CBSE
Class X Science
Sample Paper – 3 (Reference Solutions)
2024-25

SECTION - A

1. Correct option-d: C and D.
Tamarind and beverages like tea and coffee are acidic in nature.

2. Correct option-b: Has low melting point.
It is because the product R formed is an ionic compound and has high melting point.

3. Correct option-a: $CuCO_3$.
Metals like copper corrode when exposed to air and moisture. Copper article when exposed to air and moisture; develop a green coating over them. Copper reacts with carbon dioxide from the air to form a green layer of copper carbonate $CuCO_3$.

4. Correct answer-d: Displacement reaction
The caps have been exchanged in products.

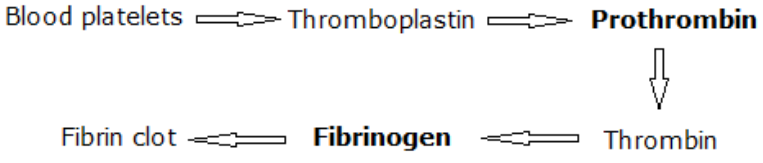
5. Correct option- b: Au.
Gold and platinum dissolve in aqua regia.

6. Correct Answer- d: A clear and homogeneous solution is formed.
Acetic acid is infinitely miscible in water.

7. Correct answer-d: All the above.
All statements are true.

8. Correct option - a. A – Exchange of materials between blood and tissue cells, B - Carry blood away from the heart, C – Carry blood towards the heart
A – Capillaries, B – Arteries, C –Veins
Arteries carry oxygenated blood away from the heart, veins carry deoxygenated blood towards the heart and capillaries assist in exchange of materials between blood and tissue cells.

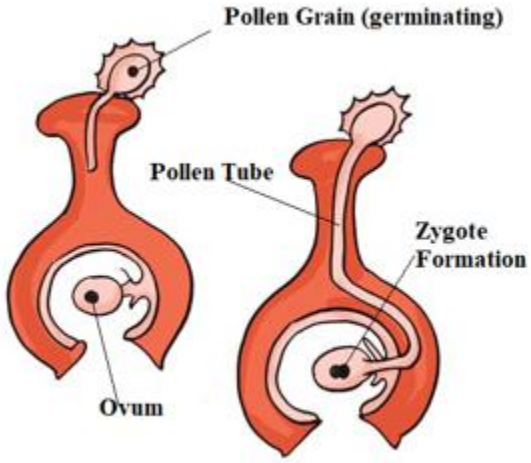
9. Correct option- a. A → Prothrombin, B → Fibrinogen



10. Correct option – d : 4 tall plants and 1 medium height plant

In a monohybrid cross between tall and short plants, all plants are tall in F_1 generation while in F_2 generation, the phenotypic ratio is 3 tall:1 short. There is no intermediate phenotype like medium plants.

11. Correct option – a : Fertilisation, A – Germinating pollen grain, B – Pollen tube



12. Correct option – b: Thigmonasty – Nastic movement

Thigmonasty is a type of nastic movement in response to touch or contact.

13. Correct option: - d) Induced current

Current produced in a conductor when it moves perpendicular to a magnetic field is known as induced current. This phenomenon is known as electromagnetic induction.

14. Correct option: - b) 2A

Total resistance –

$R = R1 + R2 = 4 + 2 = 6\ \Omega$

Potential difference - $V = 12$ V

Using Ohm's law:

$I = V/R = 12/6 = 2$ A

15. Correct option – d) Deer and Rabbit

Grass is a producer, eagle and lion are top carnivores and rabbit and deer are both herbivores. Eagle and lion are not mentioned in the given choices. So, rabbit and deer belong to the same trophic level.

16. Correct option – c) A and E

Dumping of waste without sorting (B), air pollution (C) and pollution of water (D) have negative effects on the environment. Sorting and recycling of waste (A) and use of paper bags instead of plastic bags (E) are eco-friendly ways of saving the environment.

17. A is true, but R is false.

When an acid reacts with a base, then salt and water are formed. For example, when the hydrochloric acid reacts with the sodium hydroxide solution, then a neutralisation reaction takes place to form sodium chloride and water. So, the assertion is true.

$NaOH_{(aq)} + HCl_{(aq)} \longrightarrow NaCl_{(aq)} + H_2O_{(l)}$

Such a reaction is termed as neutralisation reaction. So, the reason is false.

18. Both A and R are true, and R is the correct explanation of A.

If fertilisation of the ovum by the sperm occurs, the corpus luteum persists and continues to maintain the hormone levels. It releases progesterone to keep the uterus in a state suitable for implantation.

If, however, fertilisation does not occur, the ovum disintegrates. The corpus luteum regresses and stops producing progesterone. As a result, the thickened lining of the uterus or the endometrium starts rupturing and shedding, resulting in menstruation.

So, both assertion and reason are true, and the reason correctly explains the assertion.

19. Both A and R are true, but R is not the correct explanation of A.

Food chains are limited to 4–5 trophic levels because energy losses between trophic levels restrict the length of food chains and the biomass of higher trophic levels. So, the assertion is true.

As we pass from one trophic level to the next, only 10% of energy is transferred from the first trophic level to the next. This is because a lot of energy is lost to the surroundings and the rest is utilised by the organism. So, the reason is also true.

However, here although both assertion and reason are true, the reason does not correctly explain the given assertion.

20. Both A and R are true and R is correct explanation of A.

The metallic body connected to the earth provides low resistance conducting path for electric current. Thus, leakage of current to metallic body of appliance keep the potential to that of earth. This decreases the severity of the electric shock.

SECTION – B

21.

Plaster of Paris is prepared by heating gypsum to a temperature of 100 °C in a kiln.

$$\underset{\text{Gypsum}}{CaSO_4.2H_2O} \xrightarrow{\text{Heat (100}^\circ\text{C)}} \underset{\text{Plaster of paris}}{CaSO_4.\tfrac{1}{2}H_2O} + 1\tfrac{1}{2}H_2O$$

Plaster of Paris is used in hospitals for setting fractured bones in the right position to ensure correct healing.

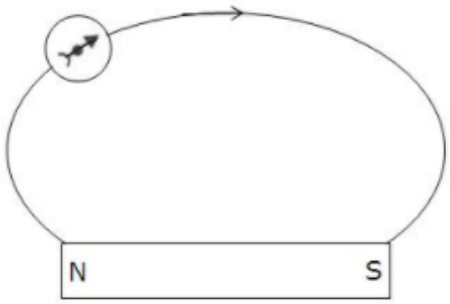
22. Multiple fission produces many new organisms at once, which can help a colony grow quickly. It can help protozoa deal with unfavorable conditions. Multiple fission can lead to a higher production rate, which can improve the protozoa's chances of survival. Hence, multiple fission is generally considered better than binary fission for protozoans.

23. Glomeruli are considered dialysis bags because they filter blood in a similar way to a dialysis machine. Like a dialysis bag, the main function performed by glomeruli is filtration. They filter small molecules containing glucose, salts, urea, and liquid serum. The large molecules such as proteins remain in blood. That is why glomeruli are considered as dialysis bags.

OR

Pancreatic juice secreted by the pancreas enters the duodenum through the pancreatic duct. The juice contains a variety of enzymes, including trypsinogen, chymotrypsinogen, elastase, carboxypeptidase, pancreatic lipase, nucleases, and amylase. The enzymes pancreatic amylase and trypsin help in the digestion of carbohydrates and proteins respectively. Therefore, if there is a blockage in the pancreatic duct, the pancreatic juice will not enter the duodenum. Hence, digestion of proteins and carbohydrates in the duodenum will not occur.

24.



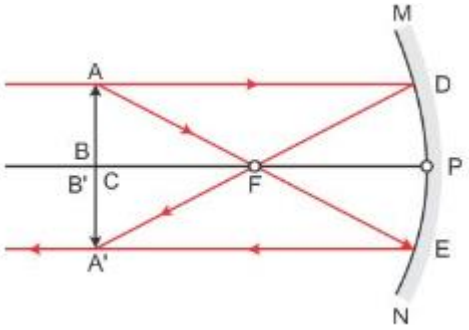
As the north pole of the magnetic needle is pointing in the opposite direction, so the nearer end of the magnet will be North Pole.

25. R = –12 cm (Radius of curvature of a concave mirror)

We know, f = R/2 = – 12/2 = – 6 cm.

The image formed by a concave mirror when an object is placed between the focus and pole is virtual, erect and magnified.

OR



The image forms at the centre of curvature itself. The image is real, inverted and of the same size as the object.

26. Eco-friendly activities in daily life: *(Any four)*

- Separation of dry wastes and wet wastes
- Use of water used for cooking and washing for gardening
- Use of gunny bags/paper bags in place of polythene/plastic bags
- Use of compost and vermicompost in place of chemical fertilisers
- Rainwater harvesting

SECTION - C

27.

(a) The metal is P is Mg.

(b) The white powder Q is MgO.

(c) White powder Y dissolves partially in water to form substance R. It is $Mg(OH)_2$, and is used as an antacid.

(d) The chemical reactions that are taking place are :

$$\underset{(X)}{2Mg(s)} + \underset{}{O_2(g)} \xrightarrow{\text{Ignition}} \underset{(Y)}{2MgO(s)}$$

$$\underset{(Y)}{MgO(s)} + \underset{}{H_2O(l)} \longrightarrow \underset{(Z)}{Mg(OH)_2}$$

28.

(a) $BaCl_2(aq) + Na_2SO_4(aq) \rightarrow BaSO_4(s) + 2NaCl(aq)$

(b) The type of this reaction is double displacement reaction.

(c) Yes, a precipitate of barium sulphate ($BaSO_4$) is formed.

(d) The precipitate is white in colour.

OR

(a) Solid sodium chloride (NaCl) and concentrated sulphuric acid (conc. H_2SO_4)

(b) Dry litmus – no change because separation of H^+ ions cannot occur in the absence of water,
Wet litmus – Blue to red since hydrogen ions present in the form of hydronium ions.
Hydrogen ions cannot exist alone, but they exist after combining with water molecules. Thus, hydrogen ions are always present as hydronium ions as follows:
$H^+ + H_2O \longrightarrow H_3O^+$

(c) $HCl + H_2O \rightarrow H_3O^+ + Cl^-$
H_3O^+ - Hydronium ion
Cl^- - Chloride ion

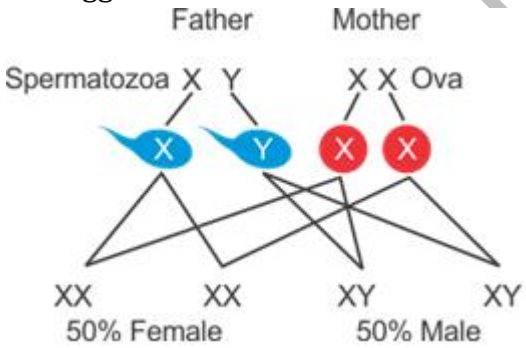
29.

(a) Chemotropism. It is the phenomenon of growth of plant organs in response to chemicals.

(b) (1): Pollen grain, (2): Pollen tube, (3): Ovule, (4): Ovary.

(c) Sugar and peptones.

30. The sex of a child depends on the kind of sperm that fertilises the egg. The egg always contains an X chromosome, but the sperms can either contain an X-chromosome or a Y-chromosome. It is simply a matter of chance as to which category of sperm fuses with the egg and this determines whether the child will be a male or a female.



If the egg fuses with the X-bearing sperm, the resulting combination is XX and the child born is a female.

If the egg fuses with the Y-bearing sperm, the resulting combination is XY, and the child born is a male.

31.

(a) When an object is placed between the pole and infinity, the image formed is virtual, erect and diminished.

(b) When light rays are incident on the rough surface, they are reflected in different directions. This type of reflection is called diffused reflection or irregular reflection.

(c) A convex mirror always produces an erect, virtual, and diminished image. This enables a driver to view a much larger area behind him. Hence, a convex mirror is suitable as a rear-view mirror.

32. Object distance, u = –40 cm

Image distance, v = 100 cm

From the lens formula,

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

$$\therefore \frac{1}{f}=\frac{1}{100}-\frac{1}{-40}=\frac{1}{100}+\frac{1}{40}$$

$$\therefore \frac{1}{f}=\frac{140}{4000}=0.035$$

$$\therefore f=28.57 \text{ cm}$$

Height of the object, h = 4 cm

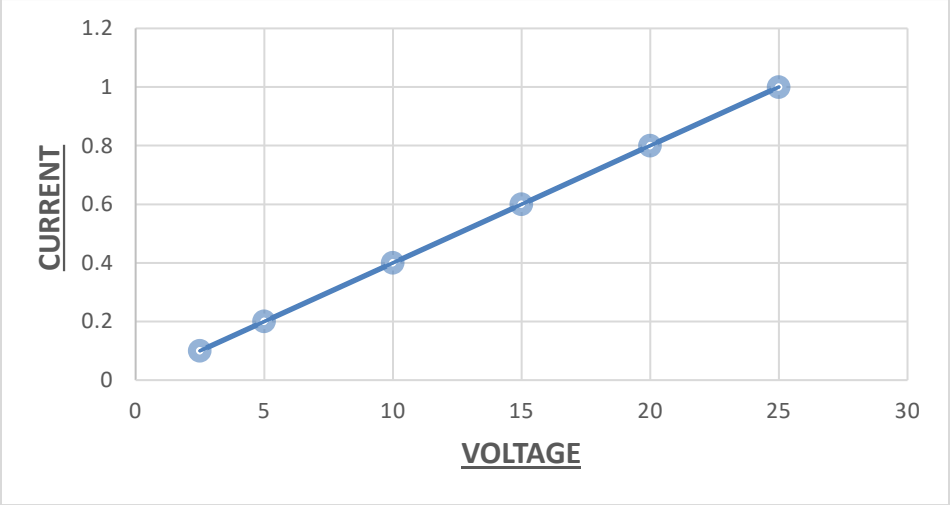
From the magnification formula,

$$m=\frac{v}{u}=\frac{h'}{h}$$

$$\therefore h'=\frac{v}{u}h=\frac{100}{-50}\times 4=-8 \text{ cm}$$

33.

(a) V-I graph is as follows:



(b) Straight line graph

(c) Ohm's law is illustrated when nature of V- I graph is straight line.

SECTION - D

34.

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

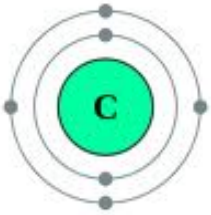
(d) Alkanes: CH_4, C_2H_6, C_4H_{10}
Alkenes: C_2H_4, C_3H_6
Alkynes: C_2H_2, C_3H_4

(e) In an organic compound, any atom other than carbon and hydrogen is called a heteroatom.
Examples: Chlorine (Cl), Bromine (Br), Oxygen (O)
Chloromethane (CH_3Cl) and methanol (CH_3OH)

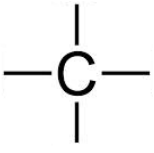
OR

The common element present in graphite, sugar and diamond is "Carbon."
Bonding formed by Carbon element is as follows:

- Carbon atom has four electrons in its outermost shell.

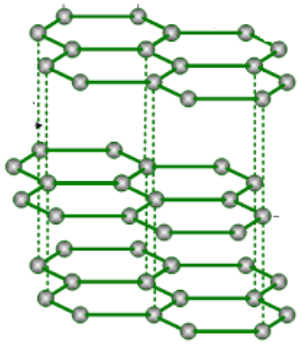


- It requires four electrons to achieve the stable, 8 electron, inert gas electron arrangement.
- Carbon atoms can achieve the inert gas electron arrangement only by sharing of the electrons. Hence, carbon always forms covalent bonds.
- The valency of carbon is four since one carbon requires 4 electrons to achieve the nearest inert gas configuration. Thus, we can say that carbon is tetravalent.
- The four valencies of carbon are usually represented by putting four short lines around the symbol of carbon, C.



Graphite:

- In graphite, each carbon atom is bonded to three other carbon atoms in the same plane, giving a hexagonal array.
- One of the bonds is a double bond and thus the valency of the carbon is satisfied.
- Graphite structure is formed by the hexagonal arrays being placed in layers, one above another.
- Graphite is smooth and slippery.
- It is a very good conductor of electricity due to the presence of free electrons.



35.

(a) If the niche were drastically altered, the population could be wiped out. However, if some variations were to be present in a few individuals in these populations, there would be some chance for them to survive. Variation is thus useful for the survival of species over time.

(b)

- The lining of the uterus thickens and is richly supplied with blood to nourish the growing embryo.
- The embryo gets nutrition from the mother's blood with the help of placenta. It is embedded in the uterine wall.
- It contains villi on the embryo's side of the tissue. On the mother's side are blood spaces, which surround the villi.
- This provides a large surface area for glucose and oxygen to pass from the mother to the embryo. The developing embryo will also generate waste substances which can be removed by transferring them into the mother's blood through the placenta.
- The child is born as a result of rhythmic contractions of the muscles in the uterus.

OR

(a) Jumping back instantly on seeing a snake is an example of a quick, involuntary, reflex action. Reflex actions help organisms to quickly adapt to an adverse circumstance that could have the potential to cause bodily harm or even death.

Walking away slowly is an example of a slow, voluntary action. Voluntary actions are produced with the involvement of thoughts. These actions are produced consciously.

(b) (i) Cycling will be controlled partially by the cerebrum as the act of pushing the paddles and partially by the cerebellum to balance the body and co-ordination between muscles of during paddling.
(ii) Body temperature is controlled by the hypothalamus.
(iii) Heartbeat is regulated by medulla oblongata.

36.

(a)

Bar magnet	Electromagnet
1. A bar magnet is a permanent magnet.	1. An electromagnet is a temporary magnet.
2. A permanent magnet produces a comparatively weak force of attraction.	2. An electromagnet can produce a very strong magnetic force.
3. The strength of a permanent magnet cannot be changed.	3. The strength of an electromagnet can be changed by changing the number of turns in the coil or changing the current passing through it.
4. The polarity of a permanent magnet is fixed and cannot be changed.	4. The polarity of an electromagnet can be changed by changing the direction of current.

(b) According to Fleming's left-hand rule, hold the forefinger, the middle finger, and the thumb of your left hand at right angles to one another. Adjust your hand in such a way that the forefinger points in the direction of the magnetic field and the middle finger points in the direction of current. The direction in which the thumb points give the direction of force acting on the conductor.

(c) As the positively charged particles are moving towards the west, the direction of current will be towards the west. It is given that the deflection is towards the north. Thus, according to Fleming's left-hand rule, holding the middle finger towards the west (direction of current) and the thumb towards the north (in the direction of force), the forefinger points in the upward direction. Hence, the direction of the magnetic field is in the upward direction.

OR

(a) **Joule's law of heating:** Amount of heat energy produced in an electric circuit is directly proportional to the
(i) Square of the amount of electric current
(ii) Time for which the current passes
(iii) Amount of resistance which the circuit provides to the flow of current

The heat energy produced in a conductor of resistance 'R' when current 'I' is flowing for time 't' is given by equation,

$H = I^2Rt$

(b)

(i) When the resistors are connected in series:

$R_s = R + R = 2R$

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

(ii) When the resistors are connected in parallel:

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

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

$\therefore H_p = \frac{V^2}{R_p} = \frac{2V^2}{R}$ ..... (2)

From (1) and (2),

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

$\therefore H_p = 4H_s$

SECTION - E

37.

(a)

i) Copper is placed below hydrogen in activity series therefore, it is less reactive than hydrogen.

ii) Iron is placed above hydrogen in activity series therefore, it is more reactive than hydrogen.

(b)

i) Metals which react vigorously with oxygen: Sodium and potassium.

ii) Correct order of reactivity of given metals: Na > Mg > Al > Cu.

OR

(c) Sameera should prefer Type B iron nails coated with zinc.

Reason: Type A nails are pure iron nails which get rusted due to corrosion.

Type B iron nails are galvanized nails.

Galvanising is a method of rust prevention. The iron or steel object is coated in a thin layer of zinc. This stops oxygen and water reaching the metal underneath. Zinc also acts as a sacrificial metal. Zinc is more reactive than iron, so it oxidises in preference to the iron object.

38.

(a) A pea plant with axial flowers (AA; dominant) was crossed with a pea plant with terminal flowers (aa, recessive). All the F_1 progeny would bear axial flowers because the trait for axial flowers is dominant over the trait for terminal flowers.

(b) In the F_2 generation,

Parents → Aa × Aa

Gametes → A, a A, a

	A	**a**
A	AA (Axial)	Aa (Axial)
a	Aa (Axial)	aa (Terminal)

Phenotypic ratio of F_2 progeny → Axial : Terminal = 3 : 1

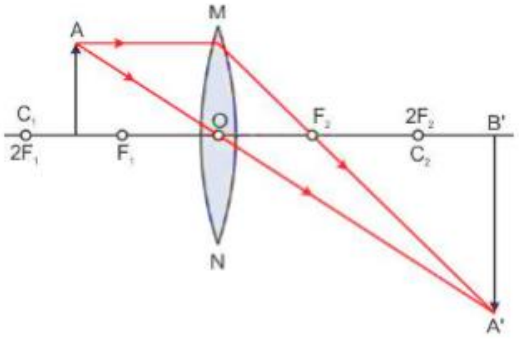
(c) F_1 plants are heterozygous (Aa), and hence, only the dominant trait is visible in the F_1 generation. In the F_2 generation, factors responsible for the two traits are segregated and recombined to form a homozygous recessive trait for terminal flowers (aa). Therefore, the F_2 progeny is different from the F_1 progeny.

OR

(c) With respect to flower colour in pea plants, the trait for violet colour is dominant over the trait for white flower colour. Thus, the phenotypic ratio of violet flowered and white flowered plants in F_2 generation would be 3 : 1. Hence, out of 400 plants, 300 plants would bear violet flowers and 100 plants would bear white flowers.

39.

a) The position of the object will produce a magnified real image when an object is placed between F and 2F on the left side of lens.



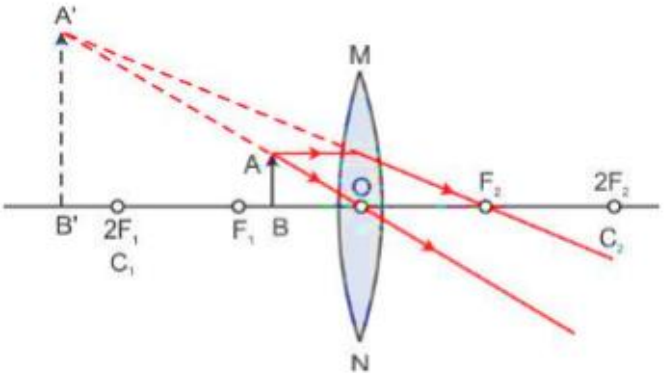
f = 15 cm and 2F position will be = 2 × 15 = 30 cm

The distance between 15 cm and 30 cm is 20 cm.

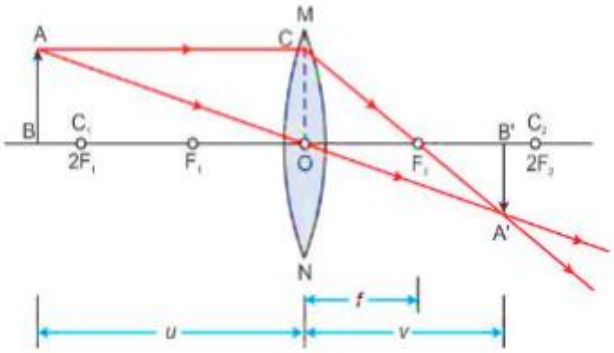
b) The image formed should be virtual and erect. In front of convex lens, this type of image is possible only when object is placed within focus.

Focal length = 15 cm

Thus, the position lying within the focal length of convex lens is 10 cm.



c) When object is placed beyond the 2F the image formed is diminished real image. We know the focal length of lens is 15 cm then the 2F will be equal to 30 cm. The distance beyond 30 cm i.e., 2F is 35 cm.



OR

d) The image formed is of same size as that of object when an object is placed at 2F of convex lens. We know, 2F position is at 30 cm as focal length is 15 cm. Thus, for this convex lens the image formed will be of same size as that of object when and object is placed at 30 cm.