X : R_Y = 3:4$

(*b*) Here, current I = 500 mA; Resistance of lamp = R_1

Resistance of the conductor (R_2) = 10 Ω

Potential Difference (V) = 6 volt

Net resistance of the circuit

$$R = R_1 + R_2 = \frac{V}{I}$$

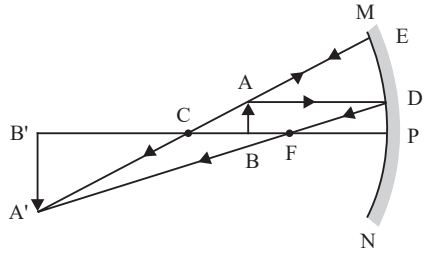
$$\Rightarrow \quad R_1 + 10\ \Omega = \frac{6}{0.5}$$

$$\Rightarrow \quad R_1 + 10\ \Omega = 12\ \Omega$$

$$\Rightarrow \quad R_1 = (12 - 10)\ \Omega$$

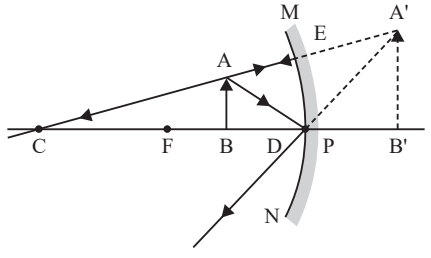
$$= 2\ \Omega$$

30. (*a*) (*i*) Real and magnified



Object distance must be between 10 to 20 cm.

(*ii*) Virtual and magnified



Object distance must be less than 10 cm.

(*b*) $f = 10$ cm ; $u = -10$ cm

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

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

$$\frac{1}{v} = \frac{1}{10} - \frac{1}{-10}$$

$$\frac{1}{v} = \frac{1}{10} + \frac{1}{10}$$

$$\frac{1}{v} = \frac{1}{5}$$

$$\therefore \quad v = 5 \text{ cm}$$

OR

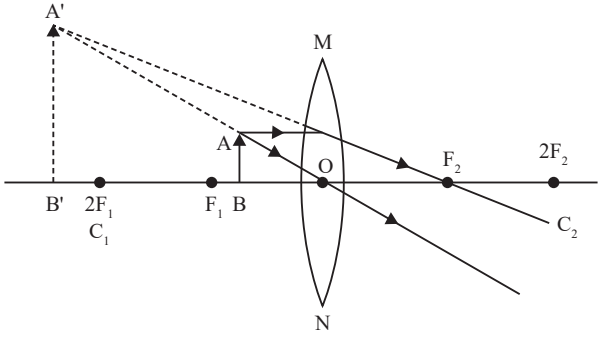
(*a*) (*i*) Power of a Lens: It is ability of a lens to converge or diverge light rays. It is the reciprocal of focal length of lens.

(*ii*) Principal froms of concave Mirror: It is a point on principal axis at which light ray parallel to principal axis converges after reflection.

(*b*) (*i*) For spherical lens: $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

(*ii*) For spherical mirror: $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

(*c*)



Distance of object (BO) = 10 cm
Focal length (OF_1) = 15 cm