Class X Session 2024-25
Subject - Science
Sample Question Paper - 7

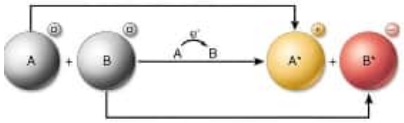
Time Allowed: 3 hours **Maximum Marks: 80**

General Instructions:

1. This question paper consists of 39 questions in 5 sections.
2. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
3. Section A consists of 20 objective-type questions carrying 1 mark each.
4. Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should be in the range of 30 to 50 words.
5. Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should be in the range of 50 to 80 words.
6. Section D consists of 3 Long Answer type questions carrying 05 marks each. Answers to these questions should be in the range of 80 to 120 words.
7. Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

Section A

1. Which type of chemical reaction is shown in the given image? **[1]**



a) Redox reaction
b) Combination reaction
c) Decomposition reaction
d) Displacement reaction

2. What happens when silver chloride is put under sunlight? **[1]**

a) Only silver metal is formed.
b) Silver metal and hydrogen gas are formed.
c) Silver metal and chlorine gas are formed.
d) Only hydrogen gas is formed.

3. Which of the following is used in the refining of petroleum to remove sulphur and other compounds? **[1]**

a) HNO_3
b) NaOH
c) HCl
d) H_2SO_4

4. Which of the following compounds contain carboxylic group? **[1]**

a) CH_3 - CH_2 - CH_3
b) CH_3CH_2COOH
c) $CH_3COOC_2H_5$
d) CH_3CH_2OH

5. The slag obtained during the extraction of copper pyrites is composed mainly of: **[1]**

a) Cu_2S b) SiO_2

c) $CuSiO_3$ d) $FeSiO_3$

6. The number of electrons in the outermost shell of the atom of a non-metal can be: **[1]**

a) 1, 2 or 3 b) 5, 6 or 8

c) 3, 4 or 5 d) 5, 6 or 7

7. IUPAC names of a few esters are given below: **[1]**

i. Ethyl propanoate
ii. Propyl methanoate
iii. Methyl butanoate
iv. Ethyl butanoate

The ester(s) which contain(s) ten hydrogen atoms per molecule is/are

a) (i) and (ii) only b) (iv) only

c) (i) and (iii) only d) i only

8. The inner lining of stomach is protected by one of the following from hydrochloric acid. Choose the correct one **[1]**

a) Salivary amylase b) Pepsin

c) Mucus d) Bile

9. In peas, a pure tall plant (TT) is crossed with a short plant (tt). The ratio of pure tall plants to short plants in F_2 is **[1]**

a) 3 : 1 b) 1 : 1

c) 1 : 3 d) 2 : 1

10. Offspring formed as a result of sexual reproduction exhibit more variations because **[1]**

a) genetic material comes from two parents of different species b) genetic material comes from many parents

c) sexual reproduction is a lengthy process d) genetic material comes from two parents of the same species

11. For evolution to occur in a population, which of the following must happen? **[1]**

i. The frequencies of some alleles in an organism's genotypes must change during its lifetime.
ii. The frequencies of each allele in an organism's genotype must remain constant within its lifetime.
iii. The frequencies of some alleles in a population’s gene pool must change over successive generations.
iv. The frequencies of each allele in a population's gene pool must remain constant over successive generations.

a) Statement (iii) is correct. b) Statement (vi) is correct.

c) Statement (ii) is correct. d) Statement (i) is correct.

12. The kidneys in human beings are a part of the system for **[1]**

a) respiration
b) excretion
c) nutrition
d) transportation

13. The magnetic field lines due to straight wire carrying a current are **[1]**

a) Parabolic
b) Straight
c) Circular
d) Elliptical

14. When more than one resistors are in series, the quantity that remains same in them is **[1]**

a) Potential difference
b) Ammeter
c) Resistance
d) Current

15. The percentage of solar radiation absorbed by all the green plants for the process of photosynthesis is about**:** **[1]**

a) 10%
b) 8%
c) 5%
d) 1%

16. In which of the following food chains, does the man get more energy? **[1]**

- Plant $\rightarrow$ Man
- Plant $\rightarrow$ Goat $\rightarrow$ Man

a) Plant $\rightarrow$ Man
b) Plant $\rightarrow$ Goat $\rightarrow$ Man
c) Different equal energy in both food chain
d) Equal energy in both food chain

17. **Assertion (A):** Corrosion of iron is commonly known as rusting. **[1]**
Reason (R): Corrosion of iron occurs in presence of water and air.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

18. **Assertion (A):** Amoeba always produces two daughter amoebae while Plasmodium divides into many daughter cells. **[1]**
Reason (R): Amoeba undergoes binary fission while Plasmodium undergoes multiple fission.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

19. **Assertion (A):** The magnitude of the magnetic field at a point on the axis of a current-carrying solenoid is inversely proportional to the current flowing through the solenoid. **[1]**
Reason (R): The magnitude of the magnetic field at a point on the axis of a current-carrying solenoid is directly proportional to the number of turns per unit length of a solenoid.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

20. **Assertion (A):** Ozone is very important layer of atmosphere. **[1]**
Reason (R): Ozone protects the living organisms from harmful UV radiation of sun.

a) Both A and R are true and R is the correct
b) Both A and R are true but R is not the

explanation of A. correct explanation of A.

c) A is true but R is false. d) A is false but R is true.

Section B

21. Name the group of derivatives of hydrocarbons that have pleasant fruity smell. Explain with the help of chemical equation how these can be prepared? Name the process involved. **[2]**

22. List two observations on the basis of which it may be concluded that the given slide shows binary fission in Amoeba. **[2]**

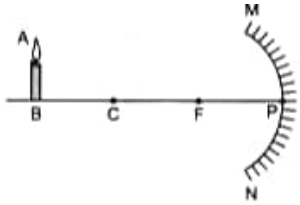
23. Why respiration is called catabolic process? **[2]**

OR

What is lymph?

24. a. Figure shows a concave mirror with its pole at P, focus F and centre of curvature C. Draw a ray diagram to show the formation of image of an object AB. **[2]**

b. State three characteristics of the image formed.



25. What is ozone? Show the reactions of formation of ozone from oxygen in the atmosphere? Name the pollutant and its role in depletion of ozone layer. **[2]**

OR

i. Construct a terrestrial food chain comprising four trophic levels.

ii. What will happen if we kill all the organisms in one trophic level?

iii. Calculate the amount of energy available to the organisms at the fourth trophic level if the energy available to the organisms at the second trophic level is 2000 J.

26. Draw a labelled diagram of human eye. What is the significance of the blind spot? **[2]**

Section C

27. (i) Name a metal for each case: **[3]**

(a) It does not react with cold as well as hot water but reacts with steam.

(b) It does not react with any physical state of water.

(ii) When calcium metal is added to water the gas evolved does not catch fire but the same gas evolved on adding sodium metal to water catches fire. Why is it so?

28. i. a. Write two properties of gold which make it the most suitable metal for ornaments. **[3]**

b. Name two metals which are the best conductors of heat.

c. Name two metals which melt when you keep them on your palm.

ii. Explain the formation of ionic compound CaO with electron-dot structure. Atomic numbers of calcium and oxygen are 20 and 8 respectively.

OR

i. Predict the reaction, if any, between

a. zinc and silver nitrate solution,

b. magnesium and iron (II) chloride solution,

c. copper and magnesium sulphate solution.

Write the equations, with its physical form symbols, for the reaction.

ii. A lump of element X can be cut by a knife. During its reaction with water, X floats and melts. What is X? Explain.

29. i. Why is nutrition necessary for the human body? **[3]**

ii. What causes the movement of food inside the alimentary canal?

iii. Why is the small intestine in herbivores longer than in carnivores?

iv. What will happen if the mucus is not secreted by the gastric glands?

30. An individual inherits different traits from his parents. On what basis classification of traits as dominant and recessive is done? **[3]**

31. What should be the position of an object with respect to focus of a convex lens of focal length 20cm, so that its real and magnified image is obtained? **[3]**

32. A heater coil connected to 200 V has a resistance of 80Ω. If the heater is plugged in for the time t such that 1 kg of water at 20°C attains a temperature of 60°C. Find **[3]**

i. the power of heater.

ii. the heat absorbed by water and the value of t in seconds.

33. i. Several electric bulbs designed to be used on a 220V electric supply line are rated 10W. How many lamps can be connected in parallel with each other across the two wires of 220V line if the maximum allowable current is 5A? **[3]**

ii. Calculate the cost of seeing 2 movies on colour T.V. daily for the month of September.
Given wattage of colour T.V. = 60 W, duration of each movie is 2 hours 30 min and 1kWh costs Rs. 4

Section D

34. a. A compound **X** undergoes addition reaction with H_2 to form a compound **Y** having molecular mass 30 g mol^{-1}. **X** decolorises bromine water and burns with a smoky flame. Identify **X** and **Y** and write chemical equations of the reactions involved. **[5]**

b. Write the structural formulae of (i) Butanone, and (ii) Pentanoic acid.

c. Would you be able to check if water is hard by using a detergent? Give reason to justify your answer.

OR

Explain the mechanism of the cleaning action of soaps.

35. State the basic requirements for sexual reproduction? Write the importance of such reproduction in nature? **[5]**

OR

'Nervous and hormonal systems together perform the function of control and coordination in human beings.' Justify the statement.

36. Define the principal focus of concave mirror. **[5]**

OR

A thin converging lens form a real magnified image and virtual magnified image of an object in front of it.

i. Write the positions of the objects in each case.

ii. Draw ray diagrams to show the image formation in each case.

iii. How will the following be affected on cutting this lens into two halves along the principal axis?

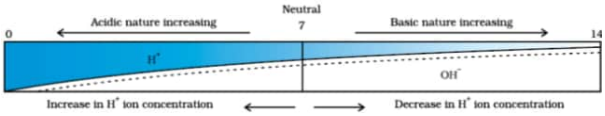
a. Focal length

b. Intensity of the image formed by half lens.

Section E

37. **Read the text carefully and answer the questions:** **[4]**

A scale for measuring hydronium ion in a solution is called the pH scale. The pH of a neutral solution is 7. A value of less than 7 on the pH scale represents an acidic solution. As the pH value, increases from 7 to 14 it represents OH- ion concentration in solution i.e a basic solution.



(a) What is the pH range of the Human Body?

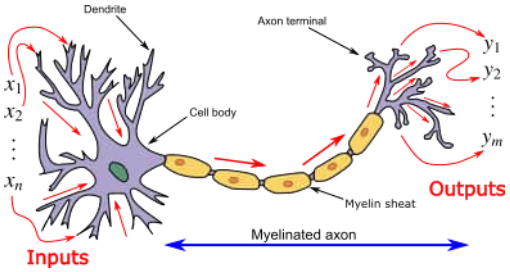
(b) The strength of acid and bases depends on which factor?

OR

If the pH of soil X is 7.5 while that of soil Y is 4.5, then which soil should be treated with powdered chalk to adjust its pH?

38. **Read the text carefully and answer the questions:** **[4]**

In animals, control and coordination are provided by nervous and muscular tissues. Touching a hot object is an urgent and dangerous situation for us. We need to detect it and respond to it. How do we detect that we are touching a hot object? All information from our environment is detected by the specialised tips of some nerve cells. These receptors are usually located in our sense organs, such as the inner ear, the nose, the tongue, and so on. So gustatory receptors will detect taste while olfactory receptors will detect the smell. This information, acquired at the end of the dendritic tip of a nerve cell, see figure, sets off a chemical reaction that creates an electrical impulse. This impulse travels from the dendrite to the cell body, and then along the axon to its end.



(a) Name the largest cell present in the body.

(b) What is an axon ?

(c) Name one gustatory receptor and one olfactory receptor present in a human beings.

OR

Name the following parts of a neuron:

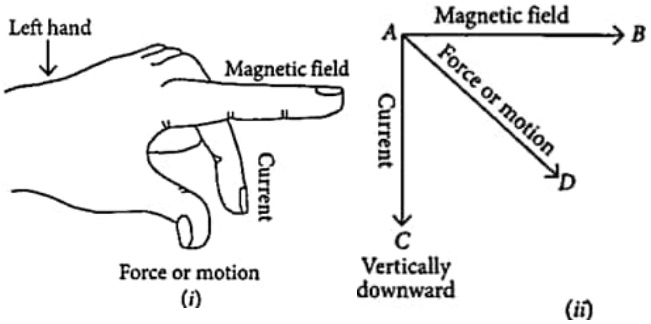
a. Where information is acquired.

b. Through which information travels as an electrical impulse.

39. **Read the text carefully and answer the questions:** **[4]**

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 charges 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

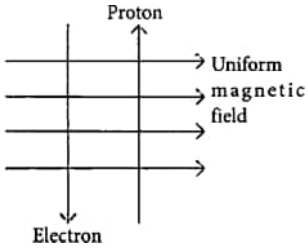
the angle between v and B. Direction of magnetic force is given by Fleming's left-hand rule.



(a) If an electron is travelling horizontally towards east. A magnetic field in vertically downward direction exerts a force on the electron along which direction?

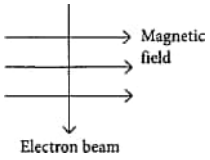
(b) A charged particle is moving with velocity v in a magnetic field of induction B. The force on the particle will be maximum when

(c) 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. Where do the electron and the proton experience the force?



OR

An electron beam enters a magnetic field at right angles to it as shown in the figure. What would be the direction of force acting on the electron beam?

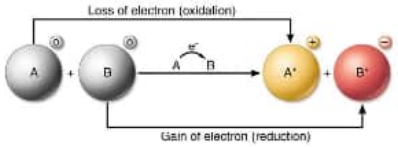


Solution

Section A

1. **(a)** Redox reaction

   Explanation: The chemical reaction in which the oxidation and reduction take place simultaneously is called a redox reaction.

2. **(c)** Silver metal and chlorine gas are formed.

   Explanation: Silver metal and chlorine gas are formed.

3. **(d)** H_2SO_4

   Explanation: Sulphuric acid is used in refining of petroleum to remove sulphur and other impurities from it.

4. **(b)** CH_3CH_2COOH

   Explanation: CH_3CH_2COOH contains a carboxylic group. CH_3CH_2OH contains an alcoholic group. $CH_3COOC_2H_5$ contains the ester group. CH_3 - CH_2 - CH_3 is an alkane.

5. **(d)** $FeSiO_3$

   Explanation: The sulphide ore of copper-containing iron is mixed with silica before heating in a reverberatory furnace. Iron oxide forms a slag of iron silicate ($FeSiO_3$).

   The reaction is: $FeO + SiO_2 \rightarrow FeSiO_3$

6. **(d)** 5, 6 or 7

   Explanation: 5, 6 or 7

7. **(c)** (i) and (iii) only

   Explanation: $\text{Ethyl propanoate} : \underset{(10\text{ H atoms})}{CH_3CH_2COOCH_2CH_3}$

   $\text{Propyl methanoate} : \underset{(8\text{ H atoms})}{HCOOCH_2CH_2CH_3}$

   $\text{Methyl butanoate} : \underset{(10\text{ H atoms})}{CH_3CH_2CH_2COOCH_3}$

   $\text{Ethyl butanoate} : \underset{(12\text{ H atoms})}{CH_3CH_2CH_2COOCH_2CH_3}$

8. **(c)** Mucus

   Explanation: A layer of mucus along the inner walls of the stomach is vital to protect the cell linings of that organ from the highly acidic environment within it.

9. **(b)** 1 : 1

   Explanation: When purebred tall plant with the phenotype (TT) crossed with a short plant with the phenotype (tt), the possible progeny in F_2 generation: TT(1), tt(1), and Tt(2). Thus the ratio of pure tall (TT) to pure short (tt) is 1:1.

10. **(d)** genetic material comes from two parents of the same species

Explanation: Sexual reproduction involves two parents of the same species. Thus, both of them contribute to the genetic material of the offspring and bring about the variations.

11. **(a)** Statement (iii) is correct.
Explanation: Evolution may be described as the change in heritable characteristics of a population over successive generation. So, for evolution to occur, allele frequency must change for whole group of population over successive generation.

12. **(b)** excretion
Explanation: Excretion is the process by which metabolic wastes and other non-useful materials are eliminated from an organism. In Human beings, kidneys are the organs that filter waste products from the blood. Therefore, Kidneys are the part of the excretory system.

13. **(c)** Circular
Explanation: The nature of the magnetic field lines around a straight current-carrying conductor is concentric circles with centre at the axis of the conductor.

14. **(d)** Current
Explanation: Resistors in series have same current.

15. **(d)** 1%
Explanation:
The percentage of solar radiation absorbed by all the green plants for the process of photosynthesis is about one percent. The green plants (producers) use this solar energy for the process of photosynthesis, convert it into food energy and make the energy available to the rest of the ecosystem.

16. **(a)** Plant $\rightarrow$ Man
Explanation: According to an extensive study, 10% can be taken as the average value for the amount of organic matter that is present at each step and reaches the next level of consumers. Therefore, man gets more energy in the first food chain. In the first case, man gets around 10% of the energy produced by the plant. In the second case, man gets around 10% of the energy produced by the plant.

17. **(b)** Both A and R are true but R is not the correct explanation of A.
Explanation: Both A and R are true but R is not the correct explanation of A. Corrosion occurs due to the oxidation of iron.

18. **(a)** Both A and R are true and R is the correct explanation of A.
Explanation: Both A and R are true and R is the correct explanation of A.

19. **(d)** A is false but R is true.
Explanation: A is false but R is true.

20. **(a)** Both A and R are true and R is the correct explanation of A.
Explanation: Both A and R are true and R is the correct explanation of A.

Section B

21. Group of derivatives of hydrocarbons that have pleasent fruity smell are esters. Which is derived by alcohol and carboxylic acid. An example of esterification reaction is given below where ethyl ethanoate is formed which is an ester of ethanoic acid and ethanol.

$$\underset{Ethanoic\ acid}{CH_3COOH} + \underset{Ethanol}{CH_2CH_3OH} \xrightarrow{Conc.\ H_2\ SO_4} \underset{Ethyl\ ethanoate}{CH_3COOCH_2CH_3} + H_2O$$

The process is called esterification.

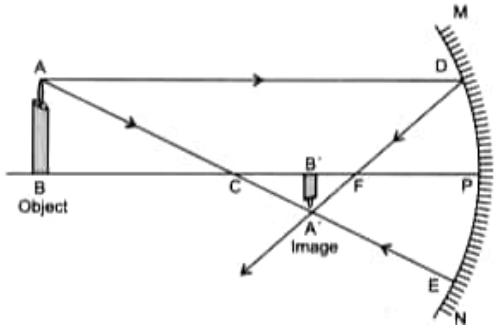
22. i. Nucleus elongates
ii. Constriction in cytoplasm/c ll membrane
These are the two observations which shows binary fission in Amoeba.

23. Catabolism is the degradative processes of metabolism. It concerned with the breakdown of complex food molecules to simple ones, with a concomitant release of free energy. Respiration is a catabolic process because it involves the breakdown of complex organic substances into simpler ones by oxidation.

OR

Lymph is the plasma and formed elements that have leaked out of the capillaries into extracellular environment. It carries food and wastes to the body cells outside the circulatory system. Lymph is formed from the fluid which leaks from blood capillaries and goes to the intercellular spaces in the tissues. This fluid is collected through lymph vessels and finally returns to the blood capillaries. Lymph also plays an important role in the immune system.

24. a.



b. Characteristics of image formed:

i. Real and inverted.

ii. Smaller in size or diminished.

iii. Formed between the focus F and the centre of curvature C of the mirror.

25. Ozone is a triatomic molecule made of three oxygen atoms. It is present as a layer in the stratosphere. It prevents the harmful UV rays of sun from reaching the surface of earth. Ozone is formed by absorption of UV rays coming from sun. $O_2 \leftrightarrow O + O$

$O + O_2 \rightarrow O_3$

UV radiations splits oxygen molecules to oxygen atoms and the oxygen atoms combine with oxygen molecule to form ozone. CFCs are mainly responsible for ozone layer depletion. CFCs release chlorine atoms which breaks ozone to oxygen. More amounts of CFCs thus released will cause depletion of ozone layer.

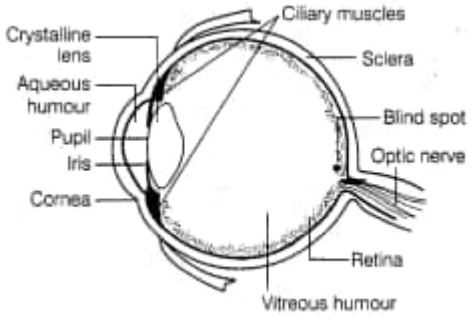
OR

a. Gross $\longrightarrow$ Rabbit $\longrightarrow$ Wolf $\longrightarrow$ Tiger

b. If all organisms of any one trophic level are killed then its previous trophic level organisms will increase in number to such an extent that their previous trophic level will also become extinct and the next trophic level organisms will also get extinct. For e.g., if we remove all wolves then rabbits will increase and will eat up all the grass, at the same time tigers will also perish because of lack of their food.

c. Energy is transferred as per 10% law : Hence, if energy available at second trophic level is 2000 J then third trophic level will have $\frac{10}{100} \times$ 2000 = 200 J and fourth trophic level will have $\frac{10}{100} \times$ 200 = 20 J.

26. Labelled diagram of human eye



Blind spot is a spot on the retina present at the point of origin of the optic nerve. Photo receptor cells are absent from this region. They are insensitive to light as both rods and cones are absent.

An image formed there is not seen by the eye.

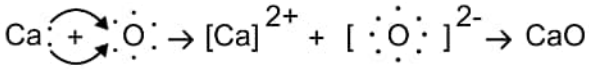
Section C

27. (i) (a) Aluminium, (b) Copper

(ii) In both cases, the gas evolved is H_2. When calcium reacts with water the heat evolved is not sufficient for hydrogen to catch

fire. On the other hand, sodium metal reacts with water violently and in this case a lot of heat is evolved which is sufficient for hydrogen to catch fire.

28. i. a. Malleability and ductility are the two properties of gold that make it the most suitable metal for ornaments
    b. Silver and Copper are the best conductors of heat.
    c. Gallium and Cesium are mostly known as metals that dissolve easily when held on a palm. Gallium basically melts when held on the palm due to the fact that it has a very low melting point.



ii. [2,8,8,2] [2,6]

OR

i. a. Zinc is more reactive than silver. It will displace silver from silver nitrate solution and will form zinc nitrate in the solution.
   $Zn(s) + 2AgNO_3\ (aq) \rightarrow Zn(NO_3)_2(aq) + 2Ag(s)$
   b. Magnesium is more reactive than iron. It will displace iron from iron (II) chloride solution and will form magnesium chloride in the solution.
   $Mg(s) + FeCl_2(aq) \rightarrow MgCl_2(aq) + Fe(s)$
   c. Copper is less reactive than magnesium. It will not displace magnesium from magnesium sulphate solution and, hence, no reaction will take place.
   $Cu(s) + MgSO_4(aq) \rightarrow$ No reaction

ii. X is potassium (K). Potassium is a soft metal that's why it can be cut with a knife and it is lighter than water that's why it floats on the surface of water and the heat produced melts the potassium.

29. i. A healthy diet throughout life promotes healthy pregnancy outcomes, supports normal growth, development, and aging, helps to maintain healthy body weight, and reduces the risk of chronic disease leading to overall health and well-being of human beings.
    ii. Peristalsis mainly causes the movement of food inside the alimentary canal.
    iii. Digestion of cellulose takes a longer time. Hence, herbivores need a longer small intestine to allow the complete digestion of cellulose. Carnivorous animals cannot digest cellulose, hence they have a shorter intestine.
    iv. Mucus is the inner lining of the digestive system which helps in the movement of food through the digestive system. Moreover, mucus in the stomach protects the inner lining from damage by hydrochloric acid which is secreted by oxyntic cells of the gastric gland to make the environment acidic for pepsin to function. So, the lack of mucus will damage the inner lining of the stomach by acid activity. It may result in gastric ulcers.

30. A trait which is able to express itself both in homozygous condition as well as heterozygous conditions is called a dominant trait. A trait which expresses itself only in homozygous condition is called recessive trait.

31. Given focal length f of lens 20 cm
    To obtain real and magnified image, the object should be placed between F_1 and $2F_1$,So the range will be from 20 cm to 40 cm of convex lens.

32. i. $\therefore$ Power of heater,
    $P = \frac{V^2}{R} = \frac{200 \times 200}{80} = 500W$
    ii. $\therefore$ Heat absorbed by water, $H = mC\theta_R$
    $= 1 \times 4200 \times 40 [\because \theta_R = 60^\circ - 20^\circ = 40^\circ\text{C}, C = 4200\text{J/kg}^\circ\text{C}]$
    $= 168000J$
    $= 168kJ$
    iii. $H = P \times t$
    $168000 = 500 \times t$
    $\Rightarrow t = \frac{168000}{500} = 336\text{s}$

33. i. Let current through each bulb be I.
    P = VI, 10 = 220 I
    $\text{I} = \frac{1}{22}\ \text{A}$
    Let n such bulbs be connected in series.

Current through n bulbs = 5A

n (current in 1 bult) = 5

$n\frac{1}{22} = 5$

n = 110

110 such bulbs can be lighted within allowable limit of 5A.

ii. Wattage of colour T.V. = 60 W

Number of hours for which colour T.V. is on during September = $2 \times 2\frac{1}{2} \times 30$ = 150 h

Energy consumed = $\frac{\text{watt} \times \text{hour}}{1000} = \frac{60 \times 150}{1000}$ = 9kWh

Cost of seeing 2 movies per day for 30 days = 9 × 4 = Rs. 36 only

Section D

34. a. X - Ethene /Ethyne / C_2H_4 / C_2H_2 /unsaturated hydrocarbon

Y - Ethane / saturated hydrocarbon

and the chemical equation:

$$CH_2 = CH_2 \ + \ H_2 \xrightarrow{Ni} CH_3 - CH_3$$

b. i. $CH_3 - \underset{\underset{O}{||}}{C} - CH_2 - CH_3$

ii. $CH_3CH_2CH_2CH_2COOH$

c. No

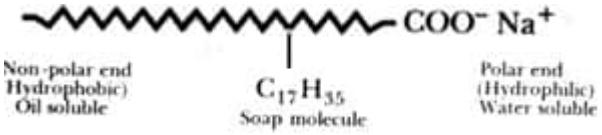
Because detergents give foam/lather with hard water

OR

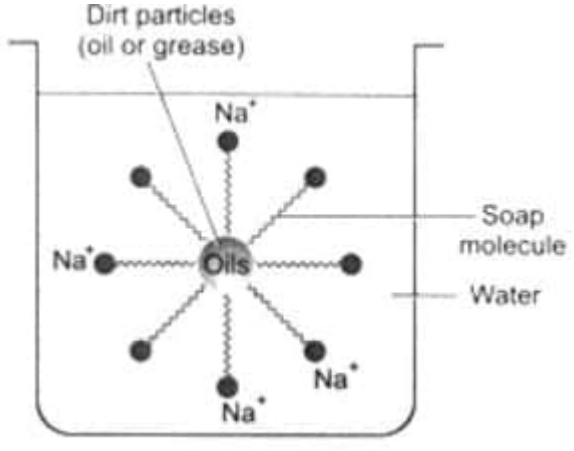
The action of soap is based on the presence of both hydrophilic and hydrophobic groups in a soap molecule. A soap molecule consists of two parts**:**

i. A short ionic part comprising the carboxylate salt, -$COONa^+$. This is the polar end. This is water soluble (i.e. hydrophilic or water-attracting) and, therefore, remains attached to water.

ii. A long hydrocarbon chain which is the non-polar end. This end is hydrophobic (i.e. water-repelling) and is soluble in oil and grease.



Micelle formation: The soap molecule may be represented as a structure as shown in the figure. When soap is dissolved in water, it forms a colloidal suspension. In this colloidal suspension, the soap molecules adhere together to form micelles and remain radially suspended in water with the hydrocarbon end towards the centre and the ionic end directed outward.



The dirt particles always adhere to the oily or greasy layer present on the skin or clothes. When a dirty cloth is dipped into a soap solution, its non-polar hydrocarbon end of micelles attach to the grease or oil present in dirt and polar end remains in water layer. The subsequent mechanical action of rubbing (agitation), dislodges the oily layer from the dirty surface shaping it into small globules. A stable emulsion of oil in water is formed. The emulsified oil or grease globules bearing the dirt can be washed away with water.

35. The basic requirements for sexual reproduction are the involvement of male and female individuals which will contribute the male and female gametes respectively. The gametes are haploid that are produced through meiosis which on fertilization produce a

zygote and the normal diploid number of chromosomes is restored in offsprings.

The importance of sexual reproduction is as follows:

i. It provides variations in species.
ii. Two individuals are required one male and another female.
iii. Specialized organ called sex organ are involved in this type of reproduction.
iv. It promotes diversity of characters in offsprings.
v. It results in recombination of genes thus increase chances of genetic variations.
vi. It plays an important role in origin of new species.

OR

The working together of various organs of human being in a systematic, controlled and efficient way to produce a proper response to various stimuli is known as coordination.

In human beings, the control and coordination is brought about by both nervous system and endocrine system. Nervous system consists of receptors that receive the stimulus from surrounding environment and send the message received by them to the spinal cord and brain in form of electrical impulses through the sensory nerves.

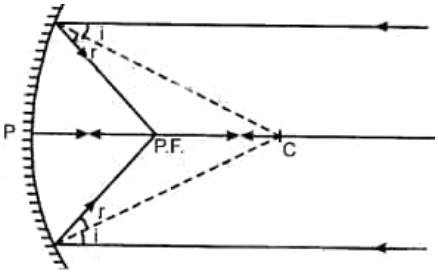
The motor nerves then transmit the response to the effector. The effectors are mainly the muscles and glands of our body. Thus, endocrine glands secreting hormones are directly or indirectly controlled by the nervous system. For example, when an emergency stimulus is detected by the nervous system, the stimulus is detected by the nervous system , the stimulus is received and analysed by central nervous system that send message to effectors to provide proper response. At the same time, the sympathetic nervous system activates adrenal gland to release adrenaline that prepares body by increasing heart rate, blood pressure,respiration and dilates pupil etc.

Hence, control and coordination in humans (or animals) depend on two things for transmitting information, i.e. chemical signals of hormones and nerve impulses.

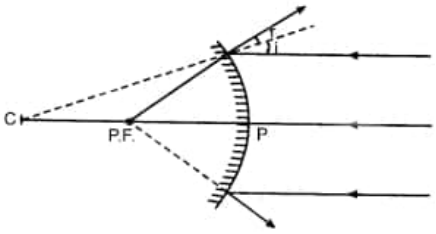
If they depended only on nerve impulses through nerve cells, only a limited range of tissues would be stimulated. Since, they get additional chemical signals as well, a large number of tissues are stimulated. This is why animals can show a wide range of response to stimulus.

36. Light rays that are parallel to the principal axis of a concave mirror converge at a specific point on its principal axis after reflecting from the mirror. This point is known as the principal focus of the concave mirror.

Principal focus (p.f.) is a point on principal axis of a concave mirror where the rays parallel to principal axis meet after reflection from the mirror.



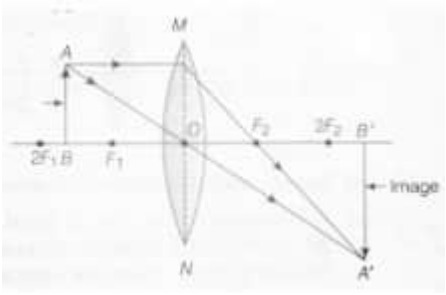
Additional reading. For convex mirror, principal focus is a point on principal axis of a convex mirror where rays parallel to principal axis appear to diverge from after reflection from the mirror.



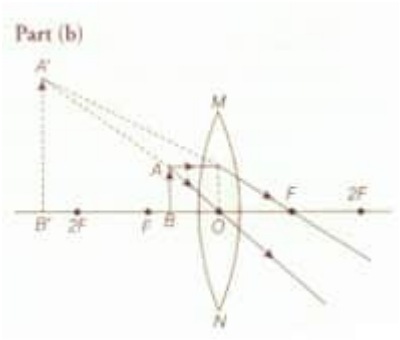
OR

i. a. Object is placed between F and 2F of thin converging lens .
   b. Object is placed between optical centre and F.

ii. The ray diagrams for real magnified and virtual magnified images are as follows:
   Part (a)



Part (b)



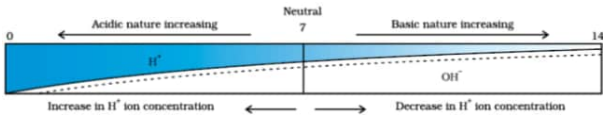
iii. a. There will be no change in focal length of converging lens.

b. Intensity will become one-fourth and brightness of lens will be less .

Section E

37. **Read the text carefully and answer the questions:**

A scale for measuring hydronium ion in a solution is called the pH scale. The pH of a neutral solution is 7. A value of less than 7 on the pH scale represents an acidic solution. As the pH value, increases from 7 to 14 it represents OH- ion concentration in solution i.e a basic solution.



(i) The pH range of the Human Body is 7 to 7.8.

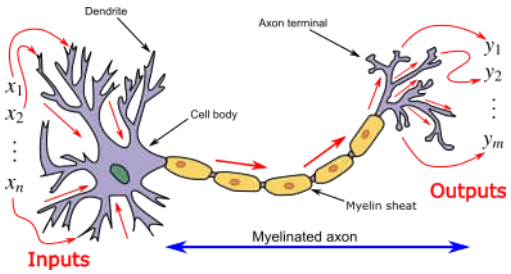
(ii) The strength of acids and bases depends on the number of H^+ ions produced and the number of OH^- ions produced.

OR

Soil Y is acidic. Hence, it should be treated with powdered chalk to reduce its acidity.

38. **Read the text carefully and answer the questions:**

In animals, control and coordination are provided by nervous and muscular tissues. Touching a hot object is an urgent and dangerous situation for us. We need to detect it and respond to it. How do we detect that we are touching a hot object? All information from our environment is detected by the specialised tips of some nerve cells. These receptors are usually located in our sense organs, such as the inner ear, the nose, the tongue, and so on. So gustatory receptors will detect taste while olfactory receptors will detect the smell. This information, acquired at the end of the dendritic tip of a nerve cell, see figure, sets off a chemical reaction that creates an electrical impulse. This impulse travels from the dendrite to the cell body, and then along the axon to its end.



(i) Nerve cell is the largest cell present in the body.

(ii) Axon is a large, single, unbranched nerve fibre arising from the cyton. It carries impulses from cyton located in CNS to the effectors.

(iii) **Gustatory receptor:** Taste buds on the tongue. The receptors for gustation are located in the oral cavity, which brings food and fluids from outside the body into the gastrointestinal tract.

Olfactory receptor: Receptor in the nose. These receptors are common to arthropods, terrestrial vertebrates, fish, and other animals.

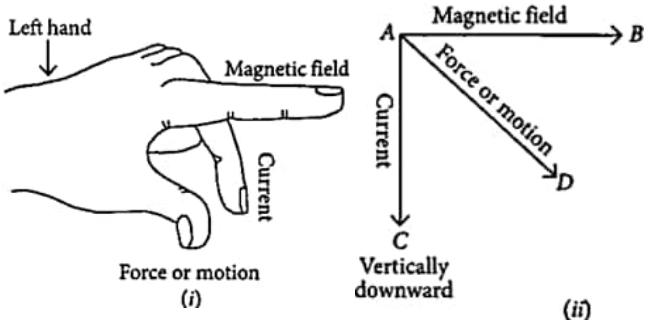
OR

a. Dendrites.

b. Axon.

39. **Read the text carefully and answer the questions:**

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 charges 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) Fleming's left-hand rule is used to determine the direction of force on electron i.e., in south direction.

(ii) Force = q (V $\times$ B) = qVB sin0

Where, 0 is angle between velocity and magnetic field.

So, sin0 is maximum when 0 is 90^0

or velocity is perpendicular to magnetic field.

(iii) 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.

OR

We know that both the directions are perpendicular, thus for force direction = ?

Using Fleming's left-hand rule,

Direction of force is perpendicular to the direction of magnetic field and current.

Thus direction of force is opposite to electron motion into the page at 90°