Class X Session 2023-24
Subject - Science
Sample Question Paper - 9

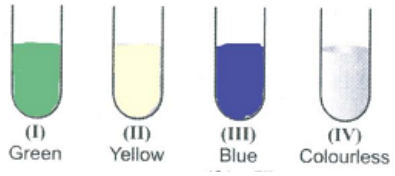
Time Allowed: 3 hours **Maximum Marks: 80**

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. Four test tubes containing solutions (I), (II), (III) and (IV) are shown below along with their colours. Zinc sulphate is contained in **[1]**



a) II b) IV

c) I d) III

2. The gas formed on heating ferrous sulphate is colourless, has the smell of burning sulphur, turns lime water milky and turns acidified potassium dichromate green is **[1]**

a) CO_2 b) H_2S

c) SO_2 d) NO_2

3. An aqueous solution turns red litmus solution blue. Excess addition of which of the following solution would reverse the change? **[1]**

a) Baking powder b) Ammonium hydroxide solution

c) Hydrochloric acid d) Lime

4. Two compounds X and Y have the same molecular formula, $C_3H_6O_2$. Identify the functional groups and structural formulae of X and Y. **[1]**

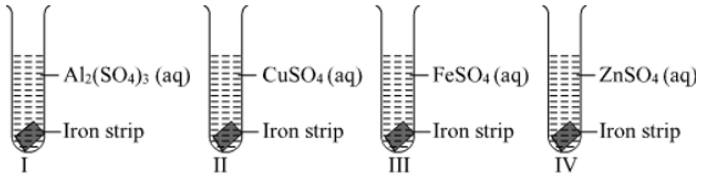
a) -CHO and -CO, X = CH_3CH_2CHO, Y = CH_3COCH_3

b) -CO and -COOH, X = CH_3COCH_3, Y = CH_3CH_2COOH

c) -CHO and -COOH, X = CH_3CH_2CHO, Y = CH_3CH_2COOH

d) -COOH and -COOR, X = CH_3CH_2COOH, Y = CH_3COOCH_3

5. A student adds one big iron nail each in four test tubes containing solution of zinc sulphate, aluminium sulphate, copper sulphate and iron sulphate. A reddish brown coating was observed only on the surface of iron nail which was added in the solution of**:** **[1]**



a) Aluminium sulphate

b) copper sulphate

c) Iron sulphate

d) Zinc sulphate

6. Which one of the following metals do not react with cold as well as hot water? **[1]**

a) Mg

b) Fe

c) Ca

d) Na

7. The odour of ethanoic acid resembles which one of the following**:** **[1]**

a) Kerosene

b) Pungent

c) Rose

d) Vinegar

8. Cramps are caused by heavy exercise resulting in the accumulation of **[1]**

a) Heat

b) Ethanol

c) Carbon dioxide

d) Lactic acid

9. The number of pair (s) of sex chromosomes in the zygote of humans is **[1]**

a) two

b) one

c) three

d) four

10. At what stage of the menstrual cycle is a woman said to be fertile? **[1]**

a) Ovulation

b) All of these

c) Secretary phase

d) Proliferative phase

11. Which of the following is not a nitrogenous base? **[1]**

a) Cytosine

b) Deoxyribose sugar

c) Guanine

d) Adenine

12. Which of the following equations is the summary of photosynthesis? **[1]**

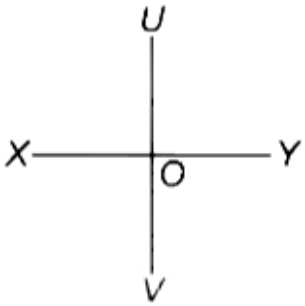
a) $6CO_2 + 12H_2O + \text{Chlorophyll} + \text{Sunlight} \rightarrow C_6H_{12}O_6 + 6O_2 + 6H_2O$

b) $6CO_2 + 12H_2O + \text{Chlorophyll} + \text{Sunlight} \rightarrow C_6H_{12}O_6 + 6CO_2 + 6H_2O$

c) $6CO_2 + 12H_2O \rightarrow C_6H_{12}O_6 + 6O_2 + 6H_2O$

d) $6CO_2 + H_2O + Sunlight \rightarrow C_6H_{12}O_6 + O_2 + 6H_2O$

13. A wire is placed perpendicular to the plane through point O. A constant current is flowing in the wire out of the plane. In the figure, the two points where magnetic field will be perpendicular to each other is **[1]**



a) V and Y

b) U and V

c) None of these

d) X and Y

14. When the diameter of a wire is doubled, its resistance becomes: **[1]**

a) Double

b) Four times

c) One-fourth

d) One-half

15. In a given food chain, suppose the amount of energy available at the third trophic level is 50 KJ. What will be the energy available at the producer level? **[1]**

a) 5000 KJ

b) 50 KJ

c) 5 KJ

d) 500 KJ

16. What will happen if deer is missing in the given food chain? Grass $\rightarrow$ Deer $\rightarrow$ Tiger. **[1]**

a) Tiger will start eating grass.

b) The population of grass will decrease.

c) The population of tiger will decreases and the population of grass will increase.

d) The population of tiger will increase.

17. **Assertion (A):** A chemical reaction becomes faster at higher temperatures. **[1]**
Reason (R): At higher temperatures, molecular motion becomes more rapid.

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):** Spore formation is found in unicellular organisms only. **[1]**
Reason (R): Rhizopus and Mucor reproduce by spore formation method.

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):** Losses in the transmission lines are very less these days. **[1]**
Reason (R): Low voltage is used for the purpose of transmission.

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):** Man is an omnivore. **[1]**

Reason (R): Man eats food products obtained from both plants and animals.

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.

Section B

21. Write the balanced chemical equation for the following: **[2]**

a. Methane is burned insufficient air.

b. Ethanol is treated with sodium.

c. Ethanoic acid is reacted with sodium hydroxide.

d. Ethanoic acid is treated with sodium carbonate.

e. Ethanol is mixed with ethanoic acid in the presence of an acid.

22. What is puberty? Mention any two changes that are common to both boys and girls in early teenage years. **[2]**

23. Plants excrete waste products from their body by various means. Justify the above statement. **[2]**

OR

Why is it not advisable to sleep under a tree at night while resting under it during mid-day is not bad?

24. A concave lens has focal length of 15 cm. At what distance should the object from the lens be placed so that it forms an image at 10 cm from the lens? Also, find the magnification produced by the lens. **[2]**

25. Carnivores cannot be self-dependent and have to depend on herbivores. Explain. **[2]**

OR

Calculate the percentage of energy that will be available to big fish in the following foods chain: Small algae, zooplankton, fish, big fish.The energy available to small algae from sun is 10000 J.

26. Name four colours of the spectrum of white light which have wavelengths longer than blue light. **[2]**

Section C

27. Nikita took Zn, Al, Cu, Fe, Mg and Na metal and put each metal in cold water and then hot water. She reacted the metal with steam **[3]**

(i) Name the metal which reacts with cold water.

(ii) Which of the above metals react with steam?

(iii) Name the metal which reacts with hot water.

(iv) Arrange these metals in order of increasing reactivity.

28. In what forms are metals found in nature? With the help of examples, explain how metals react with oxygen, water and dilute acids. Also, write chemical equations for the reactions. **[3]**

OR

Give reasons for the following:

i. Generally no hydrogen gas is evolved when metals react with dilute nitric acid.

ii. Sodium hydroxide solution cannot be kept in aluminium containers.

iii. Silver metal does not combine easily with oxygen but silver jewellery tarnishes after some time.

iv. Sodium is obtained by the electrolysis of its molten chloride and not from its aqueous solution.

v. Aluminium reacts with dilute hydrochloric acid slowly in the beginning.

29. Describe the process of urine formation in kidneys. **[3]**

30. i. Who provided the evidence of DNA as genetic material? **[3]**

ii. Why DNA is called polynucleotide?

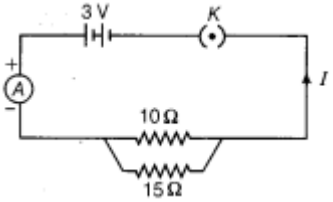
iii. List three important features of double helical model of DNA.

31. Differentiate between virtual image formed by a concave mirror and of a convex mirror. **[3]**

32. i. Write the relationship between electrical resistance and electrical resistivity for a metallic conductor of cylindrical shape. Hence derive the SI unit of electrical resistivity. **[3]**

ii. Find the resistivity of the material of a metallic conductor of length 2 m and area of cross-section 1.4×10^{-6} m^2. The resistance of the conductor is 0.04 ohm.

33. Study the following circuit and answer the questions that follows: **[3]**



i. How much current is flowing through

a. 10Ω and

b. 15Ω resistor?

ii. What is the ammeter reading?

Section D

34. Write the structural formulae of all the isomers of hexane. **[5]**

OR

An organic compound A having the molecular formula C_3H_8O is a liquid at room temperature. The organic liquid A reacts with sodium metal to evolve a gas which burns causing a little explosion. When the organic liquid A is heated with concentrated sulphuric acid at 170°C, it forms a compound B which decolorises bromine water. Compound B adds on one molecule of hydrogen in the presence of Ni as catalyst to form compound C which gives substitution reactions with chlorine.

i. What is compound A?

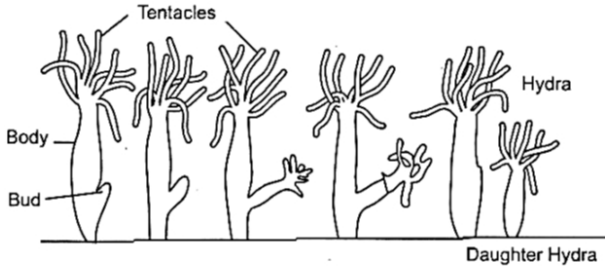
ii. What is compound B?

iii. What type of reaction occurs when A is converted into B?

iv. What is compound C?

v. What type of reaction takes place when B is converted into C?

35. With the help of suitable diagrams explain the various steps of budding in Hydra. **[5]**



Budding in Hydra

OR

What are reflex actions? Give examples? Explain reflex arc by an example with labelled diagram?

36. Draw a ray diagram in each of the following cases to show the formation of image, when the object is placed: **[5]**

i. between the optical center and principal focus of a convex lens.

ii. anywhere in front of a concave lens.

iii. at 2F of a convex lens.

State the signs and values of magnifications in the above-mentioned cases (i) and (ii).

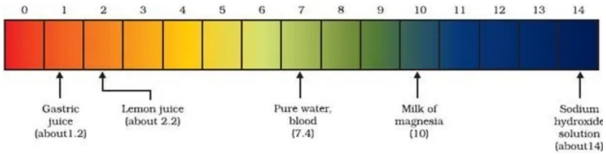
OR

Form the image in case an object is moved from infinity to the concave mirror.

Section E

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

The strength of acid and base depends on the number of H^+ and the number of OH^- respectively. If we take hydrochloric acid and acetic acid of the same concentration, say one molar, then these produce different amounts of hydrogen ions. Acids that give rise to more H^+ ions are said to be strong acids, and acids that give less H^+ ions are said to be weak acids. Can you now say what weak and strong bases are?



(i) Fresh milk has a pH of 6. How do you think the pH will change as it turns into curd?

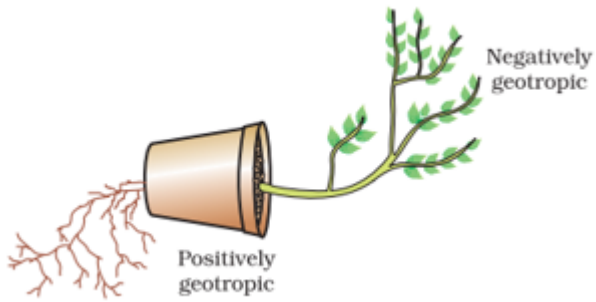
(ii) Is Gastric juice a weak acid?

OR

Milk of magnesia is an acid or base? For what purpose it can be used?

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

Environmental triggers such as light, or gravity will change the directions that plant parts grow in. These directional, or tropic, movements can be either towards the stimulus or away from it. So, in two different kinds of phototropic movement, shoots respond by bending towards light while roots respond by bending away from it. How does this help the plant? Plants show tropism in response to other stimuli as well. The roots of a plant always grow downwards while the shoots usually grow upwards and away from the earth. This upward and downward growth of shoots and roots, respectively, in response to the pull of earth or gravity, is, obviously, geotropism. If 'hydro' means water and 'chemo' refers to chemicals, what would 'hydrotropism' and 'chemotropism' mean? Can we think of examples of these kinds of directional growth movements? One example of chemotropism is the growth of pollen tubes towards ovules, about which we will learn more when we examine the reproductive processes of living organisms.



(i) Where does negative phototropism occur in plants?

(ii) Phototropism in shoots is attributed due to which plant hormone?

(iii) Tendrils exhibit/ twining of tendrils show which type of tropic movement?

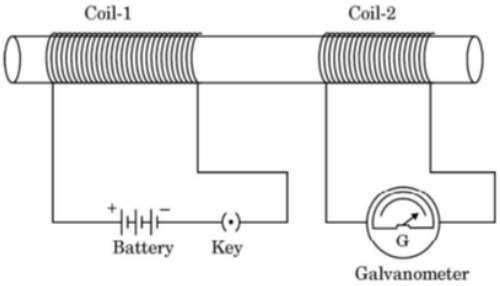
OR

If the stem grows towards sunlight and the root grows just opposite to it, then what type of movement of

the stem is it?

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

Take two different coils of copper wire having large number of turns, say 50 and 100 turns respectively. Insert them over a non-conducting roll as shown in the given figure. Connect the Coil-1, having large number of turns, in series with a battery and a plug key. Also connect the other Coil-2 with a galvanometer.



(i) Explain the reason for the current which is responsible for the deflection in the galvanometer.

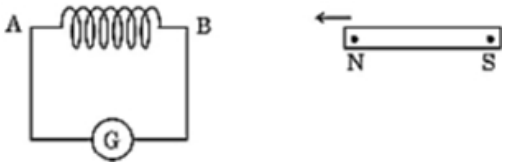
(ii) Define the phenomenon involved in this case.

(iii) State what is observed in the galvanometer, when

1. the key is closed.
2. the key is opened.

OR

A coil AB of copper wire is connected to a galvanometer as shown in the figure. What is observed when N-pole of a strong bar magnet is



I. pushed into the coil?

II. held stationary inside the coil?

State the reason for each observation.

Solution

Section A

1.

(b) IV

Explanation: $ZnSO_4$ solution is colourless. It is contained in IV.

2.

(c) SO_2

Explanation: On heating anhydrous ferrous sulphate decomposes to form ferric oxide (Fe_2O_3), sulphur dioxide (SO_2) and sulphur trioxide (SO_3).

SO_2 gas turns lime water milky and acidified potassium dichromate paper green.

3.

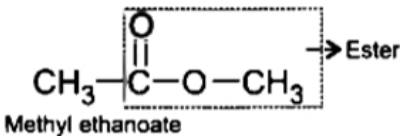
(c) Hydrochloric acid

Explanation: Red litmus is turned to blue by the addition of base or alkali like sodium hydroxide and for reversing this reaction, turning blue litmus to red requires the addition of an acid like hydrochloric acid.

4.

(d) -COOH and -COOR, X = CH_3CH_2COOH, Y = CH_3COOCH_3

Explanation: $\underset{\text{X(Propanoic acid)}}{CH3CH2\boxed{COOH}} \rightarrow \text{Carboxylic acid}$



Methyl ethanoate

5.

(b) copper sulphate

Explanation: The copper sulphate solution will turn green due to the formation of iron sulphate. A reddish brown coating of copper is formed on the nail. Iron is less reactive than aluminium and zinc. It is however, more reactive than copper. It displaces copper from its solution (displacement reaction). The less reactive copper comes out of the solution and more reactive iron goes into the solution.

$CuSO_4$ (aq) + Fe (s) à $FeSO_4$ (aq) + Cu s)

6.

(b) Fe

Explanation: Iron is a less reactive metal and does not show any reaction while treated with cold as well as hot water but will react with steam and form metal oxides and hydrogen gas.

$3Fe(s) + 4H_2O(g) \rightarrow Fe_3O_4(s) + 4H_2(g)$

Iron Steam Iron(III) oxide Hydrogen

7.

(d) Vinegar

Explanation: The odour of ethanoic acid (CH_3COOH) resembles vinegar. A dilute solution of ethanoic acid in water is called vinegar. Vinegar contains about 5 to 8% ethanoic acid.

8.

(d) Lactic acid

Explanation: Muscle cramping is a common problem encountered by athletes and nonathletes alike. They typically affect the large muscles of the legs during or immediately after exercise and last for seconds to a few minutes. Traditionally, such cramping was believed to arise from dehydration, electrolyte imbalances (including magnesium, potassium, and sodium), accumulation of lactic acid, or low cellular energy levels.

9.

(b) one

Explanation: A zygote has 23 pairs of chromosomes i.e., 46. Out of them, one pair is the sex chromosome.

10. **(a)** Ovulation

Explanation: In general, a woman's fertile window is the day of ovulation (usually 12 to 16 days before the cycle begins) and the five days preceding it.

11.

(b) Deoxyribose sugar

Explanation: A nitrogenous base is simply a nitrogen-containing molecule that has the same chemical properties as a base. They are particularly important since they make up the building blocks of DNA and RNA: adenine, guanine, cytosine, thymine, and uracil.

12. **(a)** $6CO_2 + 12H_2O + \text{Chlorophyll} + \text{Sunlight} \rightarrow C_6H_{12}O_6 + 6O_2 + 6H_2O$

Explanation: The summary equation of photosynthesis is

$6CO_2 + 12H_2O + \text{Chlorophyll} + \text{Sunlight} \rightarrow C_6H_{12}O_6 + 6O_2 + 6H_2O$

Photosynthesis is a process by which green plants make their own food, e.g., glucose. CO_2 and H_2O in the presence of sunlight energy and chlorophyll in the presence of Oxygen gas is released during the process of photosynthesis.

13. **(a)** V and Y

Explanation: V and Y

14.

(c) One-fourth

Explanation: We know that

$R = \frac{\rho l}{A}$

Therefore, when the diameter of the wire is doubled, the resistance becomes one-fourth of the actual value.

15. **(a)** 5000 KJ

Explanation: According to 10% law, the energy available to each successive trophic level is 10% of the previous trophic level.

Given, the energy available at the third trophic level = 50 KJ

The energy available at second trophic level = 50 KJ $\times$ 10 = 500 KJ

Therefore, the energy available at the producer level (first trophic level) = 500 KJ $\times$ 10 = 5000 KJ

16.

(c) The population of tiger will decreases and the population of grass will increase.

Explanation: If deer are missing from the given food chain, the population of the tiger will decrease and the growth of the grass will increase. A missing link in a food chain will create an imbalance in the ecosystem.

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

Explanation: A chemical reaction becomes faster at higher temperatures because at high temperature, the movement of particles are greater.

18.

(d) A is false but R is true.

Explanation: The spore formation method of asexual reproduction occurs in both unicellular and multicellular organisms. E.g., Bacteria, Fungi, Ferns and Mosses reproduce by spore formation method.

19.

(c) A is true but R is false.

Explanation: When we use high voltages for transmission system then line losses reduces to a much extent. As high voltages are used so current will be less in those cases which in turn reduces I^2R losses occurring in the transmission lines. So, efficiency of the transmission lines increases. Thus, assertion is true but reason is false.

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. a. $CH_4 + 5O_2 \longrightarrow CO_2 + H_2O$ + heat + Light
b. $2CH_3\text{-}CH_2$ - OH + 2Na $\longrightarrow 2C_2H_5$ - ONa + H_2
c. $CH_3COOH + NaOH \longrightarrow CH_3COONa + H_2O$
d. $CH_3COOH + Na_2CO_3 \longrightarrow 2CH_3COONa + H_2O + CO_2$
e. $CH_3COOH + CH_3\text{-}CH_2\text{-}OH \longrightarrow CH_3COOCH_2 - CH_3 + H_2O$

22. Puberty is the process in which the body attains sexual maturity by having well-developed sex organs, and becomes capable of reproduction.
Changes that occur in females during puberty:
i. development of breasts
ii. softening of voice
Changes that occur in males during puberty:
i. Under the influence of hormones, the larynx develops prominently. The vocal cord become longer and thicker in boys, causing the voice to become hoarse.
ii. Growth of hair in other areas of skin like underarms, face, hands, and legs.

23. Plants follow different strategies to get rid of the wastes produced by various activities.
Some of the strategies involved are as follows:
i. Excess of water is excreted from the plant body through the stomatal pores and from the surfaces of fruits and stems. The process of elimination of water is called transpiration.
ii. Wastes are also accumulated in the dead cells of plants.
iii. Some wastes are stored in leaves that fall off from plants.
iv. Many plant waste products are stored in cellular vacuoles.
v. Some waste products are stored as resins and gums.
vi. CO_2 and O_2 are expelled out through stomata.

OR

During the day, in presence of sunlight, the plants use up the CO_2 and release O_2 in the process of photosynthesis. But during night, plants won't perform photosynthesis so they are unable to use the CO_2 and this further leads to increase in the proportion of CO_2 in the air. During night the trees breathe in oxygen and release CO_2. If one sleeps under the trees, the amount of increased CO_2 in the air around will certainly affect the health. So it is inadvisable to sleep under trees during night. He suffers from suffocation. He feels excess weight on his chest. For this reason, some rural people imagine and fear that ghosts would come and sit on their chests if they sleep under Peepal or Banyan trees.

24. A concave lens always forms a virtual, erect image on the same side of the object.
Image-distance v = -10 cm; Focal length f = -15 cm; Object-distance u = ?
Since $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$
or, $\frac{1}{u} = \frac{1}{v} - \frac{1}{f}$
$\frac{1}{u} = \frac{1}{-10} - \frac{1}{(-15)} = -\frac{1}{10} + \frac{1}{15}$
$\frac{1}{u} = \frac{-3+2}{30} = \frac{1}{-30}$
or, u = -30 cm
Thus, the object-distance is 30 cm.
Magnification m = $\frac{v}{u}$
m = $\frac{-10\text{cm}}{-30\text{cm}} = \frac{1}{3} \simeq +0.33$
The positive sign shows that the image is erect and virtual. The image is one-third of the size of the object.

25. Food chain starts with producers i.e. autotrophs. Carnivores cannot prepare their food by themselves, they are dependent on herbivores which in turn are dependent on producers who can photosynthesise and prepare their food with the help of sunlight.

OR

The food chain is:
Small algae → Zooplankton → Fish → Big fish

10000 J from sun | 10% of 10,000 J | 10% of 1000 J | 10% of 100 J

$= \frac{10 \times 10{,}000}{10} = 1000\ J$ $= \frac{10 \times 1000}{10} = 100\ J$ $\frac{10 \times 100}{10} = 10\ J$

Percentage of energy availble to big fish = $\frac{10 \times 100}{10000} = \frac{1}{10} = 0.1J$

26. Green, yellow, orange and red light have wavelength longer than blue light.

Section C

27. (i) Na
    (ii) Al, Zn, Fe
    (iii) Mg
    (iv) Na>Mg>Al>Zn>Fe>Cu
28. Metals are found in both free and combined states. They can combine with various other elements to form different compounds. The rate at which they combine differs according to their reactivity.
    Metals can combine with oxygen at different rates to form metal oxides, e.g. sodium forms sodium oxide at room temperature.
    $4Na + O_2 \rightarrow 2Na_2O$
    But copper forms copper oxide when it is heated in air.
    $2Cu + O_2 \xrightarrow{\triangle} 2CuO$
    Metals like sodium react with cold water, magnesium with hot water to form their hydroxides and evolve hydrogen gas. But iron reacts with steam to form oxides and evolve hydrogen gas..
    $2Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g)$
    $Mg(s) + 2H_2O(l) \rightarrow Mg(OH)_2(aq) + H_2(g)$
    $3Fe(l) + 4H_2O(l) \rightarrow Fe_3O_4\ (s) + 4H_2(g)$
    Metals react with acids to form salt and evolve hydrogen gas.
    e.g. magnesium reacts with dilute hydrochloric acid to form magnesium chloride and evolve H_2.
    $Mg(s) + 2HCI(aq) \rightarrow MgCl_2\ (aq) + H_2\ (g) \uparrow$

    OR

    i. As Nitric acid (HNO_3) is a strong oxidizing agent, it oxidizes the hydrogen formed into water (H_2O) and itself, gets reduced to an oxide of nitrogen.
    ii. When sodium hydroxide (NaOH), which is a strong base, is kept in a container made of Aluminium, it reacts to form sodium aluminate ($NaAlO_2$) with the release of inflammable Hydrogen gas and will corrode the container.
    iii. Silver (Ag) is a highly unreactive metal and does not chemically combine with oxygen but gradually it turns black(tarnish) due to the reaction of silver with the hydrogen sulphide (H_2S) gas in air forming black colour silver sulphide(Ag_2S).
    iv. If the electrolysis of aqueous solution of sodium chloride is carried out, the sodium metal obtained at the cathode reacts with water to form sodium hydroxide and hydrogen gas. Thus, instead of sodium, hydrogen gas is liberated at the cathode.
    v. Aluminium metal has a layer of Aluminium oxide or Alumina (Al_2O_3) on its surface which is a highly stable compound which slows down the reaction first when reacting with acid.
29. Urine is formed in the nephron of kidneys. Nephron is the structural and functional unit of the kidney. Blood at high pressure travels into these tubules by the tuft of blood capillaries called glomerulus contained in Bowman's capsule.
    The following steps are involved in the process:
    i. **Filtration:** Blood enters the glomerulus through the afferent arterioles It passes under high pressure that results in the filtration of blood. Water and small molecules are forced out of glomerular capillary walls and Bowman’s capsule. Large molecules remain in the blood of the glomerulus.
    ii. **Selective reabsorption:** Some molecules are selectively reabsorbed into the blood. The glomerular filtrate flows through the proximal convoluted tubule, the U-shaped Henle’s loop and distal convoluted tubule. The useful substances such as glucose, amino acids and salts which require energy are reabsorbed by a process called selective reabsorption. Hence, the filtrate now contains urea, some salts and water. Reabsorption of solutes increases the water concentration of the filtrate. Water is then reabsorbed into the blood by osmosis.
    iii. **Tubular secretion:** Some nitrogenous waste products like creatinine and some other substances like K^+ are removed from the blood by DCT (Distal Convoluted Tubule) and are passed to blood. The urine thus formed is collected in the urinary bladder.
30. a. Mendel.
    b. DNA is made up many units of nucleotides.
    c. Important features-

i. Both the chains in helix runs anti-parallel.

ii. There are two types of nitrogenous bases Purine (A, G) and pyrimidine (T, C).

iii. A always pairs with T and C always pairs with G.

31. The virtual image formed by a concave mirror is always magnified whereas the virtual image formed by a convex mirror is diminished.

32. i. $\rho = R\frac{A}{l}$

SI unit of ρ = ohm $\times \frac{m^2}{m}$

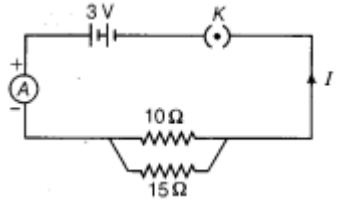
= ohm $\times$ metre/Ω m

ii. $\rho = R\frac{A}{l}$

$= \frac{0{\cdot}04\Omega \times 1{\cdot}4 \times 10^{-6}\ \mathrm{m}^2}{2\ \mathrm{m}}$

$= 2 \cdot 8 \times 10^{-8}\Omega\mathrm{m}$

33. Given,



i. Current through

a. 10Ω resistor, $I_1 = \frac{V}{R} = \frac{3}{10} = 0.3A$

b. 15Ω resistor, $I_2 = \frac{V}{R} = \frac{3}{15} = 0.2A$

ii. Current flowing through the circuit $= 0.3 + 0.2 = 0.5A$

Thus, the ammeter reading is 0.5 A.

Section D

34. There are 5 isomers of hexane. They are hexane, 2-methyl pentane, 3-methyl pentane, 2,2 dimethyl butane, and 2,3-dimethyl butane. They are known as constitutional isomers because they each contain exactly the same number and type of atoms. The structural formulae of all the isomers of hexane are given below

i. $H-\underset{H}{\overset{H}{C}}-\underset{H}{\overset{H}{C}}-\underset{H}{\overset{H}{C}}-\underset{H}{\overset{H}{C}}-\underset{H}{\overset{H}{C}}-\underset{H}{\overset{H}{C}}-H$

$n-Hexane$

ii. $H-\underset{H}{\overset{H}{C}}-\underset{CH_3}{\overset{H}{C}}-\underset{H}{\overset{H}{C}}-\underset{H}{\overset{H}{C}}-\underset{H}{\overset{H}{C}}-H$

$2-Mythyl\ \ Pen\tan e\ (Isohexane)$

iii. $H-\underset{H}{\overset{H}{C}}-\underset{H}{\overset{H}{C}}-\underset{CH_3}{\overset{H}{C}}-\underset{H}{\overset{H}{C}}-\underset{H}{\overset{H}{C}}-H$

$3-Mythyl\ \ Pen\tan e$

iv. $H-\underset{H}{\overset{H}{C}}-\underset{H}{\overset{H}{C}}-\underset{CH_3}{\overset{CH_3}{C}}-\underset{H}{\overset{H}{C}}-H$

$2{,}2\ dimethyl\ butane (Neohexane)$

v. $H-\underset{H}{\overset{H}{C}}-\underset{CH_3}{\overset{H}{C}}-\underset{CH_3}{\overset{H}{C}}-\underset{H}{\overset{H}{C}}-H$

$2{,}3\ \ \dim ethyl\ \ bu\tan e$

OR

i. A is propanol, CH_3-CH_2-CH_2OH

ii. B is propene, unsaturated alkene is formed during the reaction $CH_3CH{=}CH_2$

iii. Dehydration reaction since a water molecule is removed during the reaction..

iv. C is propane, CH_3CH_2-CH_3

v. Addition reaction

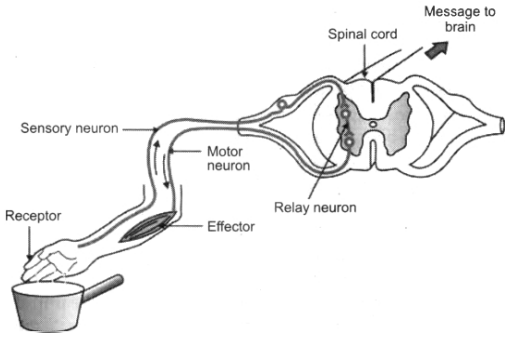
35. Budding is a form of asexual reproduction and is the process of production of new individual from an outgrowth called bud formed on the parent body. Regenerative cells present in Hydra are used for budding. Due to repeated mitotic divisions an outgrowth called bud develops from the parent body which enlarges in size and finally develops into a small hydra. After attaining suitable maturity the offspring get detached from the parent body and become an independent individuals.

OR

Reflex action is a quick, automatic, involuntary, unconscious response in the body brought about by a stimulus. Examples of reflex action:

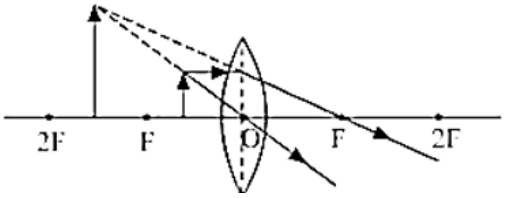
i. Withdrawal of hand suddenly on touching a hot plate.
ii. Withdrawal of finger suddenly when pricked by a thorn.
iii. Shivering of the body on feeling cold.
iv. Sudden closure of the eyelids when bright light falls on the eye.

Reflex arc: It is the shortest route taken by impulse from receptor to effector.



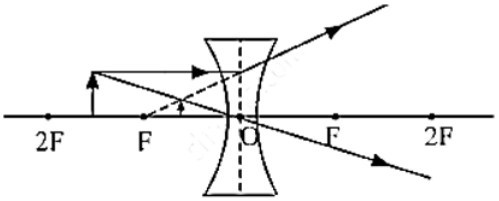
Example: When we touch a hot plate by our finger, we instantly withdraw our hand. Here stimulus is touching a hot plate, receptors are our fingers. The specialised epithelial cells of our fingers respond to stimulus and convert into impulse. This impulse is carried by sensory neuron to spinal cord which generates a motor impulse. This impulse is carried by motor neuron to effector organ i.e., muscles of hand. Response is withdrawal of our hand.

36. i. When an object is placed between the optical center and principal focus of a convex lens then image formed beyond 2F on the opposite side.



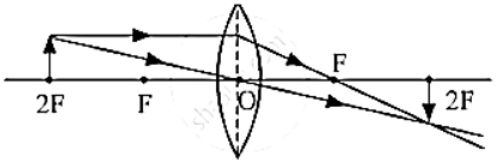
Since the image formed is virtual and erect so sign of magnification will be positive. Moreover, the image formed is magnified therefore the absolute value of magnification will be greater than one.

ii. When an object is placed anywhere in front of a concave lens.



Since the image formed is virtual and erect so sign of magnification will be positive. Moreover, the image formed is diminished therefore the absolute value of magnification will be less than one.

iii. When an object is placed at 2F of a convex lens then the image is formed at 2F opposite side of the mirror.

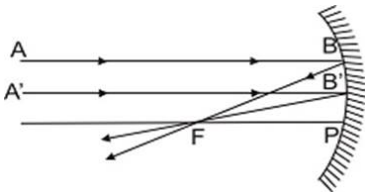


OR

Images formed by concave mirror.

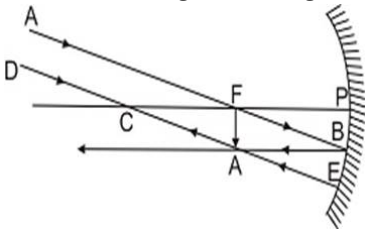
i. Object at Infinity. Two cases arise :

a. When mirror is in parallel plane to the object. In such a case, rays from infinity come parallel to principal axis. After reflection they pass through principal focus F (Rule 1). Image is extremely small, it is real, inverted and at principal focus.



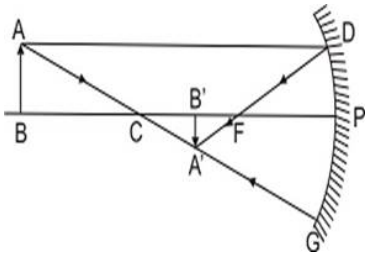
Object at infinity, real extremely diminished image is formed at principal focus.

b. When mirror is inclined so that the rays strike the mirror obliquely. The ray AB passing through F after reflection goes parallel to principal axis towards BA' (Rule 2). Another ray DE through C striking the mirror at E is reflected back. The two form an image at A' Image is real, inverted, extremely diminished and at F.



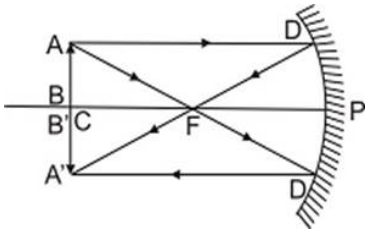
Object at infinity, image at F. It is real, inverted, very much diminished.

c. Object beyond C. A ray AD from A parallel to principal axis after reflection passes through F (Rule 1), Another ray from A through C, ray AG is reflected back along the same path (Rule 3), forming real, diminished, inverted image of AB is formed at A'B', between F and C.



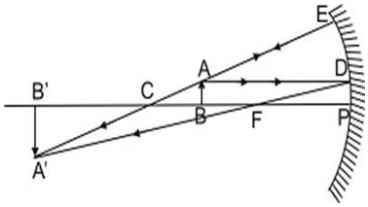
Object beyond C, a real, inverted diminished image between F and C, inverted at C and is of same size as that of object.

d. Object at C i.e. at 2*f*. A ray AD from A parallel to principal axis after reflection from mirror passes through F (Rule 1). Another ray AD' from A through F, goes parallel to principal axis i.e. towards D'A' (rule 2) forming real, inverted image of AB at C i.e. at 2*f*. The image is of the same size as the object.

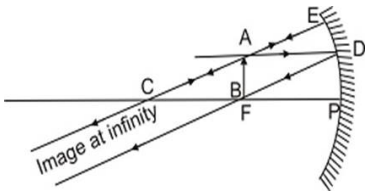


Object at C, Image is also at C. It is real.

e. Object between F and C (f and 2f) A ray AD from object going parallel to principal axis is reflected towards F (Rule 1). Another ray AE through C is reflected back (Rule 3) forming image of A at A'. Similarly image of B is formed at B'. Image is real, inverted, enlarged and beyond C (2f) i.e. as shown in fig.

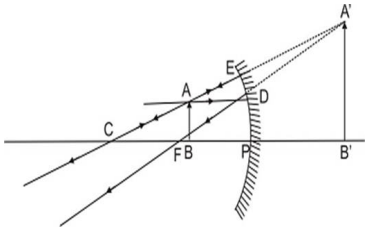


f. Object at F. A ray AD parallel to principal axis passes through F. Another ray AE strikes the mirror normally at E is reflected back as it passes through C (Rule 3). They form image of object AB at infinity. The image is very much enlarged and is real and inverted.



Object at E. Real, inverted, extremely enlarged image is formed at infinity.

g. Object between F and P. A ray AD from A goes parallel to principal axis after reflection passes through F (rule 1). Another ray AE striking the mirror normally through C is reflected back (rule 3). They form virtual image of the object behind the mirror. The image is erect and enlarged.



Object between F and P. An erect, enlarged, virtual image is formed behind the mirror.

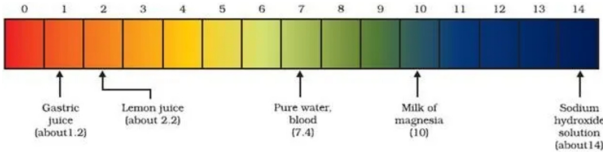
Images Formed by a Concave mirror

Position of Object	**Position of Image**	**Size of the Image**	**Nature of Image**
At infinity	At focus F	Highly diminished	Real and inverted
At C	At C	Same size	Real and inverted
At F	At infinity	Highly Enlarged	Real and inverted
Beyond C	Between F and C	Diminished	Real and inverted
Between F and C	Beyond C	Enlarged	Real and inverted
Between P and F	Behind the mirror	Enlarged	Virtual and erect

Section E

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

The strength of acid and base depends on the number of H^+ and the number of OH^- respectively. If we take hydrochloric acid and acetic acid of the same concentration, say one molar, then these produce different amounts of hydrogen ions. Acids that give rise to more H^+ ions are said to be strong acids, and acids that give less H^+ ions are said to be weak acids. Can you now say what weak and strong bases are?



(i) The pH of milk is 6. As it changes to curd, the pH will reduce because curd is acidic in nature. The acids present in it decrease the pH.

(ii) Yes, gastric juice is a weak acid.

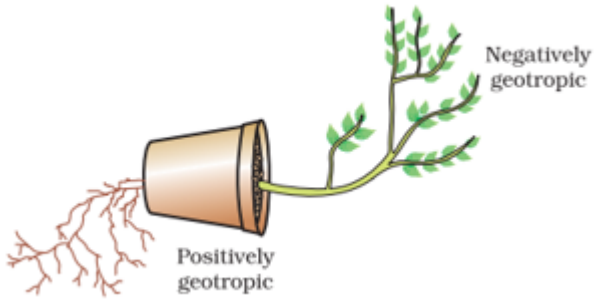
OR

Milk of magnesia is a base and it can be used as an antacid.

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

Environmental triggers such as light, or gravity will change the directions that plant parts grow in. These directional, or tropic, movements can be either towards the stimulus or away from it. So, in two different kinds of phototropic movement, shoots respond by bending towards light while roots respond by bending away from it. How does this help the plant? Plants show tropism in response to other stimuli as well. The roots of a plant always grow downwards while the shoots usually grow upwards and away from the earth. This upward and downward growth of shoots and roots, respectively, in response to the pull of earth or gravity, is, obviously, geotropism. If 'hydro' means water and 'chemo' refers to chemicals, what would 'hydrotropism' and 'chemotropism' mean? Can we think of examples of these kinds of directional growth movements? One example of chemotropism is the growth of pollen tubes towards ovules, about which we will learn more when we examine the reproductive

processes of living organisms.



(i) In plants, negative phototropism occurs in roots.

(ii) Phototropism in shoots is attributed due to auxin in plants.

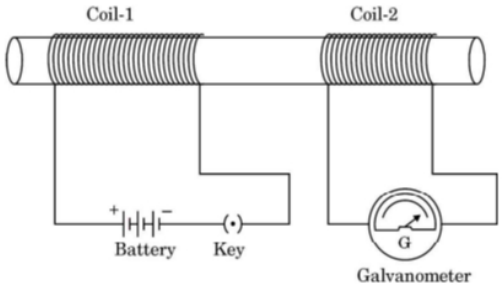
(iii) Tendrils exhibit/ twining of tendrils show thigmotropism movement.

OR

Positive phototropic movement.

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

Take two different coils of copper wire having large number of turns, say 50 and 100 turns respectively. Insert them over a non-conducting roll as shown in the given figure. Connect the Coil-1, having large number of turns, in series with a battery and a plug key. Also connect the other Coil-2 with a galvanometer.



(i) The reason involved is electromagnetic induction.

When current is passed through coil 1 magnetic field changes in coil 2 due to which an induced current starts flowing in coil 2 and the galvanometer present in coil 2 shows some deflection.

(ii) The electromagnetic induction is the phenomenon involved above.

The process by which a changing magnetic field in a conductor induces a current in another conductor is called electromagnetic induction.

(iii) 1. A momentary deflection is shown by the galvanometer.

2. A momentary deflection is shown by the galvanometer but in the opposite direction.

OR

i. When bar magnet is pushed into the coil there is some deflection in the galvanometer.

ii. When bar magnet is held stationary there is no change in magnetic field due to which there is no change in the galvanometer.