CBSE
Class X Science
Sample Paper – 12 Solution

Section A

1. $I = \dfrac{Q}{T} = \dfrac{40}{10} = 4A$

2. The control rod is made of boron.

3.

  (a)

    (i) P = VI

       P = 240 × 10 = 2400 W

    (ii) Energy consumed = VIt = 2400 × 120 = 28800 Joules

  (b)

    (i) 5: Funnel of the fallopian tube/oviduct

       6: Cervix

    (ii) <u>Hormones secreted by 1 (ovary):</u>

- Oestrogen
- Progesterone

4.

  (a) C has 1 valence electrons.

  (b) The decreasing order of the size of atoms is H > G > F > E.

  (c) H is a metal.

  (d) B has the largest atomic size.

5. (c) 3

    $V = IR$; 18=I×6; I=3A

    3A $\Rightarrow$ 3C/s

<div align="center">

OR

</div>

  (d) Insulators have the highest resistance.

6. (b) Electromagnetic induction

7. (c) In a concave mirror, the reflection of light takes place at the bent in surface.

8. (a) According to Darwin, the species of life have originated from a common ancestor through the process of natural selection.

<div align="center">

OR

</div>

(c) The tuber of potato and the runner of lawn grass are homologous organs because both of them represent stems.

9. (a) A rapid and temporary plant movement in response to the stimulus of touch is known as seismonastic movement.

10. (b) When vanilla extract is added to a base, it destroys the pleasant smell of vanilla extract.

11. (c) Hydrogen and chlorine are the by-products formed in the chlor-alkali process.

12. (b) Dichlorodiphenyltrichloroethane (DDT) is the major cause of biomagnification in India.

OR

(a) Water vapour is the most dominant greenhouse gas and accounts for about 55% of the greenhouse effect.

13. Both A and R are true, but R is not the correct explanation of the assertion. In a drunk person, the cerebellum gets affected and is unable to coordinate muscular movements and maintain balance. Hence, after consuming alcohol, a person walks clumsily. Involuntary actions, including those involved in maintaining blood pressure, salivation and vomiting, are controlled by the medulla in the hindbrain.

14. Both A and R are true, and R is the correct explanation of the assertion. The bending of the stick appears to take place by different amounts in different liquids because light is refracted in different media by different amounts.

Section B

15. A reflex action is an involuntary, automatic and nearly instantaneous response to a stimulus.
Steps involved in a reflex action:
    i. The sense organ (skin) is stimulated with a prick, and the stimulus is received by skin receptor cells.
    ii. Sensory nerves send this impulse to the spinal cord.
    iii. An association neuron transmits this impulse to the motor neuron.
    iv. The motor neuron relays the impulse to the muscles of the effector organ (hand).

16. On the basis of the presence of feathers in both birds and reptiles, both are said to be closely related. Initially, feathers performed the function of protection from cold as in the case of reptiles, but later on, they evolved to perform the function of flight to help birds fly.

OR

Biodegradable substances: Substances which can be broken down by microorganisms such as bacteria and fungi are called biodegradable substances. Examples: Paper, vegetable and fruit peels, human excreta

Non-biodegradable substances: Substances which cannot be broken down by microorganisms into simpler and harmless substances are called non-biodegradable substances. Examples: Polythene bags, aluminium cans, DDT

Effects of biodegradable substances:

- They produce a foul smell causing air pollution. If thrown in water, they cause water pollution.
- They serve as a breeding ground for flies and mosquitoes which are carriers of malaria.

Effects of non-biodegradable substances:

- Non-biodegradable pesticides and fertilisers run off with rainwater into water bodies and cause water pollution and affect the soil making it acidic or alkaline.
- Some non-biodegradable pesticides enter the food chain and badly affect humans and other organisms.

17. The size of the mirror required to see the full face should be half the size of the face.
Hence, the mirror should be 24/2 = 12 cm long and 20/2 = 10 cm wide.
The mirror should be placed with the longer side vertical and the eyes kept at proper height.

OR

Height of the object (h) = 1 cm
Image height (h′) = 1.5 cm
Object distance (u) = 15 cm
To find = Image distance (v)
The relationship between the object distance (u), image distance (v), object height (h) and image height (h′) is given as
$- v/u = h'/h$
$- v/-15 = -1.5/1$
$v = 15 \times 1.5$
$v = -22.5$ cm
The image distance is –22.5 cm.
The negative sign indicates that the image is formed on the left side from the optical centre.

18.

    (a)   Na = 11

           Cl = 17

           Ar = 18

    (b)   Na (2, 8, 1)   Cl (2, 8, 7)   Ar(2,8,8)

    (c)   Metallic and reducing character decreases

19. Analogous organs have different origin and different basic structure but are present in organisms to perform the same functions. For example, the wings of a bird and the wings of a bat have the same function, i.e. they help them to fly, but structurally they are different. The wings of a bird are present in the form of a feathery covering, while in the case of a bat, the wings are the skin folds between elongated fibres.

20. Traits arise due to variations which occur due to sexual reproduction of inaccuracies during DNA copying or environmental factors.
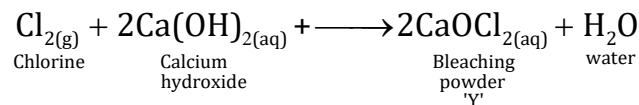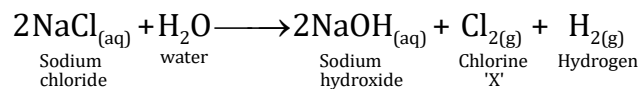
The individuals with a particular trait may increase in a population due to the following factors:

(i) Natural selection: Variations which give survival advantage in nature, and such traits increase in population.

(ii) Genetic drift: It occurs due to change in gene frequency due to the accumulation of particular genes.

(iii) Geographical isolation: It leads to change in gene frequency leading to expression of one type of traits in a geographically isolated population.

**21.** X is chlorine gas.

Y is bleaching powder.

Equations involved are

$$2NaCl_{(aq)} + H_2O \longrightarrow 2NaOH_{(aq)} + Cl_{2(g)} + H_{2(g)}$$

$$\underset{\text{Chlorine}}{Cl_{2(g)}} + \underset{\substack{\text{Calcium}\\\text{hydroxide}}}{2Ca(OH)_{2(aq)}} + \longrightarrow \underset{\substack{\text{Bleaching}\\\text{powder}\\\text{'Y'}}}{2CaOCl_{2(aq)}} + \underset{\text{water}}{H_2O}$$

OR
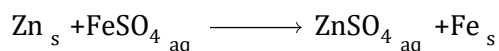
$$Zn_s + CuSO_{4\ aq} \longrightarrow ZnSO_{4\ aq} + Cu_s$$

In this reaction, zinc displaces copper from copper sulphate solution, so that copper is set free. This displacement reaction takes place because zinc is more reactive than copper.

$$Fe_s + ZnSO_{4\ aq} \longrightarrow FeSO_{4\ aq} + Zn_s$$
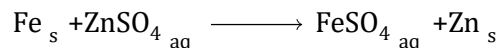
This reaction does not take place because Fe is less reactive than Zn.

$$Zn_s + FeSO_4{}_{aq} \longrightarrow ZnSO_4{}_{aq} + Fe_s$$

In this reaction, Zn displaces Fe from $FeSO_4$ solution so that Fe is set free. This displacement reaction takes place because zinc is more reactive than Fe.

22.

An electromagnet is a magnet consisting of a long coil of insulated copper wire wrapped around a soft iron core which is magnetised only when electric current is passed through the coil.

An electromagnet is a temporary magnet. Its polarity can be reversed by reversing the direction of current, whereas the polarity of permanent magnets is fixed.

Uses: Electric crane, electric bell

23. (a) The reaction in which an unsaturated hydrocarbon combines with another substance to give a single product is called an addition reaction.

Example: Ethene reacts with hydrogen when heated in the presence of nickel catalyst to form ethane.

$$CH_2=CH_2 + H_2 \xrightarrow[\text{Heat}]{\text{Ni catalyst}} CH_3\text{-}CH_3$$
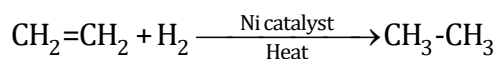
(b) Hydrogen is added to groundnut oil when it is to be converted to *vanaspati* ghee.

(c) Vegetable oil is better because it has unsaturated fatty acids which are good for our health.

24.

i)

$$V = IR$$
$$6 == I \times (8+10)$$
$$I = 6/18 = 1/3 A$$

ii)

$$V_{\text{electric heater}} = \frac{1}{3} \times 10 = \frac{10}{3} V$$

iii)

$$V_{\text{electric wire}} = \frac{1}{3} \times 8 = \frac{8}{3} V$$

## Section C

25.

(a)

(i) Cu
(ii) Fe
(iii) Cu
(iv) Cu

(b) (i) Highly exothermic; (ii) the metal starts floating in water

26. In a four-chambered heart, the left half is completely separated from the right half by septa. This prevents oxygenated and deoxygenated blood from mixing. It allows a highly efficient supply of oxygenated blood to all parts of the body. This is useful in animals that have energy needs, such as birds and mammals.
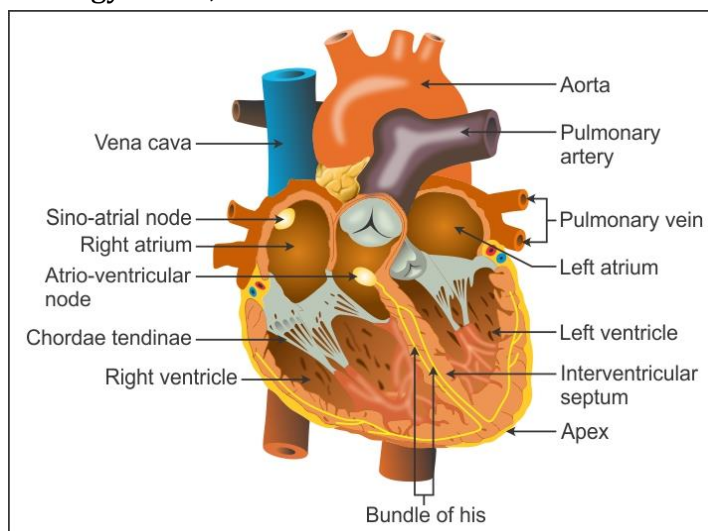
OR

(a) The transport of soluble products of photosynthesis is called translocation and it occurs in the part of the vascular tissue known as phloem. Besides the products of photosynthesis, the phloem transports amino acids and other substances. These substances are especially delivered to the storage organs of roots, fruits and seeds and to growing organs.

The translocation of food and other substances takes place in the sieve tubes with the help of adjacent companion cells in both upward and downward directions.

(b) If the distances between soil-contacting organs and chlorophyll-containing organs are small, energy and raw materials can easily diffuse to all parts of the plant body. But if these distances become large because of changes in the plant body design, diffusion processes will not be sufficient to provide raw material in leaves and energy in roots. A proper system of transportation is therefore essential in such situations.

27.

(a) The linear magnification produced by a mirror is defined as the ratio of the height of the image to the height of the object.
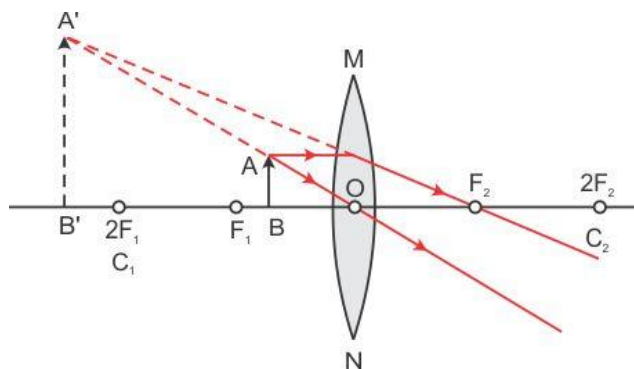
(b) The power of the lens has a positive sign; so, it is a convex lens.

Power, $P = \dfrac{1}{f}$

$f = \dfrac{1}{P} = \dfrac{1}{2.5}$

$f = 0.4$ m $= 40$ cm

So, focal length, f=40 cm

(c) When the object is between the focus and the optical centre of a convex lens, the image formed is

i. Beyond the focus

ii. Virtual and erect

iii. Enlarged

28.

(a) A conductor offers resistance to the flow of current. Hence, work must be done by the current continuously to keep itself flowing.

When an electric charge Q moves against a potential difference V, the work done is

$W = QV$

From the definition of current,

$$I = \frac{Q}{t}$$

$\therefore Q = It$

From Ohm's law,

$V = IR$

$\therefore W = It \times IR = I^2Rt$,

Assuming that all this work goes in producing heat energy.

Therefore, the heat produced in a conductor of resistance 'R' when current 'I' is flowing for time 't' is

$H = I^2Rt$

The above equation is the expression for Joule's law of heating.

(b)

Let R be the resistance of identical resistors.

Let H_s and H_p be the heat energy evolved due to the series and parallel combinations, respectively.

When the resistors are connected in series:

$$R_s = R + R = 2R$$

$$\therefore H_s = \frac{V^2}{R_s} = \frac{V^2}{2R} \qquad \text{...... (1)}$$

When the resistors are connected in parallel:

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

$$\therefore R_p = \frac{R}{2}$$

$$\therefore H_p = \frac{V^2}{R_p} = \frac{2V^2}{R} \qquad \text{...... (2)}$$
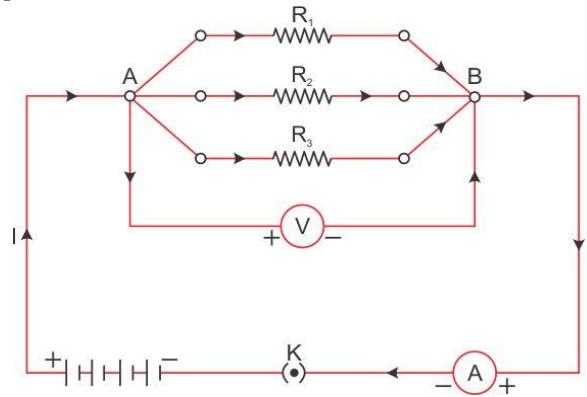
From (1) and (2),

$$\frac{H_s}{H_p} = \frac{V^2}{2R} \times \frac{R}{2V^2} = \frac{1}{4}$$

$$\therefore H_p = 4H_s$$

OR

(a) When two or more resistors are joined to the same end, the resistances are connected in parallel.

Potential difference in a parallel circuit remains the same across all resistors. The current is the sum of the currents across all the individual resistors.

$$I = I_1 + I_2 + I_3 \qquad \text{...... (1)}$$

Let R_p be the resultant resistance of the circuit.
On applying Ohm's law to the entire circuit,

$$I = \frac{V}{R_p} \qquad \text{...... (2)}$$

Now, applying Ohm's law to individual resistances,

$$I_1 = \frac{V}{R_1}$$

$$I_2 = \frac{V}{R_2}$$

$$I_3 = \frac{V}{R_3}$$
(3)

From equations (1), (2) and (3),

$$\frac{V}{R_p} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$$

$$\therefore \frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

29.

(a) A homologous series is a group of organic compounds having similar structures and similar chemical properties in which the successive compounds differ by a CH_2 group.

Example of homologous series: All the alkanes have similar structures with single covalent bonds and show similar chemical properties, so they can be grouped together in the form of a homologous series.

Homologous series of alkanes: Methane, CH_4; Ethane, C_2H_6; Propane, C_3H_8; Butane, C_4H_{10}; Pentane, C_5H_{12}

(b) (i) All the members of the homologous series can be represented by the same general formula.

(ii) Any two adjacent homologues differ by 1 carbon atom and 2 hydrogen atoms in their molecular formulae.

(c) Alkene, C_nH_{2n}

(d) Alkanes: CH_4, C_2H_6, C_4H_{10}

Alkenes: C_2H_4, C_3H_6

Alkynes: C_2H_2, C_3H_4

(e) In an organic compound, any atom other than carbon and hydrogen is called a heteroatom. Examples: Chlorine (Cl), Bromine (Br), Oxygen (O)

In chloromethane (CH_3Cl), chlorine is the heteroatom. In methanol (CH_3OH), oxygen is the heteroatom.

OR

Distinction based on physical properties:

(i) Smell: Ethanol has a characteristic smell known as alcoholic smell which is pleasant. Ethanoic acid has vinegar-like smell.

(ii) Boiling points: Boiling point of ethanol is less than that of ethanoic acid.

(iii) Litmus test: Ethanol is neutral in nature and does not bring any change in litmus whether blue or red. Ethanoic acid is acidic and changes the colour of the blue litmus strip to red when dipped in it.

Distinction based on chemical properties:

(i) Action with sodium hydrogen carbonate: On adding a small amount of sodium hydrogen carbonate to ethanoic acid, carbon dioxide gas is evolved with brisk effervescence. No such reaction takes place in case of ethanol.

(ii) Action with alkalis: Ethanoic acid reacts with both sodium hydroxide and potassium hydroxide to form corresponding salt and water. Ethanol fails to react with either of these.

$$CH_3COOH + NaOH \longrightarrow CH_3COONa + H_2O$$

$$CH_3COOH + KOH \longrightarrow CH_3COOK + H_2O$$
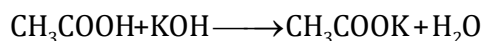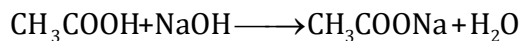
30.

(a)
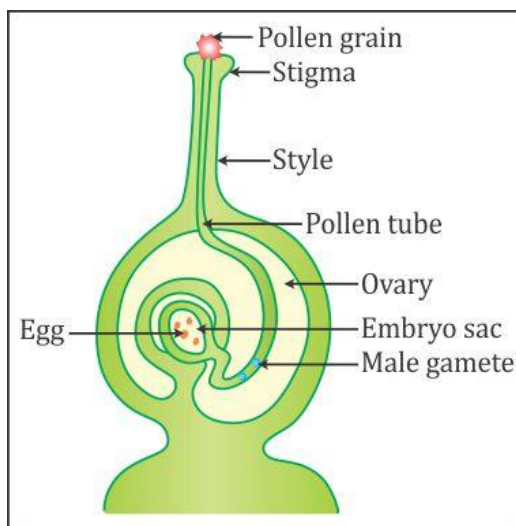
(b) The ovule becomes a seed, the ovary thickens to form a fruit and the zygote develops into the embryo of the seed.