Solutions

Section A

1. Due to small size and presence of four valence electrons, carbon forms strong bonds with other carbon atoms, hydrogen, oxygen, nitrogen or sulphur.

2. Functions of food chain:
   i) Food chain maintains ecological balance.
   ii) It helps in transforming solar energy into chemical energy amongst the various members of the food chain.

3. Retina converts the light to electrical signals and these signals are carried by the optic nerves to the brain.

4. Resemblance with alkali metals:
   Hydrogen has the same outermost electronic configuration as that of alkali metals.

   Resemblance with halogens:
   Hydrogen exist as diatomic molecule as halogens.

5. (a) Water shed management is a scientific method of developing land and water resources to increase the biomass production without causing ecological imbalance.

   (b) The advantages are:
   i) Watershed management only increases the production and income of the watershed community.
   ii) It also mitigates droughts and floods.
   iii) It increases the life of the downstream dam and reservoirs.

6. (a) Copper-T is placed in the uterus to prevent pregnancy.
   (b) If the vas deferens in the male is blocked surgically, sperm transfer will be prevented and fertilization will not occur.

7. (a) It is a method of reproduction in certain plants, where in parts of the plant like the root, stem and leaves develop into new plants under appropriate conditions.
   (b) Male reproductive part- Stamen
   Female reproductive part- carpel

8. (a) Valency remains same on moving from top to bottom in a particular group. This is because the outermost electronic configuration of all the elements in a group remains same.

(b) On moving from left to right in a period, the number of valence electrons in elements increases from 1 to 8. The elements in a period have consecutive atomic numbers.
On moving down a group in the periodic table, the number of valence electrons in the elements remains the same.

9. mA concave lens always forms a virtual, erect image on the same side of the object.
v = -20 cm, f = -25 cm, u =?
1/v -1/u = 1/f
1/u = 1/(-20) - 1/(-25)
1/u = -1/100
u = -100cm
Thus, object distance is 100 cm.
Magnification= v/u = -20/ (-100) = + 0.5
Thus, image is erect, virtual and is half of the size of object.

10. Formation of rainbow: The rainbow is formed in the sky when sun shines and it is raining at the same time. The raindrops in the atmosphere act like many small prisms. As white light enters and leaves these raindrops the various colours present in white light are refracted by different amounts due to which an arch of seven colours called rainbow is formed in the sky.

11. (a) We are able to see distant and nearby objects clearly by changing the focal length of the eye lens. This is called accommodation of the eye.

(b) Ciliary muscles help in changing the curvature of lens.

(c) At the junction of optic nerve and retina, there are no light sensitive cells due to which no vision is possible at that spot. This is called blind spot.

12. The rough focal length of a convex lens is obtained by forming sharp image of a very distant object on a screen. The distance of the screen from the lens gives us the rough focal length of the lens.

This method is not applicable to a concave lens, as image formed by a concave lens is virtual and it cannot be taken on a screen.

13. (a) X is ethyl ethanoate.
(b) It is saponification reaction.
(c) $CH_3COOC_2H_5 + NaOH \rightarrow C_2H_5OH + CH_3COOH$

14. (a) By the electronic configuration of an element, we can identify the group and period to which the atom belongs.
For example - Oxygen has atomic number 8.
Its electronic configuration is 2, 6.
As it can gain two electrons to complete its octet, so it belongs to group 16. Also, since the electrons are filled in two shells. So, oxygen belongs to the second period.

(b) As we move down the group, electronegativity of elements decreases as the atomic size increases. Nitrogen is placed above phosphorus in group 15. So, nitrogen is more electronegative than phosphorus.

15. Approach of society is baseless. Sex of the child is determined by the type of chromosome present in sperm (X and Y) that fuses with ovum at the time of fertilization.

Associated value: The learner will be able to improve their mindsets that help them to discontinue various social malaise i.e. gender inequality, female foeticide etc.

16. a) No.
This is because all the F_1 progeny plants show the genetic make up Pp, which results in purple flowers.
b) Dominant trait is a genetic trait that is expressed in a person who has only one copy of that gene.
Recessive trait is a genetic trait that is expressed only when two copies of the gene are present.

17. i) Genetic drift refers to the random change in gene frequencies in a small population, presumably owing to chance rather than natural selection, thereby providing diversity without any adaptations.
ii) The transmission of characters from parents to offspring from one generation to another is called heredity.
iii) Organs of different organisms which are similar in function and external appearance, but dissimilar in origin and structural plan are called analogous organs.

18. Fossils are the impressions or remains of ancient life found preserved in sedimentary rocks, snow or oil.

Information given by fossils:
(i) Fossils reveal that the life form which existed earlier do not exist today.This suggests that the living forms are ever changing.
(ii) Fossils indicate the time when these organisms existed on earth.
(iii) Fossils indicate about the extent of evolution that has taken place when they are compared with their present forms.

19. Scrotum remains outside the body to provide optimal temperature for the formation of sperms. The sperms develop at a temperature 1-3^{o} C lower than the normal body temperature.
(b) The flowers are coloured to attract insect pollinators for cross pollination.

(c) The plants which are propagated only by vegetative methods do not produce viable seeds.

20. (a) Distances measured upward and perpendicular to the principal axis are taken as positive. Distances measured downward and perpendicular to the principal axis are taken as negative. A real image is formed below the principal axis and a virtual image is formed above the principal axis. So, magnification for a real image is taken negative and for a virtual image it is taken as positive.
(b) A convex mirror is used as rear-view mirror in vehicles because it always produces an erect and diminished image of the objects and it has a wide field of view. (c) Power = $\frac{1}{\text{Focal length}}$ $f = \frac{1}{4.5} = 0.22$ m

$$\text{Focal length (f)} = \frac{1}{\text{Power}}$$

Or

(a) Object distance, u = -15 cm Image distance, v=?
(b) Focal length, f = -10 cm
Mirror formula,

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$
$$\frac{1}{v} + \frac{1}{-15} = \frac{1}{-10}$$
$$\frac{1}{v} = -\frac{1}{10} + \frac{1}{15}$$
$$\frac{1}{v} = \frac{-3+2}{30}$$
$$\frac{1}{v} = -\frac{1}{30}$$
$$v = -30$$

Thus the image is formed in front of the concave mirror at a distance of 30 cm.

The image formed is real and inverted.

Magnification, $m = -\frac{v}{u}$

$m = -\left(\frac{-30}{-15}\right)$

$m = -2$

$m = \frac{h_2}{h_1}$

$-2 = \frac{h_2}{1}$

$h_2 = -2\ cm$

Thus, the size of image is 2 cm and image is real and inverted.

(b) Refractive index of a medium $= \frac{\text{Speed of lght in air}}{\text{Speed of light in the medium}}$

So,

$$\text{Speed of light in a medium} = \frac{\text{Speed of light in air}}{\text{Refractive index of the medium}}$$

Thus, speed of light will be more in a medium having lower value of refractive index. Therefore, speed of light is more in water in comparison to kerosene.

21. (i) (a) The centre of curvature of a spherical mirror is the centre of the hollow sphere of glass of which the mirror is a part.
(b) The centre of the spherical surface (reflecting) of the mirror is called its pole.

(ii) Mirror formula: $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$

Magnification: $m = \frac{-v}{u}$

where, f is the focal length of the mirror
v is the image distance
u is the object distance

(iii) v = -45cm (real and inverted image)
f = -20cm

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

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

$$= \frac{1}{-20} - \frac{1}{-45}$$

$$= \frac{-9+4}{180} = \frac{-5}{180}$$

$$u = -36 \text{ cm}$$

The object should be placed at a distance of 36 cm in front of the concave mirror.

Or

(i) Given, focal length of the concave lens, f = -20 cm
Object height, h_1=+5cm
Image distance, v=-15 cm
Object distance, u=?
Image height, h_2=?

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

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

$$= \frac{1}{-15} - \frac{1}{-20} = -\frac{1}{15} + \frac{1}{20}$$

$$= \frac{-4+3}{60} = -\frac{1}{60}$$

$$u = -60\text{cm}$$

The object must be placed at a distance of 60 cm in front of the concave lens. To find the image height we have to make use of the magnification formula

$$m = \frac{v}{u} = \frac{h_2}{h_1}$$

$$h_2 = \frac{v}{u} h_1 = \frac{-15}{-60} \times 5 = \frac{75}{60} = 1.25 \text{ cm}$$

So, the image height will be smaller than the object height.
(ii) This is because normal to spherical mirror at any point is the line joining that point to the centre of curvature (C) of the mirror. Therefore, any ray passing through C falls normally on the mirror and it would retrace its path on reflection from the mirror.

22. (a) Science which deals with the study of heredity and variations is called genetics.
(b) Pea plant.
(c) Mendel termed genes as factors.
(d) Genes is the unit of inheritance. It is a part of the chromosome which controls the appearance of a set of characters. Genes are located on chromosomes.

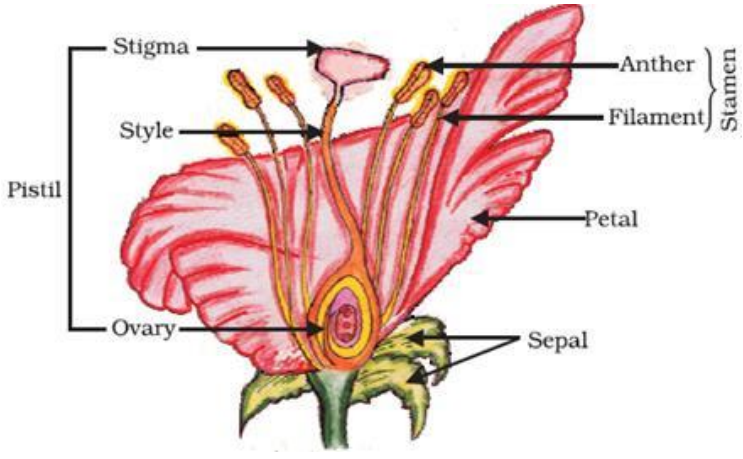
Or

(a) According to Darwin, natural selection is the process which brings about evolution of new species of plants and animals.
It consists of the following process:
(i) He noted that the size of the population tends to remain constant despite the fact that more offspring are produced than needed.
(ii) Variations provide adaptations.
(iii) The best adopted survive in the changing environment.
(iv) Nature selects the best organisms with better adaptations and after many generations new species are formed.
Both perform different functions but have similar basic structural design, i.e. both are modified branches.

23. (a) Placenta is a special tissue in the form of a disc embedded in the uterine wall.
Two functions of placenta are:
i) Placenta allows the passage of nutrients and oxygen from the mother's blood to the embryo.
ii) The waste substances generated by the developing embryo can be removed by transferring them into the mother's blood through the placenta.
(b) i) Gonorrhoea and syphilis
ii) Warts and HIV-AIDS

Or

(a)



	Self-pollination	Cross-pollination
1	Here pollen is transferred from the stamen to the stigma of the same flower.	Here pollen is transferred from the stamen of one flower to the stigma of another flower.
2	Self-pollination does not need the	Cross-pollination relies heavily on

	help of any agents.	pollinating agents

24. (a) Catenation: The property of carbon atom to link with other carbon atoms to form large molecules is called as catenation.
(b) i. Functional group is -OH group.
ii. Functional group is -COOH group.
(c) C_nH_{2n+2} represents a saturated hydrocarbon.
(d) Methane burns in oxygen with formation of carbon dioxide and water.

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

(a) Conversion of ethanol to ethanoic acid is an oxidation reaction because oxygen is added to ethanol and ethanoic acid is formed.

$$\underset{\text{Ethanol}}{CH_3CH_2OH} + O_2 \rightarrow \underset{\text{Ethanoic acid}}{CH_3COOH} + H_2O$$

Or

(a)

No.	Alkene	Alkyne
1	Unsaturated hydrocarbons containing a double bond between two carbon atoms are known as alkenes.	Unsaturated hydrocarbons containing a triple bond between two carbon atoms are known as alkynes.
2	General formula is C_nH_{2n}	General formula is C_nH_{2n-2}
3	Example: Ethene, Propene	Example: Ethyne, Propyne

(b) A detergent molecule consists of two ends - a hydrocarbon tail which is hydrophobic (water repelling) and a polar head which is hydrophilic (water attracting or loving). When a detergent is dissolved in water, the hydrocarbon tail aligns itself towards the dirt and ionic part aligns itself towards the water. The molecules gather together as clusters, called micelles. When water is agitated, the dirt suspended in the micelles is easily rinsed away. Thus, the cloth gets cleaned.

Section B

25. Correct option: B
On reacting $NaHCO_3$ and acetic acid, carbon dioxide gas is evolved along with formation of sodium ethanoate. This CO_2 gas turns lime water milky.

26. Correct option: D
CH_3COOH is an acid and turns blue litmus solution red.

27. Correct option: B
The reaction between ethanoic acid with $NaHCO_3$ is vigorous and produces a lot of effervescence.

28. Correct option: D
Chain of buds

29. Correct option: B
Elongation of its nucleus

30. Correct option: B
The sharp image of distant object forms at the focus of the lens. So, the distance between the lens and the screen (image's position) gives the focal length of the image.

31. Correct option: A
The best set up is given in figure (I). The incoming light should not fall perpendicularly as the light will emerge straight and refraction cannot be traced. The light rays should not be very close or far from the normal as the emergent rays are difficult to trace.

32. Correct option: D
A concave mirror converges the parallel beam of light falling on it at a point F.

33. Correct option: B
More in A than in B

34. Correct option: A
Exosmosis

35. Correct option: D
Weight of dry raisins + weight of wet raisins.

36. Correct option: B
Changed first to red then to blue since blue to red indicates acid and no colour change i.e. blue indicates base.

37. Correct option: C
When the ray light is going from denser to rarer medium, it bends away from the normal. So, the angle of refraction is greater than the angle of incidence.

38. Correct option: D
If a glass rod is immersed in a liquid of the same refractive index, then the speed of light will not change as it enters the glass rod. No refraction will take place, and the glass rod will be invisible.

39. Correct option: A
Carbon dioxide

40. Correct option: A
Saponification is the process of making soap by the hydrolysis of fats and oils with alkalis.

41. Correct option: B
In each case, the distances l_1 and l_2 give the focal length of the mirror and lens respectively. Also, the image formed in both cases is real and inverted.

42. Correct option: C
Bud appears as protuberance.