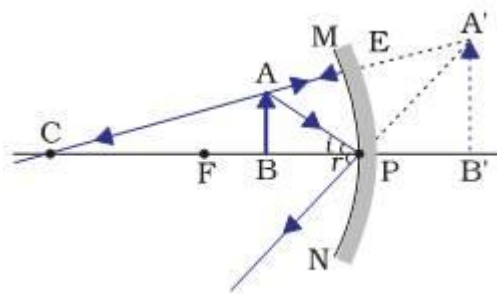


Solutions**Section A**

1. Covalent bonding
2. When light passing through a prism, it undergoes deviation and dispersion. This splits the white light into its 7 spectral colours.
3. Grass → Rabbit → Snake → Hawk
4. Yes, there is a similarity in the atoms of lithium, sodium and potassium elements.
All these elements have a similar electronic configuration having one electron each in their valence shells. The electronic configurations of lithium, sodium and potassium are given below:

Lithium: 2,1
Sodium: 2,8,1
Potassium: 2,8,8,1
5. The importance of watershed management system is-
 - i. It results in conservation of both water and soil.
 - ii. It is helpful in increasing the biomass production.
 - iii. It controls excess of droughts and floods.
 - iv. It maintains ecological balance in nature.(Any two)
6. a) Sperm is the male and ovum is the female gamete.
b) Fallopian tube
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) Advantages of vegetative propagation:
 - i) It helps in producing similar kinds of plants.
 - ii) It helps in producing such plants which do not produce viable seeds, or produce very few seeds.(Any one point)

8. (a) Chemical reactivity of metals increases on going down in a group and chemical reactivity of non-metals decreases on going down in a group.
 (b) It is not possible to have an element with atomic number 1.5 because atomic number is the number of protons in an atom which is always a simple whole number (it can be either 1 or 2 but not 1.5).
 (c) Potassium is larger in size than lithium because as we move down the group, the atomic size of the element increases.
9. Dentists use concave mirror to see enlarged image of the teeth for examining it. If an object is placed close to a concave mirror it forms erect and enlarged image of the object. So, the dentist holds the mirror in such a way that the tooth lies within its focus.



Convex mirror will result in virtual image which is erect but diminished than the actual size. Diminished image of the teeth will not help the dentist in identifying the tooth problem.

10. (a) Position of image, height of object and image are 16 cm, 2 cm and 3 cm respectively.

$$m = h'/h$$

In this, height of image will be taken negative as it is a real image.

So,

$$m = -3/2 = -1.5,$$

$$\text{Also, } m = -v/u$$

$$\text{Therefore, } -1.5 = -v/(u)$$

$$v = -1.5 \times 16 = -24 \text{ cm}$$

(b) Focal length

$$u = -16 \text{ cm, } v = -24 \text{ cm, focal length, } f = ?$$

$$1/v + 1/u = 1/f$$

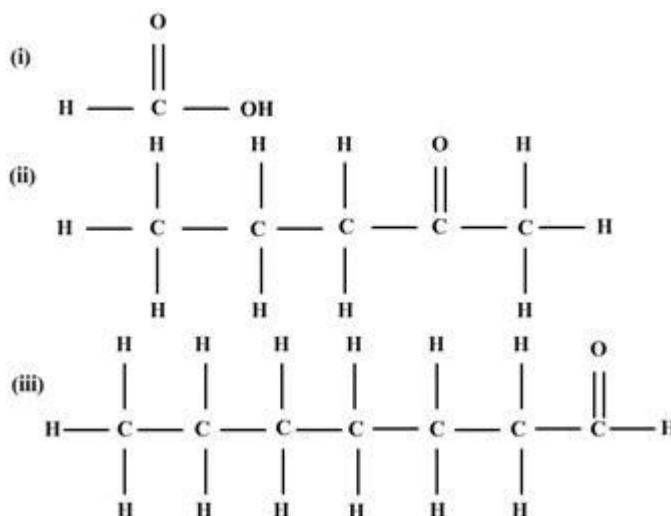
$$-1/24 + (-1/16) = 1/f$$

$$-5/48 = 1/f$$

$$f = -9.6 \text{ cm}$$

11. (i) Myopia or short sightedness
 (ii) Two possible causes-
 (a) excessive curvature of the eye lens
 (b) elongation of the eyeball.
 (iii) Friendship, concern for each other
12. (a) White light is composed to 7 spectral colours, which are of different wavelengths. They travel with different speeds when passed through a medium like glass. As a result of difference in speeds of constituent colours of light while passing through a medium, their refractive indices are also different, and hence the white light splits into the respective spectral colours. This splitting of colours of white light is known as dispersion of white light.
 (b) Range is: 4×10^{-7} m to 8×10^{-7} m.
13. (a) Physical and chemical properties of elements are determined by their atomic numbers which is equal to the number of electrons.
 By using the number of electrons, we can find out the number of valence electrons and hence the physical and chemical properties.
- (b) According to Modern Periodic Law, elements are arranged in the Modern Periodic Table in the increasing order of their atomic numbers. Isotopes have the same atomic number and different atomic mass. So, though they have different atomic masses still they are given the same position in the Modern Periodic Table.

14. (a)



- (b)
 (i) Methan-1-ol
 (ii) 2-bromo butane
 (iii) Hex-3-ene

15. (a) The testes are located outside the abdominal cavity in scrotum because sperm formation requires a lower temperature than the normal body temperature.
 (b) The aim of the mechanical barrier of contraception is to prevent the sperms from reaching the egg.
 Example of this contraceptive is condoms worn on the penis.

16. (a)
 i) The pink colour of flowers is the dominant trait whereas the recessive trait is white colour.
 ii) 3:1 (pink:white)
 (b) Genes

17. (a) Mendel chose the pea plant because:
 i. Pea plant completes its life cycle in a very short interval of time.
 ii. Pea plant has several distinct and contrasting characters that can be easily studied.
 (b) No, experiences of a person will not be transferred to the next generation because it is an acquired trait.

18. a) Advantages of variations are:
 i. Variations in individuals often increase the chances of their survival.
 ii. Variations are also helpful in bringing about the evolution of species.

- (b) i) The person is a male as human males have XY chromosome.
 ii) In lizards environmental factor helps in sex determination.
 High temperature induces maleness while low temperature brings about femaleness in the offspring.

19. (a) Placenta
 (b) i) Seminal vesicles- secretions of these glands provide nourishment to sperms.
 ii) Uterus- after fertilization embryo gets implanted on uterus and develops there.

20. (a) Nitrogen has valency 3. So, it needs 3 electrons to complete its outermost shell. It requires a lot of energy to gain three electrons or lose five electrons. Hence, two atoms of nitrogen share three electrons to form a triple bond. Therefore, in each molecule of nitrogen, two atoms are joined by a triple bond.

(b)

Saturated hydrocarbons	Unsaturated hydrocarbons
1. In these hydrocarbons carbon atoms are linked by single bond only. 2. They burn in air with a clean, non sooty flame. 3. They undergo substitution reactions.	1. In these hydrocarbons double and/or triple carbon bonds are also present. 2. They burn with a yellow flame producing large amount of smoke. 3. They undergo addition reactions.

Or

(a) Three characteristics of a homologous series are:

1. Any two adjacent members of a homologous series differ by a CH_2 group.
2. The difference in molecular masses of any two adjacent homologues is 14 u.
3. All the compounds of a homologous series show similar chemical properties.

(b) Valency of carbon is four.

In a molecule of methane, carbon shares one electron each with four hydrogen atoms forming four single covalent bonds with four hydrogen atoms. Thus, it satisfies its valency by sharing four electrons with hydrogen atoms.

21. (a) Image distance (v), object distance (u) and focal length (f) of a lens are related to each other by the following formula

$$1/v - 1/u = 1/f$$

This is called lens formula.

Focus of a convex lens lies on the right side of the lens, hence according to sign convention; the distances measured to the right are taken as positive. So focal length for convex lens is taken as positive.

Similarly, the focus of concave lens lies on the left side of the lens, hence according to sign convention; the distances measured to the left are taken as negative. So its focal length is taken negative.

(b) Object distance, $u = -20\text{ cm}$

Image distance = ?

Focal length, $f = r/2 = +10\text{ cm}$

$$1/v - (1/u) = 1/f$$

$$1/v - 1/u = 1/f$$

$$1/v = 1/f + 1/u$$

$$1/v = 1/10 - 1/20$$

$$1/v = 1/20$$

$$v = 20\text{ cm}$$

The image is formed at a distance of 20 cm. It is real and inverted.

Size of image can be found out by

Magnification, $m = v/u$

$$m = 20/-20$$

$$m = -1$$

This implies that the image is of same size as the object and is real and inverted.

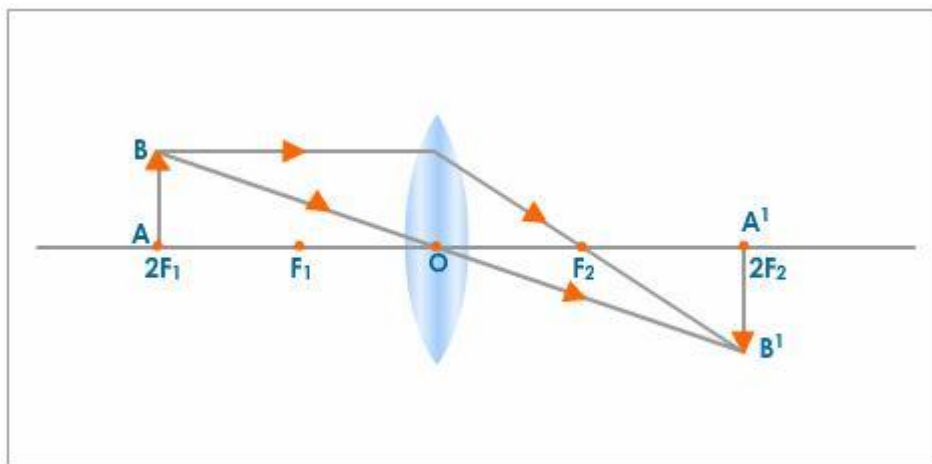
OR

Size of object, $h_1 = 8\text{ cm}$

Size of image, $h_2 = 8\text{ cm}$

(a) As the image formed is of the same size as that of the object, it can be said that the object and image are located at $2F$ on the either side of the lens.

(b)



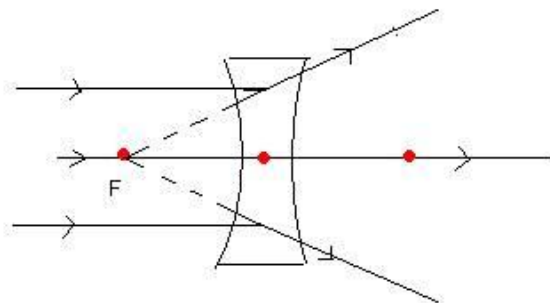
(c) (i) -25 cm , -20 cm , -10 cm , -5 cm (Lens arranged in decreasing order of focal length would correspond to increasing bending power.)

(ii) Lens with same numerical value of focal lengths, irrespective of signs, will show same bending powers. $(+5\text{ cm}, -5\text{ cm})$; $(+10\text{ cm}, -10\text{ cm})$

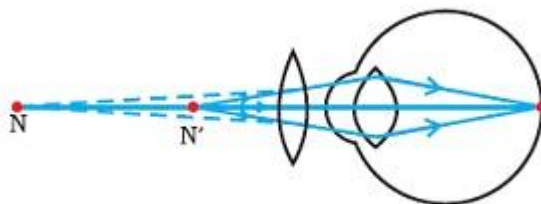
(iii) Yes, a convex and a concave lens of same numerical value of focal lengths will show similar bending power.

However, a convex lens of focal length +10 cm will exhibit converging power, whereas a concave lens of focal length -10 cm will exhibit diverging power.

22. (a) Diagram of concave lens showing that it is a diverging lens.



- (b) Diagram below shows how convex lens corrects the defect of hypermetropia.



- (c) It means that the image is real and inverted.

OR

- (a) Object distance, $u = \text{infinity}$, Image distance, $v = -40 \text{ cm}$, focal length = ?

$$1/v - 1/u = 1/f$$

$$1/(-40) - 0 = 1/f$$

$$-1/40 = 1/f$$

$$f = -40 \text{ cm}$$

Thus the focal length (f) of the concave lens is 40 cm or 0.4 m

$$\text{Power, } P = 1/f$$

$$P = 1/(-0.4)$$

$$P = -2.5 \text{ D}$$

Power of the concave lens is -2.5 D.

- (b) Retina contains light sensitive cells known as rods and cones. These cells get activated upon illumination and generate electrical signals pulses. The electrical signals are sent to the brain through optic nerves. In the brain, the signals are processed, interpreted and the objects in front of the eye are perceived.

- (c) Refractive index of a medium has no units.

23. (a) Tallness of a plant is a characteristic. Height of a plant depends on the amount of hormone secreted by the plant responsible for its tallness. The gene has the coding for the amount of hormone released. If the gene for that hormone has an alteration and makes its efficiency low, then the plant will be short. Thus, this shows that the traits are controlled by genes.

(b) (i) In turtle, high incubation temperature results in the development of female progeny.

(ii) In lizard, high incubation temperature results in the development of male progeny.

OR

(a) (i) Haploid: A single set of impaired chromosomes is said to be haploid.

(ii) Diploid: The paired condition of chromosomes is known as diploid.

(b) Genes are segments of DNA on a chromosome occupying specific positions. Every chromosome contains DNA and the chromosomes are the carriers at the genes. Genes have a specific sequence of nucleotides which determines their functions.

(c) It occurs due to change in gene frequency leading to expression of one type of trait in a geographically isolated population.

24. (a) (i) If no fertilisation occurs, the thickened uterine lining slowly breaks down and comes out through the vagina as blood and mucous.

(ii) This process is known as menstruation.

(iii) It usually lasts for about two to eight days.

(b) Since the ovary releases one egg every month, the uterus also prepares itself every month to receive a fertilised egg. In the absence of fertilisation, the thickened uterine lining is shed as menstruation once every month.

c) A number of finger like projections called villi penetrate the tissues of the uterine wall in which they are embedded and make up the organ known as the placenta.

By means of this placenta, the developing foetus obtains nutrients and oxygen and also gets rid of carbon dioxide and other metabolic wastes.

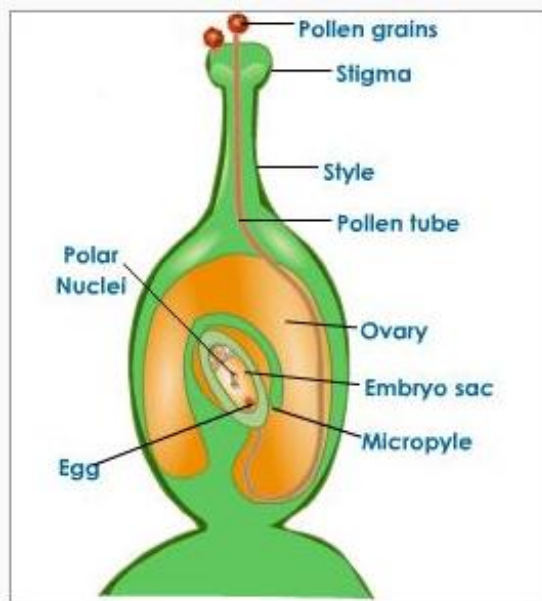
Or

(a) i) Spore formation is beneficial for fungi because spores are able to withstand adverse conditions like shortage of food and moisture, heat etc.

ii) Plasmodium lives in lining of stomach it reproduces by multiple fission. Thus a large number of organisms are produced by one organism.

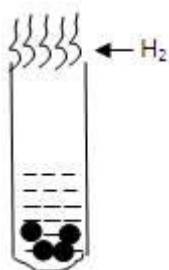
iii) Mitosis

(b)



Section B

25. Correct option: D



This test tube produces a pop sound on bringing a burning matchstick close to the tube since hydrogen burns in air to produce a pop sound.

26. Correct option: A

Have intact stalks

27. Correct option: C

40%

28. Correct option: B

Colourless to blue because of the basic nature of NaOH.

29. Correct option: D

Dilute hydrochloric acid shows up red colour on the pH scale.

30. Correct option: A

A gas evolves

31. Correct option: D

Both acetic acid and ethanoic acid can turn the pH paper orange.

32. Correct option: B

Mitosis cell division

33. Correct option: A

A

34. Correct option: B

Hydra

35. Correct option: C

The image gets blurred and enlarged (or shortened) when the lens is moved farther (or nearer) from (to) the screen.

36. Correct option: C

Sun is at infinite distance. So, rays coming from the sun can be treated as parallel beam of light which get reflected from the concave mirror and form a point sized image on the screen

37. Correct option: A

Angle of refraction < angle of incidence

Angle of incidence = angle of emergence

38. Correct option: C

When light goes from rarer medium to denser medium; it bends towards the normal and vice-versa. This condition is fulfilled in figure (iii).

39. Correct option: B

iii, ii, iv, i

40. Correct option: C

Saponification

41. Correct option: B

When the source is placed at the first principal focus, after refraction from the lens, a parallel beam of light can be obtained.

42. Correct option: C

For better results, the angle of incidence should be in the range 30° - 60° and larger separation between the pins will give better collinearity of the pins and accuracy of the result.