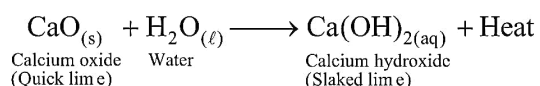**SAMPLE PAPER – 05** | **SOLUTIONS**

SECTION-A

1. Option (3)

Calcium oxide (quick lime) reacts vigorously with water to produce calcium hydroxide (slaked lime) releasing a large amount of heat. It is a combination reaction.

$$\underset{\substack{\text{Calcium oxide}\\ \text{(Quick lime)}}}{CaO_{(s)}} + \underset{\text{Water}}{H_2O_{(\ell)}} \longrightarrow \underset{\substack{\text{Calcium hydroxide}\\ \text{(Slaked lime)}}}{Ca(OH)_{2(aq)}} + Heat$$

2. Option (2)

Reaction (i) : Here, HCl has lost hydrogen to give Cl_2. Hence, HCl has been oxidized to chlorine (Cl_2) and it is acting as the reducing agent.

Reaction(ii) :
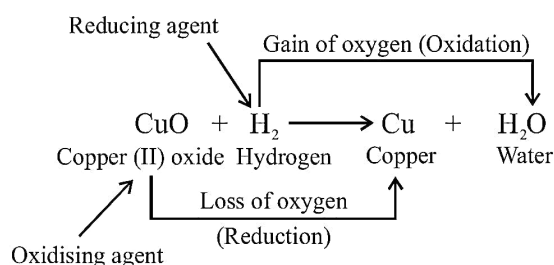
3. Option (4)

4. Option (3)

Since the number of valence electrons in X is 5, it is phosphorus and the number of valence electrons in Y is 7, it is fluorine.
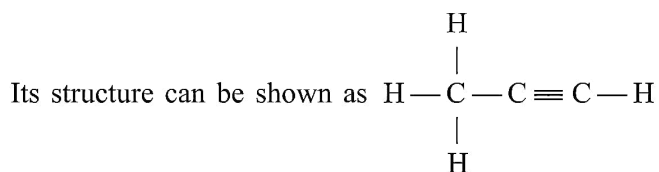
5. Option (3)

Gallium and caesium have very low melting points.

6. Option (1)

Vinegar (acetic acid) reacts with metal carbonates (Na_2CO_3) and metal hydrogencarbonates ($NaHCO_3$) to produce carbon dioxide gas which extinguishes burning matchstick.

7. Option (2)

C_3H_4 or propyne has a triple bond. It belongs to the bomologous series of alkynes with general formula C_nH_{2n-2}.

Its structure can be shown as
$$H - \overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle H}{|}}{C}} - C \equiv C - H$$

8. Option (3)

Bread mould shows saprotrophic mode of nutrition by which it break down the nutrients of bread and then absorb them.

9. Option (2)

10. Option (4)

Endometrium is the innermost thick layer of uterus

11. Option (4)

12. Option (3)

Frog is the secondary consumer as it feeds on insect which is a primary consumer.

13. Option (1)

$$V = \frac{W}{q} \qquad \Rightarrow V = \frac{W}{I \times t} \qquad \Rightarrow \text{Voltage} = \frac{\text{Work done}}{\text{Current} \times \text{Time}}$$

14. Option (4)

Since, each circuit is closed and Ammeter (in each circuit) is connected in series with appropriate polarity, the current recorded in ammeters in all cases will be same.
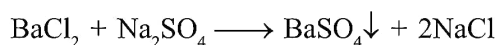
15. Option (1)

When a point source of light is placed at the focus of a concave mirror [or convex lens], the light rays emerges out as a parallel beam after reflection [or refraction] through mirror (or lens).

16. Option (3)

Sun's rays (a parallel beam of light coming from Sun) are focused on a screen at 24 cm away after reflection from mirror and the screen is placed in front of mirror. The device is a concave mirror of focal length 24 cm.

17. Option (1)

$BaCl_2 + Na_2SO_4 \longrightarrow BaSO_4\downarrow + 2NaCl$

18. Option (1)

Respiration is a biochemical process opposite to photosynthesis, because energy is released during respiration due to oxidation of food while in photosynthesis sunlight energy is used for the synthesis of food.

19. Option (4)

Glomerular filtration occurs because the pressure of the blood flowing in the glomerular capillaries is higher than the pressure of the filtrate in Bowman's capsule. The blood pressure drives glomerular filtration and because the process takes advantage of pressure gradient, glomerular filtration does not require expenditure of energy by kidney cells.
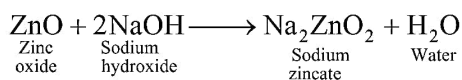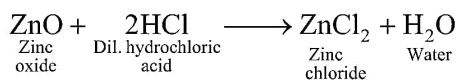
20. Option (4)

Assertion is false but reason is true.

SECTION-B

21. (a) Hydrogen gas is not evolved when most metals react with nitric acid with the exception of two metals (Mg and Mn). It is because HNO_3 is a strong oxidising agent. It oxidises the H_2 produced to water and itself gets reduced to any of the nitrogen oxides (N_2O, NO, NO_2).

(b) ZnO reacts both with acids as well as bases to form salt and water. Thus, ZnO is an amphoteric oxide.

$$ZnO + 2HCl \longrightarrow ZnCl_2 + H_2O$$
Zinc oxide, Dil. hydrochloric acid, Zinc chloride, Water

$$ZnO + 2NaOH \longrightarrow Na_2ZnO_2 + H_2O$$
Zinc oxide, Sodium hydroxide, Sodium zincate, Water

OR

Based on the reactivity series, the relative position of the metals involved in solutions is :

Zn > Fe > Cu > Ag

Metal A is more reactive than copper and less reactive than iron.

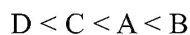Metal B is more reactive than iron and less reactive than zinc.

Metal C is more reactive than silver only and less reactive than other metals.

Metal D is the least reactive in nature.

In the light of above information, we can conclude that

(a) Metal B is the most reactive.

(b) The increasing order of reactivity of metals is :

D < C < A < B

22. When growing plants detect light, a hormone called auxin, synthesized at shoot tip, help the cells to grow longer. When light is coming from one side of the plant, auxin diffuses towards the shady side of the shoot. This concentration of auxin stimulates the cells to grow longer on the side of the shoot which is away from light. Thus, the plant appears to bend towards light.

23. The loss of water in the form of water vapour from the aerial parts of plant is known as transpiration. It is considered as necessary evil because it leads to loss of water from the plants but it also helps in absorption and upward movement of water.

It also helps in temperature regulation. The plants are protected from the burning due to transpiration. Evaporation of water from leaf produces cooling effect.

24. The required pH maintained in the stomach due to the presence of HCl in the gastric juice and in the small intestine the required pH is maintained due to the secretion of bile juice from liver which is alkaline in nature as well as intestinal juice is also alkaline.

25. (i) If alpha particle is at rest in a magnetic field, it will experience no magnetic force.

(ii) If alpha particle moves parallel to magnetic field lines, it will experience no magnetic force in this case also.

(iii) If the alpha particle moves perpendicular to the magnetic field lines, it experiences maximum force of magnetic field on it and direction of the force on alpha particle can be identified using fleming's left hand rule.
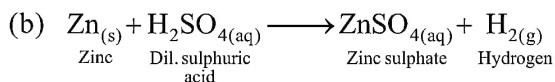
OR

Magnetic field can be produced or made available to a place wherever required by using

(i) a permanent magnet or artificial magnet (like bar magnet, Horse shoe magnet)

(ii) a straight current carrying conductor.

(iii) a flow of current in a solenoid.

26. Kidney produces 180 litre of filtrate per day but the amount of urine released is 1.5-2 litre per day, this is due to the phenomena of selective reabsorption that absorbs 99% of the filtrate and helps in concentration of urine.

SECTION-C

27. (a) 'X' is hydrogen gas.

The gas liberated is hydrogen and it can be tested by taking a burning matchstick near the mouth of the test tube in which the reaction is taking place. The gas will burn with a popping sound.

(b) $\underset{\text{Zinc}}{Zn_{(s)}} + \underset{\substack{\text{Dil. sulphuric} \\ \text{acid}}}{H_2SO_{4(aq)}} \longrightarrow \underset{\text{Zinc sulphate}}{ZnSO_{4(aq)}} + \underset{\text{Hydrogen}}{H_{2(g)}}$

Displacement reaction

(c) It is an exothermic reaction as heat is evolved.

28. (a) Copper

(b) It is concentrated by froth-floatation process.

(c) Impure metal is taken as anode whereas pure metal is taken as cathode. Soluble salt of metal is taken as electrolyte. When electric current is passed, impure metal changes to ions which gain electrons at cathode and change into pure metal. Impurities are left behind as anode mud.

At anode : $M(s) \longrightarrow M^{n+}(aq) + ne^{-}$
        Impure

At cathode : $M^{n+}(aq) + ne^{-} \longrightarrow M(s)$
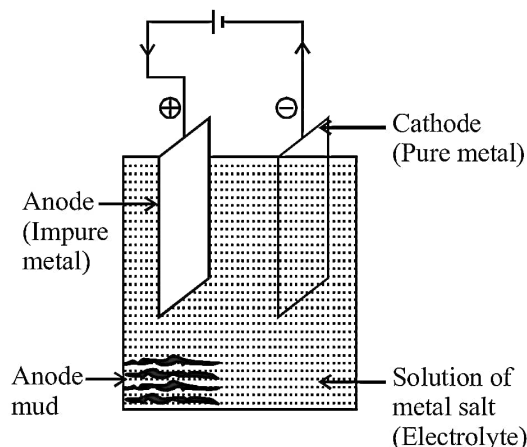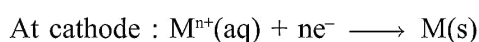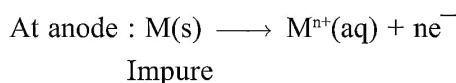
29. The three events that occur during the process of photosynthesis are :

(i) Absorption of light energy by chlorophyll.

(ii) Conversion of light energy into chemical energy and splitting of water molecule into hydrogen and O_2.

(iii) Hydrogen reduces CO_2 and synthesizes glucose (reduction of CO_2 into carbohydrates).

Two functions of stomata are :

(i) Massive amount of gaseous exchange takes place in the leaves through stomata.

(ii) Large amount of water is lost in the form of water vapour through stomata and it is known as transpiration.

OR

(i) The breathing cycle is rhythmic, as it consists of regular inhaling and exhaling of air. The exchange of gases is continuous because the lungs always contain a residual volume of air so that the absorption of oxygen and release of carbon dioxide keep on going.

(ii) Two molecules of ATP are produced by oxidation of glucose under anaerobic condition.

30. (i) (a) The position of object AB would have been beyond $2F_1$.

(b) Size of the object would have been bigger than the size of image.

(ii) Given : $n_w = \dfrac{4}{3}$, $n_g = \dfrac{3}{2}$, $\angle i = 45°$, $\angle r = ?$

The refractive index of glass with respect to water,

$$n_{gw} = \dfrac{n_g}{n_w} = \dfrac{\left(\dfrac{3}{2}\right)}{\left(\dfrac{4}{3}\right)} = \dfrac{9}{8} \qquad\qquad ....(1)$$

Since, $n_{gw} = \dfrac{\sin i}{\sin r} = \dfrac{\sin 45°}{\sin r} = \dfrac{\left(\dfrac{1}{\sqrt{2}}\right)}{\sin r} \qquad\qquad ....(2)$

Therefore, using relation (1) and (2), we have

$$\dfrac{9}{8} = \dfrac{\left(\dfrac{1}{\sqrt{2}}\right)}{\sin r}$$

$\Rightarrow \sin r = 0.6284 \quad \Rightarrow \quad r = 38.9°$

31. (i) Effective resistance of the network,

$$R_{AB} = 2\Omega + 6\Omega \parallel 3\Omega = 2 + \dfrac{6 \times 3}{6 + 3} = 2 + \dfrac{18}{9} = 2 + 2 = 4\ \Omega$$

(ii) The main current in the network, $I = \dfrac{V}{R_{AB}} = \dfrac{12}{4} = 3$ A

Potential difference across $2\ \Omega$ resistor, $V_1 = I \times R_1 = 3 \times 2 = 6$ V

So, potential difference across the parallel combination of $3\ \Omega$ and $6\ \Omega$, $V_2 = 12 - 6 = 6$ V

Therefore, current flowing through $6\ \Omega$ resistor, $I' = \dfrac{6V}{6\Omega} = 1$ A

32. Given : Concave mirror, $h_0 = 6$ cm, $f = -30$ cm, $u = -45$ cm

Using mirror formula

$$\dfrac{1}{f} = \dfrac{1}{v} + \dfrac{1}{u} \quad \Rightarrow \quad \dfrac{1}{-30} = \dfrac{1}{v} + \left[\dfrac{1}{-45}\right]$$

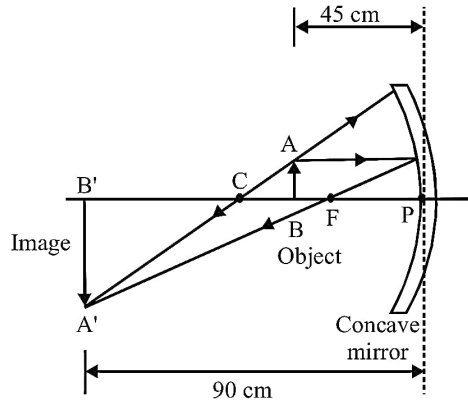$$\Rightarrow \dfrac{1}{v} = \dfrac{1}{45} - \dfrac{1}{30} = \dfrac{2-3}{90} = -\dfrac{1}{90}$$

$\Rightarrow v = -90$ cm (Position of Image)

Magnification, $m = \dfrac{h_i}{h_o} = \dfrac{-v}{u} = -\dfrac{(-90)}{(-45)} = -2$

$\Rightarrow h_i = h_o \times (-2) = 6 \times (-2) = -12$ cm

Therefore, the image formed is two times magnified (i.e. 12 cm tall), real and inverted and its position is at 90 cm from the mirror on the same side of object.

Ray diagram :

45 cm

A

B'

C

Image

B F P

Object

A'

Concave mirror

90 cm

OR

Given : Convex lens, h_0 = 6 cm, u = –50 cm, f = +30 cm

Using lens formula,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \qquad \Rightarrow \frac{1}{30} = \frac{1}{v} - \left[\frac{1}{-50}\right]$$

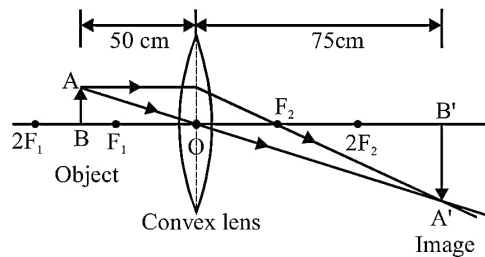$$\Rightarrow \frac{1}{v} = \frac{1}{30} - \frac{1}{50} = \frac{5-3}{150} = \frac{2}{150}$$

$$\Rightarrow v = \frac{150}{2} = +75 \text{ cm} \quad \text{(Position of Image)}$$

Magnification, m = $\dfrac{h_i}{h_o} = \dfrac{v}{u} = \dfrac{+75}{-50} = -\dfrac{3}{2} = -1.5$
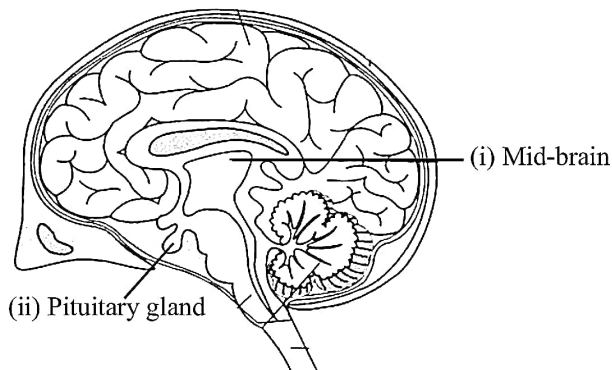
$$\Rightarrow h_i = h_o \times (-1.5) = 6 \times (-1.5) = -9 \text{ cm}$$

Therefore, the image formed will be real, 1.5 times magnified (i.e 9 cm in size) and inverted. The screen should be placed at 75 cm distance from convex lens (on other side of object) to obtain the sharp image on it.
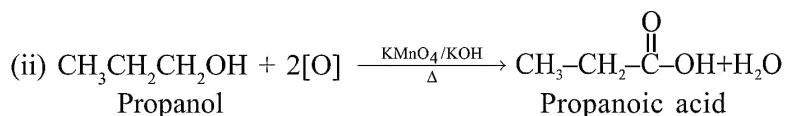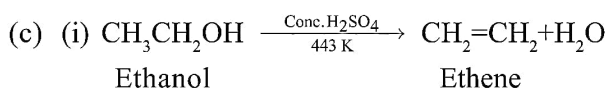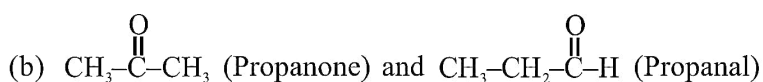
Ray diagram :

50 cm

75cm

A

$2F_1$ B F_1

Object

F_2

O

$2F_2$

B'

Convex lens

A'

Image

33.

(i) Mid-brain

(ii) Pituitary gland

SECTION-D

34. (a) 'X' is ethanol, C_2H_5OH. 'Y' is H_2 gas

(b) $2C_2H_5OH + 2Na \longrightarrow C_2H_5ONa + H_2\uparrow$

   Ethanol   Sodium   Sodium   Hydrogen

    'X'   Ethoxide   'Y'

'Y' is hydrogen gas, which burns with 'pop' sound.

(c) Ethene, C_2H_4 is formed when 'X' is heated with conc. H_2SO_4.

$CH_3CH_2OH \xrightarrow[\text{Heat}]{\text{Conc.}H_2SO_4} CH_2 = CH_2 + H_2O$

Ethanol   Ethene   Water

('X')

OR

(a) Those compounds which has same molecular formula but different structural formula are called isomers.

(b) $CH_3-\overset{\overset{O}{\|}}{C}-CH_3$ (Propanone) and $CH_3-CH_2-\overset{\overset{O}{\|}}{C}-H$ (Propanal)

(c) (i) $CH_3CH_2OH \xrightarrow[443 \text{ K}]{\text{Conc.}H_2SO_4} CH_2=CH_2+H_2O$

     Ethanol   Ethene

(ii) $CH_3CH_2CH_2OH + 2[O] \xrightarrow[\Delta]{KMnO_4/KOH} CH_3-CH_2-\overset{\overset{O}{\|}}{C}-OH+H_2O$

     Propanol   Propanoic acid

35. (i) Placenta is a fully formed reddish brown disc embedded in the uterine wall, that serves to bring the foetal and maternal blood close enough.

Function of placenta (i) It provides a large surface area for glucose and oxygen to pass from the mother to the embryo. (ii) The developing embryo will also generate waste substances which can be removed by transferring them into the mother's blood through the placenta.

(ii) The various methods of contraception are :

(1) Mechanical methods (any one)

(i) It includes use of condoms which are the rubber or plastic sheets put on the penis before coital activity.

(ii) Use of diaphragms or cervical caps fitted in vagina of female to check the entry of sperms into the uterus and also helps in avoiding conception.

(iii) Use of IUCD i.e., Intra Uterine Contraceptive Devices like copper T and loops fitted in the uterus, help to prevent fertilization and implantation of embryo. They can cause side effects due to irritation or infection of uterus.

(2) Chemical methods (any one)

(i) It consists of using some chemicals which are spermicidal. They may be in form of tablets, jellies, paste and creams introduced in the vagina before coital activity.

(ii) Another chemical method is the use of oral contraceptive (OC) pills which inhibit the secretion of FSH (Follicle Stimulating Hormone) and LH (Leutinising Hormone) from the anterior lobe of pituitary gland and thus inhibiting ovulation from the ovary. These contraceptives therefore change the hormonal balance so that egg cell is not released (inhibit ovulation) and hence prevent fertilization.

(3) Surgical methods (any one)

(i) Tubectomy involves cutting of fallopian tubes in females and Vasectomy involves cutting of vas deferens of each side in males.

(ii) Surgical removal of ovaries is known as ovariectomy and removal of testes is known as castration.

(iii) Another surgical method is MTP i.e. Medical Termination of Pregnancy or abortion.

(iv) Other method is tubal ligation in which fallopian tubes are blocked by an instrument called laproscope.

OR

(a) The reason for the selection of pea plants for the genetic experiments are:

(i)   It is easy to grow in the garden.

(ii) The flowers of pea plants are bisexual so choice of self fertilization and cross fertilization.

(iii) Easy to obtain pure breed plant through self-fertilization

(iv) Plant has short life cycle .   (Any two)

(b) **(i) Law of dominance :** In crossing between organisms pure for contrasting characters of a pair, only one character of the pair appears in the F1 generation. This character is termed as dominant while the one which does not express itself in F1 generation is termed as recessive.

(ii) Law of segregation : Different alleles or genes of a character remain together in an individual and segregate randomly at the time of gamete formation. This is also known as the Law of purity of gametes.

(iii) Law of independent assortment : This law states that when individuals differing in two or more than two pairs of contrasting characters are crossed, the inheritance of any one pair is not affected by the presence of the other.

e.g., The inheritance of seed shape character is not related to the seed colour character. Rather, the two characters inherit independently of each other.

36. (a) Magnetic field lines can never intersect each other because if they intersect at a point, magnetic field at that point will have two directions which is not possible. (If we put a magnetic needle at such a point, it will point in two directions, that is impossible)

(b) **Right hand thumb rule :** 'Imagine that you are holding a current-carrying straight conductor in your right hand and the thumb is stretched along the direction of current, then, your fingers will wrap around the conductor in the direction of the magnetic field lines of the magnetic field'.
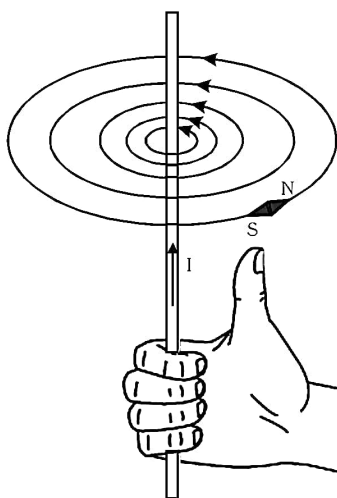
(c) Magnetic field produced by a straight current carrying conductor depends upon:

(i) Current. The strength of magnetic field is directly proportional to the current flowing through it.

(ii) Distance from conductor. The strength of magnetic field is inversely proportional to the distance from the conductor.

SECTION-E

37. (a) Corrosion and Rancidity

(b) $CuSO_4$ in (III) and CuO in (VI)

OR

(b) Oxidation takes place at anode and reduction at cathode

38. (a). Two examples of artificial ecosystem are- Crop field, aquarium.

(b). Biotic factors of an ecosystem- Producers, Consumers, and Decomposers

(c). DECOMPOSERS-The micro-organisms which break down the complex organic compounds in dead organisms into simpler substances.

Role of decomposers in an ecosystem are as follows-

i. Clean the environment.

ii. Helps in nutrients recycling.

iii. Maintains soil fertility.

OR

(c). It is because only 10% of energy is passed on to next higher trophic level in a food chain. As a result of this, there is a progressive decline in the energy level and the amount of energy available is not enough to sustain more than few trophic levels in a food chain.

39. (a) The distance between the focus and the optical centre of concave lens is called its 'focal length'.

(b) **Ray diagram :**
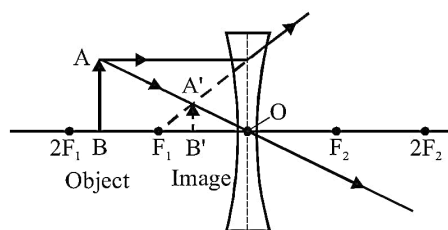
(c) Divergent lens (Concave lens), f = –30 cm

h_0 = +5 cm, v = –15 cm, u = ?

[A concave lens forms virtual images on the same side of object.]

Using lens formula,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \qquad \Rightarrow \quad -\frac{1}{30} = \frac{1}{(-15)} - \frac{1}{u}$$

$$\Rightarrow \quad \frac{1}{u} = \frac{1}{30} - \frac{1}{15} = \frac{1-2}{30}$$

$$\Rightarrow \quad u = -30 \text{ cm} \qquad \text{[Object's position from lens]}$$

OR

(c) Given : Concave lens, $m = +\dfrac{1}{2}$, $|u| + |v| = 60$ cm

$\because$ $m = \dfrac{v}{u} = +\dfrac{1}{2}$ $\qquad$ $\therefore$ $v = \dfrac{u}{2}$

If, $u = -x$ cm (say); then, $v = -\dfrac{x}{2}$ cm $\qquad$ ..... (1)

Given, $|u| + |v| = 60$ cm

Therefore, $|-x| + \left|\dfrac{-x}{2}\right| = 60$

$\Rightarrow$ $\dfrac{3x}{2} = 60$

$\Rightarrow$ $x = 40$

So, $u = -40$ cm and $v = -20$ cm $\qquad$ [By using relation (1)]

Using lens formula,

$$\dfrac{1}{f} = \dfrac{1}{v} - \dfrac{1}{u} = \left(\dfrac{1}{-20}\right) - \left(\dfrac{1}{-40}\right) = \dfrac{-2+1}{40} = -\dfrac{1}{40}$$

$\Rightarrow$ $f = -40$ cm $\quad$ [Focal length of concave lens]