| SUBJECT: SCIENCE | MAX. MARKS: 80 |
| CLASS : X | DURATION: 3 HRS |

General Instruction:
1. This Question Paper has 5 Sections A-E.
2. **Section A** has 20 MCQs carrying 1 mark each.
3. **Section B** has 5 questions carrying 02 marks each.
4. **Section C** has 6 questions carrying 03 marks each.
5. **Section D** has 4 questions carrying 05 marks each.
6. **Section E** has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

SECTION – A
Questions 1 to 20 carry 1 mark each.

1. Match the labelled parts of the given figure with the correct option.
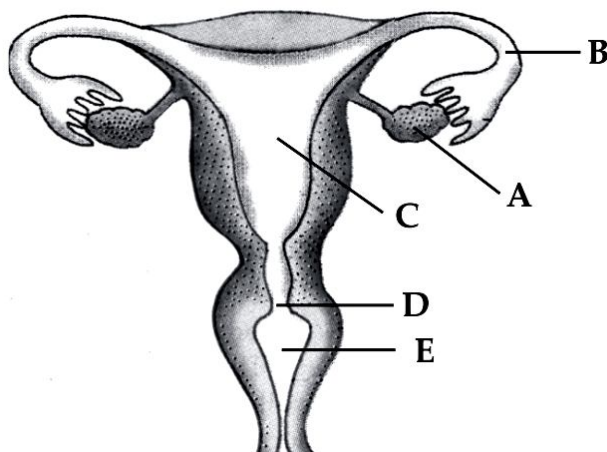
	A	B	C	D	E
(a)	Fallopian tube	Oviduct	Uterus	Cervix	Vagina
(b)	Oviduct	Vas deferens	Ovary	Vagina	Cervix
(c)	Ovary	Oviduct	Uterus	Cervix	Vagina
(d)	Ovary	Fallopian tube	Uterus	Vagina	Cervix

Ans: (c)

2. When a big fish eats a small fish, which eats water fleas supported by phytoplankton, the water fleas are
(a) primary consumers (b) secondary consumers (c) top consumer (d) producers.
Ans: (a) : Water fleas feed on phytoplanktons or producers. So they are primary consumers as primary consumers are those organisms that directly derive energy from producers by feeding upon them.

3. Given a point source of light, which of the following can produce a parallel beam of light?
(a) Concave lens (b) Two plane mirrors inclined at 90° to each other
(c) Convex mirror (d) Concave mirror
Ans: (d) Concave mirror
A point source at principal focus of a concave mirror will give rise to a parallel beam of light.

4. The trachea is prevented from collapsing by
   (a) complete cartilaginous rings   (b) incomplete cartilaginous rings
   (c) bony rings   (d) chitinous rings.
   Ans: (b) Trachea is the tube in air-breathing vertebrates that conducts air from the throat to the bronchi. It is strengthened with incomplete C-shaped rings of cartilage.

5. Refer to the given figures (i), (ii) and (iii).

   (i)   (ii)   (iii)
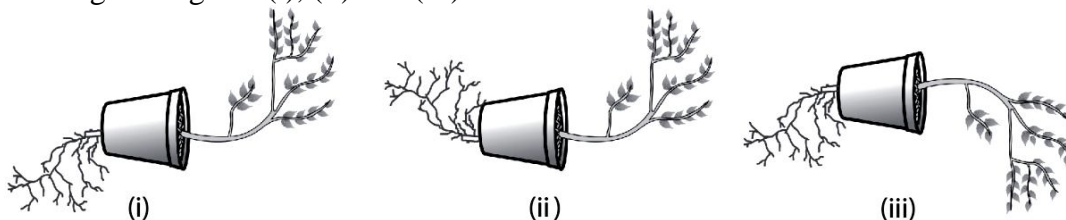
   Which of these appears more accurate?
   (a) (i) and (iii) (b) (ii) only (c) (i) only (d) (ii) and (iii)
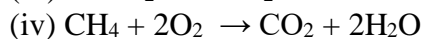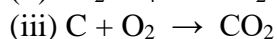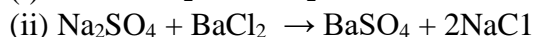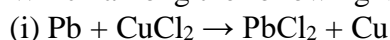   Ans: (c) (i) only
   Fig. (i) appears more accurate as it shows shoot growing away from the earth, thus proving that it is negatively geotropic and roots growing towards the earth, thus proving that they are positively geotropic.

6. The magnetic field produced due to a circular wire at its centre is
   (a) at 45° to the plane of the wire (b) at 60° to the plane of the wire
   (c) in the plane of the wire. (d) perpendicular to the plane of the wire
   Ans: (d) perpendicular to the plane of the wire
   According to the direction of the electric current, the direction of the magnetic field is in upward or downward direction perpendicular to the plane of the circular wire.
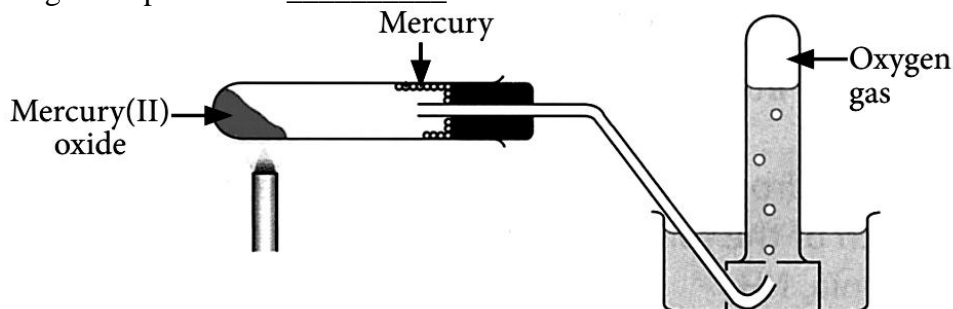
7. Which among the following is(are) double displacement reaction(s)?
   (i) $Pb + CuCl_2 \rightarrow PbCl_2 + Cu$
   (ii) $Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$
   (iii) $C + O_2 \rightarrow CO_2$
   (iv) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
   (a) (i) and (iv) only (b) (ii) only (c) (i) and (ii) only (d) (iii) and (iv) only
   Ans: (b) (ii) is an example of double displacement reaction since ions of both the reactants are exchanged.

8. The given diagram represents a _____ reaction.

   (a) photodecomposition (b) electrolysis (c) displacement (d) thermal decomposition
   Ans: (d) thermal decomposition
   It is a thermal decomposition reaction. When mercury(II) oxide is heated strongly, it decomposes to give mercury and oxygen.
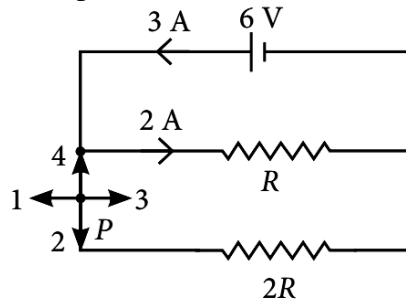
9. A magnetic field exerts no force on
   (a) a stationary electric charge   (b) a magnet
   (c) an electric charge moving perpendicular to its direction   (d) an unmagnetised iron bar
   Ans: (a) a stationary electric charge
   Magnetic field does not exerts force on a stationary electric charge.

10. Which of the following is true about point P?

(a) Current is flowing in direction 4.
(b) Electron is flowing in direction 4.
(c) Electrons is flowing in either direction 1 or direction 3.
(d) Electron is flowing in direction 2.
Ans: (b) : The direction of electron flow is opposite to the direction of electric current.

11. An object 20 cm from a spherical mirror give rise to a virtual image 15 cm behind the mirror. The type of the mirror and its focal length is
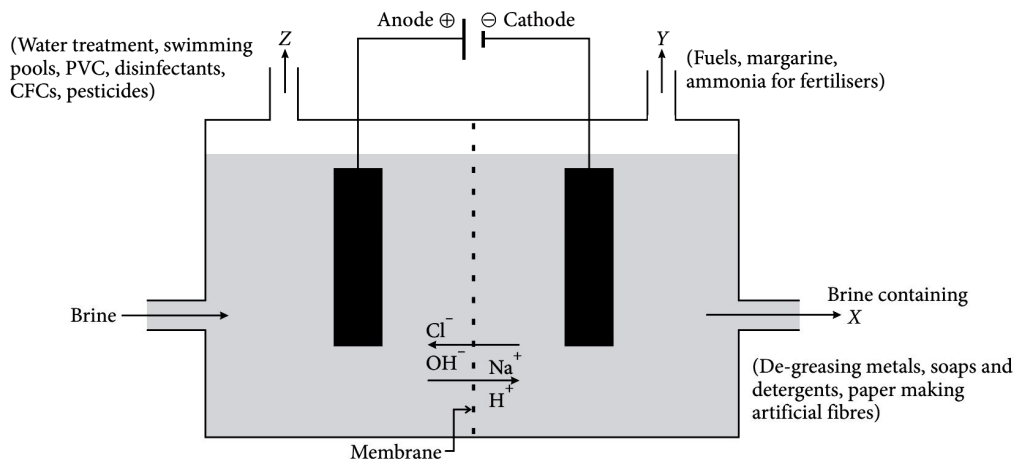(a) concave, 8.5 cm (b) convex, 30 cm (c) concave, 60 cm (d) convex, 60 cm
Ans: (d) convex, 60 cm
Taking new Cartesian sign conventions
$$\frac{1}{u}+\frac{1}{v}=\frac{1}{f} \Rightarrow -\frac{1}{20}+\frac{1}{15}=\frac{1}{f} \Rightarrow \frac{1}{f}=\frac{-3+4}{60}=\frac{1}{60} \Rightarrow f=60 \text{ cm}$$
The mirror is convex.

12. What are (X), (Y) and (Z) in the given figure?

	X	Y	Z
(a)	H_2	Cl_2	NaOH
(b)	NaOH	H_2	Cl_2
(c)	NaOH	Cl_2	H_2
(d)	Cl_2	H_2	NaOH

Ans: (b)

13. Observe the given figure and answer the question that follows:
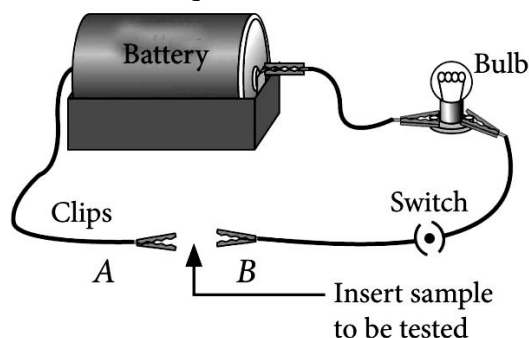
Bulb glows when _____ wire is placed between the terminals A and B.
(i) Copper (ii) Aluminium (iii) Iron (iv) Silver
(a) (i) and (iii)
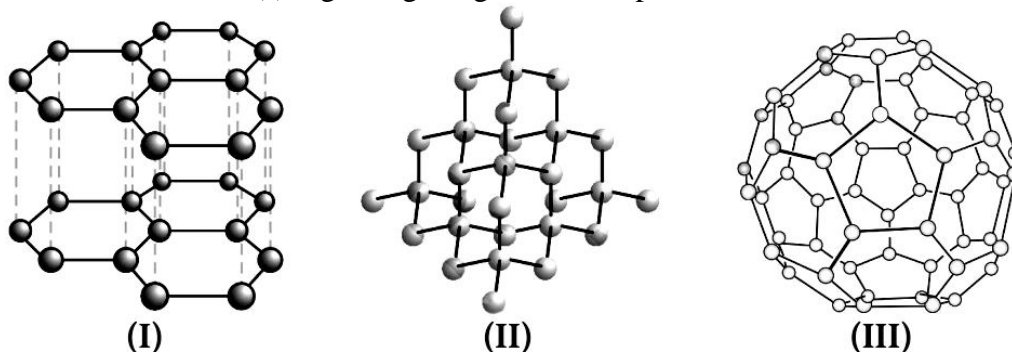(b) (i), (ii) and (iii)
(c) Only (iv)
(d) (i), (ii), (iii) and (iv)
Ans: (d) : Metal conducts electricity.

14. Select the correct statement(s) regarding the given allotropes of carbon.

(I)　　　　　　　(II)　　　　　　　(III)

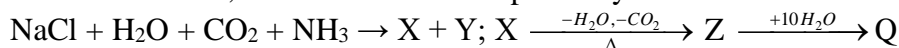(i) A crystal of (II) is a giant molecule consisting of only carbon atoms.
(ii) The density of (II) is much lower than that of (I).
(iii) Allotrope (III) is the softest one.
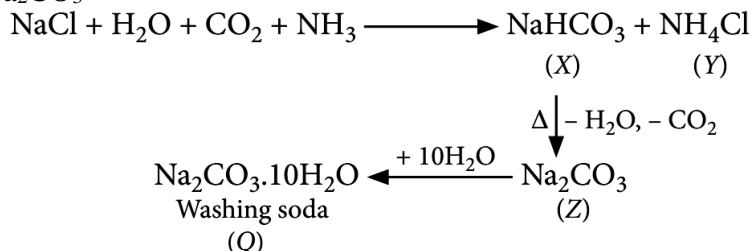(a) (i) only (b) (i) and (iii) only (c) (ii) only (d) (i), (ii) and (iii)
Ans: (a) : I - Graphite, II - Diamond, III - Buckminster fullerene. Thus, (II) is a giant molecule. Graphite (I) has much lower density than diamond (II). Graphite is the softest one.

15. In the given series of reactions, what are Y and Z respectively?
$$NaCl + H_2O + CO_2 + NH_3 \rightarrow X + Y; \quad X \xrightarrow[\Delta]{-H_2O, -CO_2} Z \xrightarrow{+10H_2O} Q$$
(a) $NaHCO_3$, $NaOCl_2$ (b) NH_4Cl, Na_2CO_3 (c) Na_2CO_3, NH_4Cl (d) Na_2CO_3, $NaHCO_3$
Ans: (b) NH_4Cl, Na_2CO_3
$$NaCl + H_2O + CO_2 + NH_3 \longrightarrow \underset{(X)}{NaHCO_3} + \underset{(Y)}{NH_4Cl}$$

$$\Delta \downarrow -H_2O, -CO_2$$

$$\underset{\substack{\text{Washing soda} \\ (Q)}}{Na_2CO_3.10H_2O} \xleftarrow{+ 10H_2O} \underset{(Z)}{Na_2CO_3}$$

16. pH of different solutions are given in the table below:

Solution	pH
P	2.2-2.4
Q	13.8-14.0
R	6.5-7.5
S	8.0-9.0

Arrange these solutions in the increasing order of OH ion concentration.
(a) S<R<Q<P (b) P<R<S<Q (c) R<S<Q<P (d) Q<S<R<P
Ans: (b) : Lower the pH values, higher will be the concentration of H+ ions and lesser will be the OH ion concentration. Thus, the increasing order of OH ion concentration is

$$P \quad < \quad R \quad < \quad S \quad < \quad Q$$
$$(2.2–2.4) \quad (6.5–7.5) \quad (8.0–9.0) \quad (13.8–14.0)$$
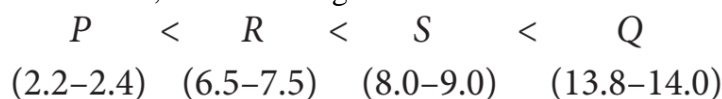
DIRECTION: In the question number 17 and 20, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**.
Choose the correct option
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)

(b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)
(c) Assertion (A) is true but reason (R) is false.
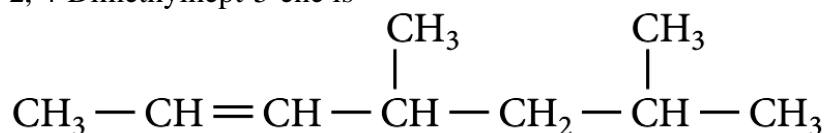(d) Assertion (A) is false but reason (R) is true.

17. **Assertion (A):** A current carrying wire should be charged.
   Reason (R): The current in a wire is due to flow of free electrons in a definite direction.
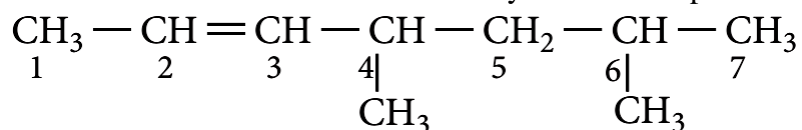   Ans: (d) Assertion (A) is false but reason (R) is true.
   The current in a wire is due to flow of free electrons in a definite direction. But the number of protons in the wire at any instant is equal to number of electrons and charge on electrons is equal and opposite to that of proton. Hence, net charge on the wire is zero.

18. **Assertion (A):** 2, 4-Dimethylhept-5-ene is

$$CH_3 - CH = CH - \overset{\overset{\displaystyle CH_3}{\displaystyle |}}{CH} - CH_2 - \overset{\overset{\displaystyle CH_3}{\displaystyle |}}{CH} - CH_3$$

   Reason (R): The double bond gets preference to the alkyl group.
   Ans: (d) : During numbering of carbon chain, the parent carbon chain is numbered in a manner so as to give lowest number to the carbon atom linked by double or triple bond.

$$\underset{1}{CH_3} - \underset{2}{CH} = \underset{3}{CH} - \underset{4}{\overset{\overset{\displaystyle}{\displaystyle}}{CH}} - \underset{5}{CH_2} - \underset{6}{\overset{\overset{\displaystyle}{\displaystyle}}{CH}} - \underset{7}{CH_3}$$
   $$\quad\quad\quad\quad\quad\quad CH_3 \quad\quad\quad\quad CH_3$$

   4, 6-Dimethylhept-2-ene

19. **Assertion (A):** Capillaries are the thinnest blood vessels.
   Reason (R): Capillaries connect the branches of arteries and veins.
   Ans: (b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)
   Capillaries are the thinnest blood vessels and connect the branches of arteries and veins. Capillaries allow the exchange of materials like nutrients, respiratory gases, hormones, etc, between the blood and body cells through tissue fluid.

20. **Assertion (A):** Monohybrid cross deals with inheritance of one pair of contrasting characters.
   Reason (R): Dihybrid cross deals with inheritance of two pairs of contrasting characters.
   Ans: (b) : In monohybrid cross, we study the inheritance of one pair of contrasting characters of organism by their first generation and second generation progeny. In dihybrid cross, we study the inheritance of two pairs of contrasting characters of organisms.

SECTION – B
Questions 21 to 26 carry 2 marks each.

21. (a) Which of the following flowers will have higher possibility of self-pollination?
   Mustard, Papaya, Watermelon, Hibiscus
   (b) List the two reproductive parts of a bisexual flower.
   Ans: (a) Mustard and Hibiscus will have higher possibility of self pollination, since these are bisexual flowers, i.e., male and female are produced in the same flower.
   (b) The two reproductive parts of a bisexual flower are stamens (male reproductive part) and carpels (female reproductive part).
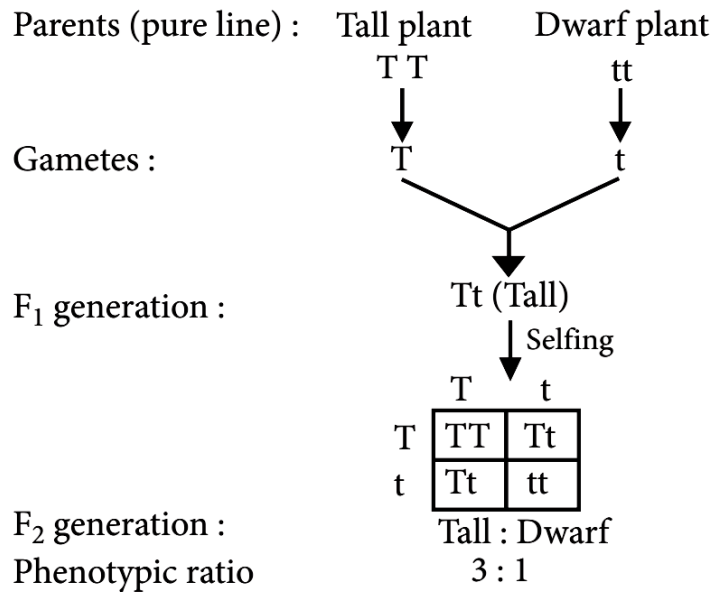
22. What is variation? List two main reasons that may lead to variation in a population.
   Ans: Variation is the degree of differences between the progeny and parents. Two main reasons of variations are mutations and genetic recombination during sexual reproduction.
   OR
   Is it possible that a trait is inherited but not expressed in an organism? Explain on the basis of Mendel experiment.

Ans: Mendel first selected two pureline plants. He then crossed such plants having contrasting characters. In the F1 generation, he observed that only one of the two contrasting character appeared, he called it dominant and the one which does not get expressed in F1 was recessive. He later selfed the F1 plants and observed that both the traits appear but in a definite proportion. It can be explained by the following cross:

Parents (pure line) :   Tall plant   Dwarf plant
                             T T   tt

Gametes :   T   t

F_1 generation :   Tt (Tall)
                                 Selfing

	T	t
T	TT	Tt
t	Tt	tt

F_2 generation :   Tall : Dwarf
Phenotypic ratio   3 : 1

This is how Mendel explained that a trait may be inherited but not expressed in the plant.

23. Explain the formation of a rainbow in the sky.
Ans: A rainbow is a natural spectrum caused by dispersion of sunlight by tiny water droplets, present in the atmosphere.
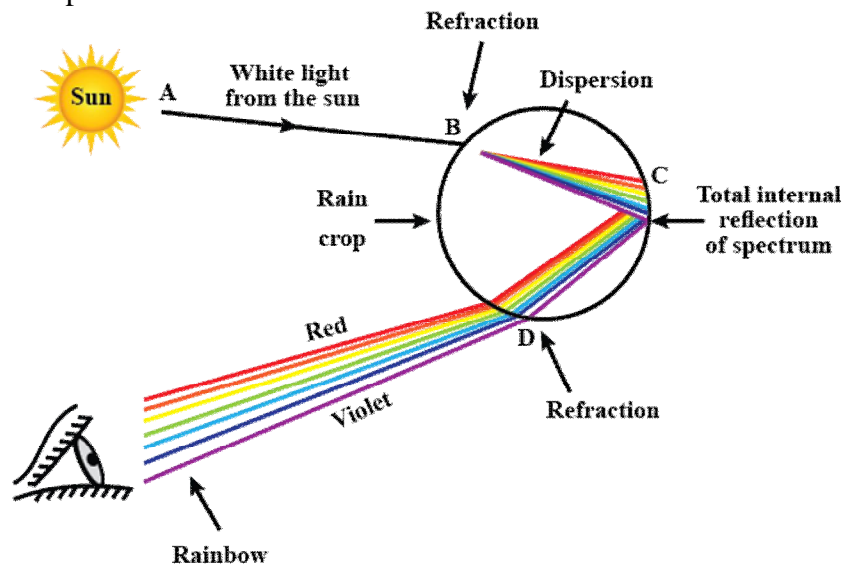
24. A rectangular coil ABCD is placed between the pole pieces of a horse-shoe magnet as shown in figure.
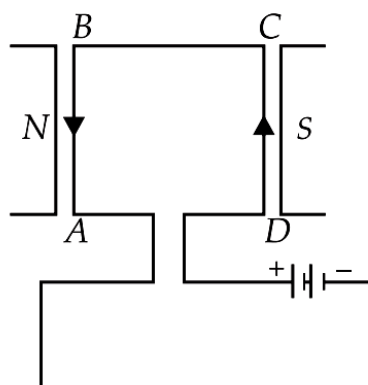
(i) What is the direction of force on each arm?

(ii) What is the effect of the forces on the coil?

Ans: (i) In figure, the current in the coil is in direction DCBA. By Fleming's left hand rule, in the arm AB, the force is outward at right angle to the plane of the coil. On the arm BC no force acts. On the arm CD, the force is inwards perpendicular to the plane of the coil. On the arm DA, no force acts.

(ii) The force on the arms AB and CD are equal in magnitude, but opposite in direction. They form a clockwise couple. So the coil will rotate clockwise with the arm AB coming out and the arm CD going in.

OR

A current carrying conductor is placed in a magnetic field now answer the following :

(i) List the factors on which the magnitude of force experienced by conductor depends.

(ii) When is the magnitude of this force maximum?

(i) When a current carrying wire is placed in a magnetic field, it experiences a magnetic force that depends on - current flowing in the conductor - strength of magnetic field - length of the conductor - angle between the element of length and the magnetic field.

(ii) Force experienced by a current carrying conductor placed in a magnetic field is largest when the direction of current is perpendicular to the direction of magnetic field.

25. The electronic configurations of two elements A and B are 2, 8, 1 and 2, 8, 7 respectively. Which one of them is a metal and which is a non-metal?

Ans: Based on the atomic number, the electronic configurations of the two elements X and Y are

$$\begin{array}{cccc} & K & L & M \\ _{11}X\ (Z=11): & 2 & 8 & 1 \\ _{17}Y\ (Z=17): & 2 & 8 & 7 \end{array}$$
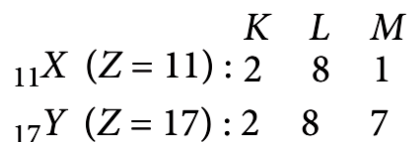
Metals usually have 1 to 3 electrons in their outermost shell (when all inner shells are complete). Therefore, element is a metal. Y is an non-metal as it has tendency to accept an electron to complete its octet.

26. How does chemical coordination take place in animals?

Ans: The endocrine system consists of specialised glands (endocrine glands) which bring about control by sending chemical messengers termed hormones. These glands secrete hormones directly into the blood. Hormones reach the target organs via blood and regulate the activities of these organs, thus coordinating the functioning of living organisms and also their growth.

SECTION – C
Questions 27 to 33 carry 3 marks each.

27. How do germ cells make a single set of genes from two normal copies of genes?

Ans: There is a pair of genes for a particular trait. The genes controlling a particular trait separate from each other during gamete formation. Germ cells make a single set of genes from two normal copies by a process called meiosis or reductional division. Hence, gamete is always pure as far as contrasting characters are considered and will possess only one gene set. When male and female gametes fuse during fertilisation, paired condition is restored.
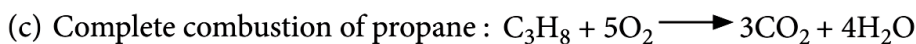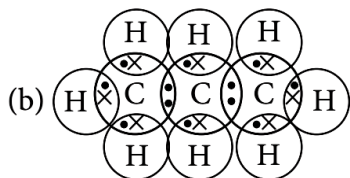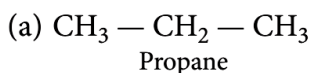
28. 1000 cm³ of propane is burnt completely in oxygen.

(a) What is the full structural formula of propane?

(b) Draw the electronic structure of propane.

(c) Write the balanced chemical equation for the complete combustion of propane.

Ans:

(a) $CH_3 — CH_2 — CH_3$
    Propane

(b)

(c) Complete combustion of propane : $C_3H_8 + 5O_2 \longrightarrow 3CO_2 + 4H_2O$

29. A yellow brittle element on burning produces a suffocating gas. The solution of this gas in water turns blue litmus paper red. Answer the following questions :
(a) Is the solution of gas in water acidic or basic?
(b) Is the yellow substance a metal or a non-metal?
(c) Name the gas and the yellow brittle element.
Ans: (a) The solution of the gas in water is acidic because it turns blue litmus paper to red.
(b) The yellow substance is a non-metal because it forms an acidic oxide that turns blue litmus paper red.
(c) Yellow brittle element - Sulphur; Gas formed -Sulphur dioxide (SO_2).

30. Write about power of accommodation of human eye. Explain why the image distance in the eye does not change when we change the distance of an object from the eye?
Ans: The ability of the eye-lens to adjust its focal length is called power of accommodation. The ciliary muscles modifies the curvature to some extent. The change in the curvature of the eye lens can thus change its focal length. Thus, the focal length of the human lens increases or decreases depending on the distance of the object value to this distance of the image does not change. For example, when the ciliary muscles are relaxed, the lens becomes thin and its focal length increases, thus enables us to see distant object clearly.

31. Write three points of difference between respiration in plants and respiration in animals.
Ans: Differences between respiration in plants and animals are as follows:

Plant respiration	Animal respiration
(i) All parts of plants, like roots, stem and leaves, perform respiration individually.	Animal performs respiration as a single unit.
(ii) There is little transport of respiratory gases from one part to the other during respiration.	Respiratory gases are usually transported over long distance inside an animal during respiration.
(iii) Respiration occurs at a very slow rate.	Respiration is a fast process in animals.

OR

Explain giving any three reasons the significance of transpiration in plants.
Ans: Significance of transpiration in plants:
(i) The absorbed water is transported from roots to leaves through xylem vessels which is greatly influenced by transpiration pull.
(ii) The water stream moving upwards carries dissolved minerals with it. Transpiration also helps in distributing these minerals throughout the plant.
(iii) The evaporation of water during transpiration provide cooling effect to the leaves.

32. Design an activity to demonstrate that a bar magnet has a magnetic field around it.
Ans: One can easily demonstrate the presence of field lines around a bar magnet using compass needles. Place the magnet on a white sheet and mark its boundaries on sheet. Place the compass near the north pole of magnet and mark the position of needle. Now move the compass such that its south pole occupies the position previously occupied by its north pole. Repeat this step several times and you will have pattern as shown in the figure.
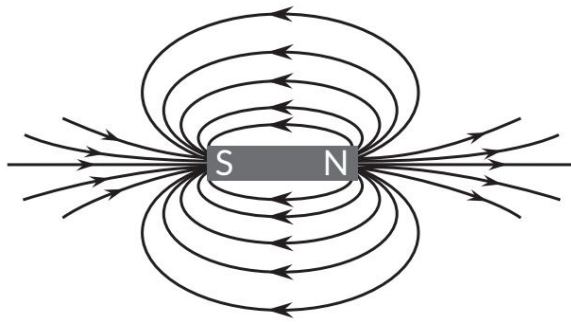
Magnetic field lines around a bar magnet
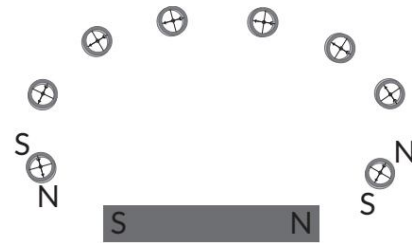
Drawing a magnetic field lines with the help of a compass needle

Repeat the above procedure and draw as many lines as you can. These lines represent the magnetic field around the magnet. These are known as magnetic field lines.

33. (a) What happens to the zygote after fertilization in flowering plants?
(b) What is germination?
(c) Identify the labelled parts A, B and C of the given figure.
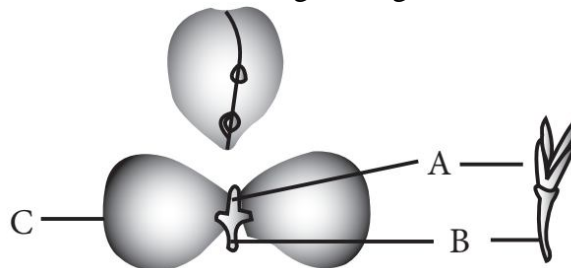

Ans: (a) After fertilisation, the zygote divides several times to form an embryo within the ovule. The ovule develops a tough coat and is gradually converted into a seed. The ovary grows rapidly and ripens to form a fruit. Meanwhile, the petals, sepals, stamens, style and stigma may shrivel and fall off.
(b) Germination is the process of development of seedling from a seed.
(c) A – Plumule, B – Radicle, C – Cotyledon

SECTION – D
Questions 34 to 36 carry 5 marks each.

34. The diagram given below shows the apparatus that can be used for electrolysis of water. This is done by passing electricity through acidified water.
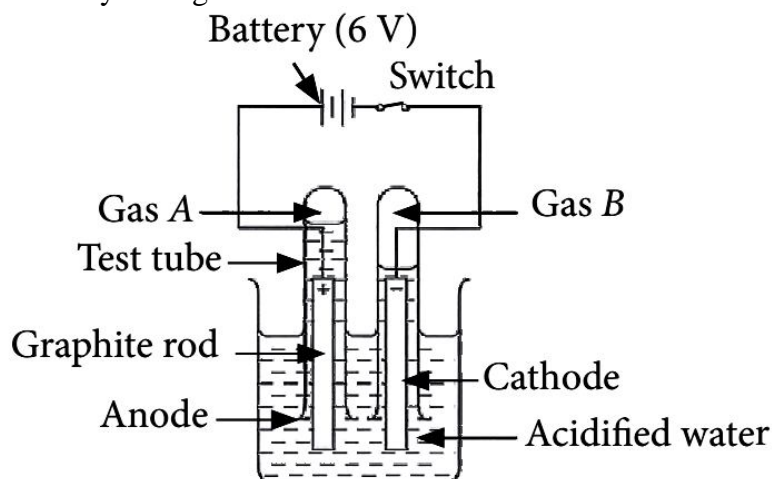

(a) Name the gas A.
(b) Name the gas B.
(c) What type of reaction is taking place? Give a reason for your answer.
(d) Write the chemical equation for this reaction.
(e) Give one test to detect the gas produced at cathode.
Ans: (a) Oxygen
(b) Hydrogen

(c) Water is broken down into hydrogen and oxygen. So, this is a decomposition reaction.
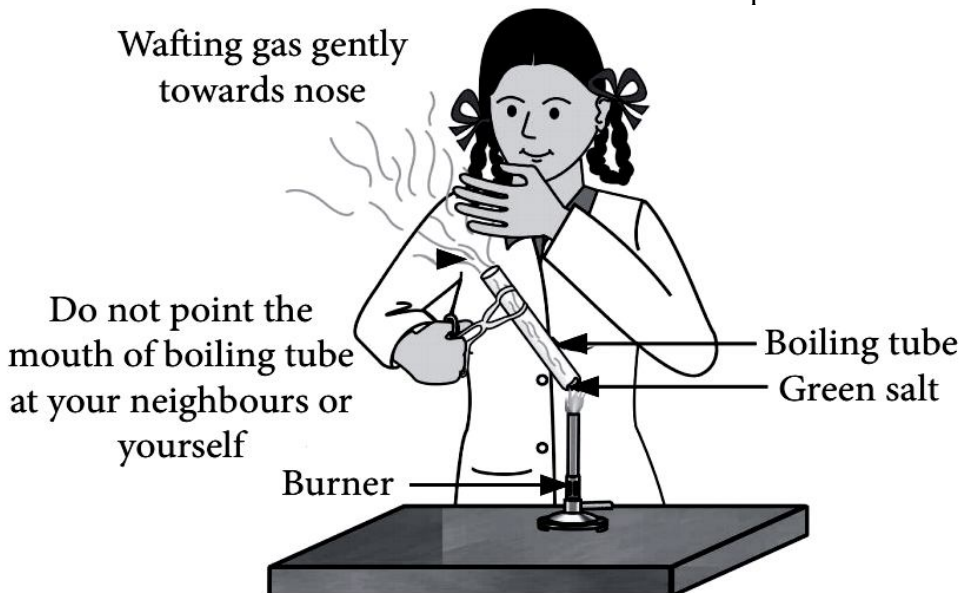(d)

$$2H_2O_{(l)} \xrightarrow{\text{Electricity}} 2H_{2(g)} + O_{2(g)}$$

Water \hspace{2cm} Hydrogen \hspace{0.5cm} Oxygen
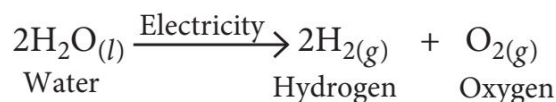
(e) H_2 gas is produced at cathode which burns with pop sound on bringing a burning candle near it.

OR

(i) A green salt on heating decomposes to produce a colourless suffocating gas and leaves behind a reddish brown residue. Name the salt and write the decomposition reaction.

Wafting gas gently towards nose

Do not point the mouth of boiling tube at your neighbours or yourself
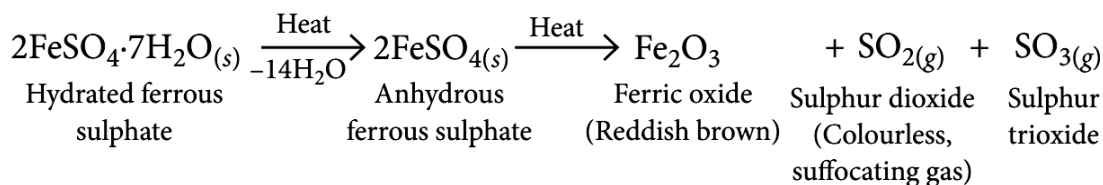
Boiling tube
Green salt

Burner

(ii) Old oil paintings get blackened over the years due to reactions with pollutant gases in the air.
(a) Name the gas responsible for discolouration of the paintings.
(b) Give the formula of the black substance formed.
(c) How can the original colour of paintings be restored?

Ans: (i) The salt is hydrated ferrous sulphate ($FeSO_4.7H_2O$).

$$2FeSO_4 \cdot 7H_2O_{(s)} \xrightarrow[-14H_2O]{\text{Heat}} 2FeSO_{4(s)} \xrightarrow{\text{Heat}} Fe_2O_3 + SO_{2(g)} + SO_{3(g)}$$

Hydrated ferrous sulphate \hspace{1cm} Anhydrous ferrous sulphate \hspace{0.5cm} Ferric oxide (Reddish brown) \hspace{0.3cm} Sulphur dioxide (Colourless, suffocating gas) \hspace{0.3cm} Sulphur trioxide

(ii) (a) Hydrogen sulphide (H_2S)
(b) Lead(II) sulphide (PbS)
(c) The original colour of oil paintings can be restored by treating with hydrogen peroxide (H_2O_2) which oxidises black lead suphide to lead sulphate.

$$PbS + 4H_2O_2 \rightarrow Pb_5O_4 + 4H_2O$$
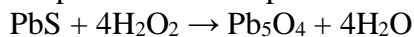
35. (a) A concave mirror of focal length 10 cm can produce a magnified real as well as virtual image of an object placed in front of it. Draw ray diagrams to justify this statement.
(b) An object is placed perpendicular to the principal axis of a convex mirror of focal length 10 cm. The distance of the object from the pole of the mirror is 10 cm. Find the position of the image formed.

Ans: (a) A magnified real image is produced in a concave mirror when the object is placed between principal focus and centre of curvature.
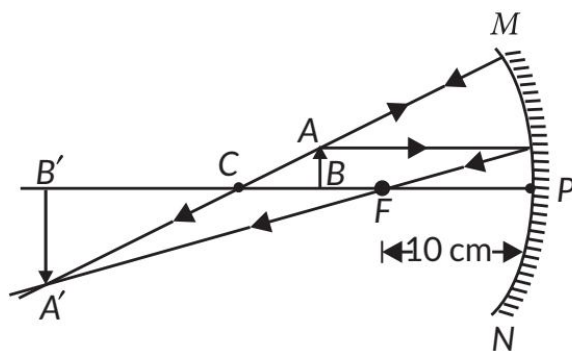
A magnified virtual image is produced in a concave mirror when the object is placed between the pole and the principal focus of the mirror.
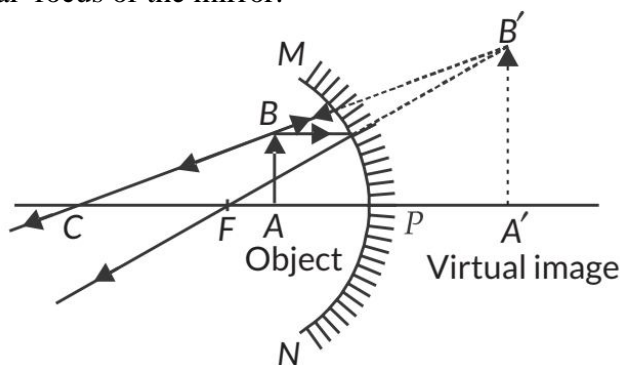
(b) Given, f = +10 cm (convex mirror) and u = –10 cm

From mirror formula, $\dfrac{1}{u}+\dfrac{1}{v}=\dfrac{1}{f}\Rightarrow\dfrac{1}{v}=\dfrac{1}{f}-\dfrac{1}{u}\Rightarrow\dfrac{1}{v}=\dfrac{1}{10}-\dfrac{1}{-10}=\dfrac{1}{10}+\dfrac{1}{10}=\dfrac{2}{10}$

∴ v = 10/2 = 5cm behind the mirror.

OR

The image of a candle flame placed at a distance of 30 cm from a mirror is formed on a screen placed in front of the mirror at a distance of 60 cm from its pole. What is the nature of the mirror? Find its focal length. If the height of the flame is 2.4 cm, find the height of its image. State whether the image formed is erect or inverted.

Ans: Given, Object distance, u = – 30 cm, image size, h′ =? Image distance, v = – 60 cm, Object size, h = 2.4 cm, Focal length, f =?

Using mirror formula, $\dfrac{1}{v}+\dfrac{1}{u}=\dfrac{1}{f}\Rightarrow\dfrac{1}{f}=-\dfrac{1}{60}-\dfrac{1}{30}\Rightarrow\dfrac{1}{f}=\dfrac{-1-2}{60}=-\dfrac{3}{60}=-\dfrac{1}{20}$

$\Rightarrow f = -20$ cm

Hence, the mirror is concave and focal length of mirror is 20 cm.

Also, magnification, $m=\dfrac{h'}{h}=-\dfrac{v}{u}\Rightarrow m=-\dfrac{-60}{-30}=-2\Rightarrow\dfrac{h'}{h}=-2$

$\Rightarrow h' = -2\times 2.4 = -4.8$ cm

As the image formed is real, therefore it is proved that the mirror is concave.

The height of the image is 4.8 cm.

The image formed is enlarged and inverted.

36. (a) Draw a well labelled diagram of stomata.

(b) Explain the structure of stomata. Write the function of guard cells.

Ans: (a) The labelled diagram of stomata is as follows:

(b) Each stoma is a minute pore surrounded by two guard cells. The guard cells are kidney-shaped and contain numerous chloroplasts. The inner walls of guard cells are comparatively thicker than the outer walls.

Function of guard cells: The guard cells regulate the opening and closing of the stomatal pore. The guard cells swell when water flows into them causing the stomatal pore to open. When there is outflow of water from guard cells, the outer thin walls come to their original position resulting in closure of stomatal pore.

OR

(a) What are the functions of stomach?

(b) What are the constituents of gastric juice? Write one function of each.

Ans: (a) Functions of stomach are as follows:

(i) It stores food for variable duration. For example, carbohydrates remain in stomach for about 1-2 hours, proteins for 3 hours and fats for 3-6 hours.

(ii) Walls of stomach undergoes periodic muscular contraction. This helps in churning and mixing of food with gastric juices.

(iii) Wall of stomach has numerous gastric glands which secrete juices. Gastric juices contain enzymes and hydrochloric acid which aid in digestion.

(iv) Stomach regulates movement of partially digested food into the small intestine.

(b) Gastric glands present in the wall of the stomach secrete gastric juice which contains hydrochloric acid, pepsin enzyme and mucus.

(i) Hydrochloric acid kills bacteria and also makes the medium acidic for the action of pepsin enzyme.

(ii) Pepsin enzyme helps in digesting proteins.

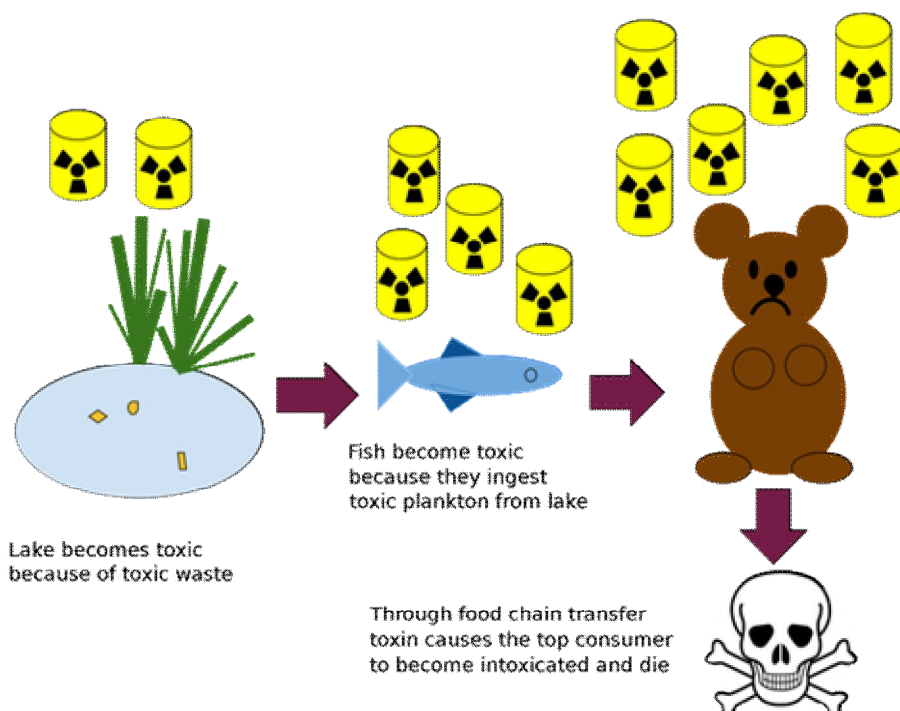(iii) Mucus protects the inner lining of the stomach from the action of the HCI under normal conditions.

SECTION – E(Case Study Based Questions)
Questions 37 to 39 carry 4 marks each.

37. Case Study – 1

Some harmful non-biodegradable chemicals enter the bodies of organism through the food chain and go on concentrating at each trophic level. This phenomenon is called bio-magnification or biological magnification. It is simply the increase in concentration of a substance in a food chain, not an organism. Persistent organic pollutants (POPs) are compound that biomagnifies. Example is of DDT (Pesticide) mercury, Zinc, Lead, Cadmium and other persistent organic pollutants.

The concentration effect occurs because these pollutants are metabolised and excreted much more slowly than the nutrients that are passed from one trophic level to the next. Therefore, they accumulate in the body (especially in the fat as pollutants have more affinity towards tal). The accumulation of insecticides (pollutant) Increase try 10 times. Example: If the goat gets partimillion of DDT from the grasses, it might have 10 ppm in its tissue. The man eating the goat, will have 100 pm. If the food chain is still greater, the accumulation would still be higher (Bioamplification). The most common example of blomagnification is of mercury. Large quantity of mercury is used throughout the world in industries and it is estimated that more than half of this quantity finds its way two natural ecosystems.

Lake becomes toxic because of toxic waste

Fish become toxic because they ingest toxic plankton from lake

Through food chain transfer toxin causes the top consumer to become intoxicated and die

(a) Why maximum concentration of DDT is found in the human beings?

(b) Refer to the given food chain.

Phytoplankton $\rightarrow$ Zooplankton $\rightarrow$ Small fish $\rightarrow$ Large fish $\rightarrow$ Fish eating birds

If concentration of DDT in small fish is estimated to be 0.5 ppm, then what will be amount of DDT in zooplankton and large fish?

OR

Explain how pesticides and heavy metals enter the food chain.

Ans: (a) Due to bio-magnification, the non-biodegradable chemicals such as DDT accumulate and go on concentrating at each trophic level. As human beings occupy the top level in any food chain, the maximum concentration of these chemicals accumulated in our bodies.

(b) Due to bio-magnification, the concentration of DDT increases with increase in trophic level. For example, 0.003 parts per billion of DDT in water becomes 0.003 ppm in phytoplankton, 0.04 ppm zooplankton, 0.5 ppm in clams and small fish, 2.0 ppm in predator or large fish and 25 ppm in fish eating birds like sea gulls.

OR

Chemicals or pesticides when sprayed to protect crops from diseases and pests are either washed down into the soil or into the water bodies. From the soil, these are absorbed by the plants along with water and minerals and from the water bodies these are taken up by aquatic plants and animals. Due to this reason, food grains such as wheat and rice, vegetables and fruits and even meat contain varying amounts of pesticides residues.

38. **Case Study – 2**

A series of organic compounds having same functional group, with similar or almost identical chemical characteristics in which all the members can be represented by the same general formula and the two consecutive members of the series differ by -CH_2 group or 14 mass unit in their molecular formulae is called a homologous series. For example, all the members of alcohol family can be represented by the general formula, $C_nH_{2n+2}OH$ where, n may have the values 1, 2, 3, ... etc. The various members of a particular homologous series are called homologues. The physical properties such as density, melting point, boiling point, solubility, etc. of the members of a homologous series show almost regular variation in ascending or descending the series.

(a) What is the general formula of the homologous series of alkynes?

(b) The table shows the formulae of three organic compounds that belong to the same homologous series.

First member of the homologous series	$CH_3 – O – CH_3$
Second member of the homologous series	$CH_3CH_2 – O – CH_3$
Third member of the homologous series	$CH_3CH_2CH_2 – O – CH_3$

What is the general formula of this series?

(c) Write down the molecular formula of the initial four members of C_nH_{2n+2} homologous series.

OR

Write down the molecular formula of the initial four members of alcohol homologous series.

Ans: (a) Alkynes have the general formula $C_nH_{2n–2}$. e.g., ethyne (C_2H_2), propyne (C_3H_4), butyne (C_4H_6).

(b) Molecular formula of first member : C_2H_6O

Molecular formula of second member : C_3H_8O

Molecular formula of third member : $C_4H_{10}O$ Thus, the general formula of the homologous series is $C_nH_{2n+2}O$

(c) The general formula of the homologous series is C_nH_{2n+2}.

Molecular formula of first member will be $C_1H_{2x1+2} = CH_4$

Molecular formula of second member will be $C_2H_{2x2+2} = C_2H_6$

Molecular formula of third member will be $C_3H_{2x3+2} = C_3H_8$

Molecular formula of fourth member will be $C_4H_{2x4+2} = C_4H_{10}$

OR

The general formula of the alcohol homologous series is $C_nH_{2n+1}OH$.

Molecular formula of first member will be $C_1H_{2x1+1}OH = CH_3OH$

Molecular formula of second member will be $C_2H_{2x2+1}OH = C_2H_5OH$

Molecular formula of third member will be $C_3H_{2x3+1}OH = C_3H_7OH$

Molecular formula of fourth member will be $C_4H_{2 \times 4+1}OH = C_4H_9OH$

39. Case Study - 3

Andre Marie Ampere suggested that a magnet must exert an equal and opposite force on a current carrying conductor, which was experimentally found to be true. But we know that current is due to changes in motion. Thus, it is clear that a charge moving in a magnetic field experience a force, except when it is moving in a direction parallel to it. If the direction of motion is perpendicular to the direction of magnetic field, the magnitude of force experienced depends on the charge, velocity (v), strength of magnetic field (B), and sine of the angle between v and B. Direction of magnetic force is given by Fleming's left hand rule.

(i)

(ii)
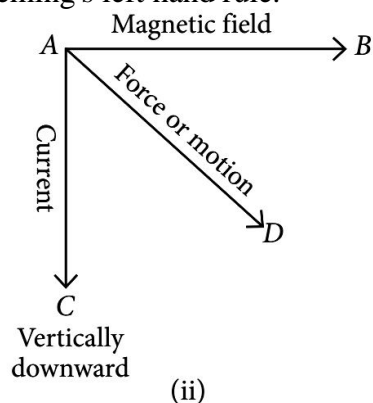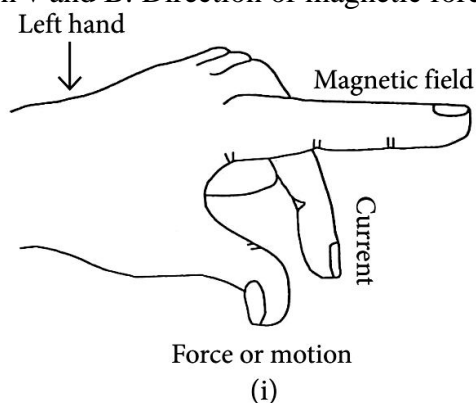
(a) If an electron is travelling horizontally towards east, what is the direction of force experienced by the electron for a magnetic field in vertically downward direction exerts a force on the electron along?

(b) If a charged particle is moving along a magnetic field line, then what is the magnetic force on the particle?

(c) What is magnetic lines of force?

OR

A uniform magnetic field exists in the plane of paper pointing from left to right as shown in figure. In the field an electron and a proton move as shown. Find the forces experienced by the electron and the proton.
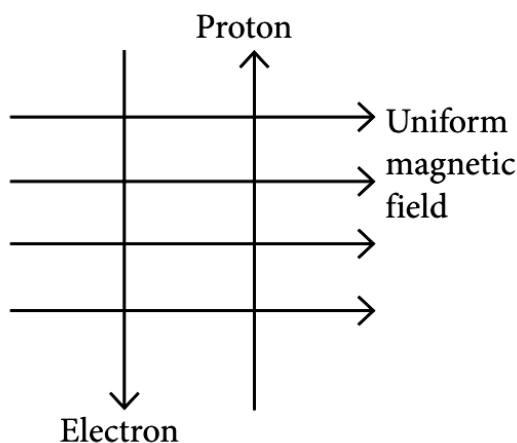
Ans: (a) Fleming's left hand rule is used to determine the direction of force on electron i.e., in south direction.

(b) The angle between velocity and magnetic field is zero. Therefore, magnetic force on the particle is zero.

(c) Magnetic lines of force can be used to indicate the direction of the magnetic field at a point.

OR

As the direction of current is taken opposite to the direction of motion of electrons, therefore, current from the motion of electron and proton is in the same direction, i.e., from bottom to top. Now, according to Fleming's left hand rule, the electron and the proton experience forces both pointing into the plane of paper.