Class X Session 2026-27
Subject - Science
Sample Question Paper - 6

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

General Instructions:

1. This question paper consists of 39 questions in 3 sections. Section A is Biology, Section B is Chemistry and Section C is Physics.
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.

Section A

1. The teacher instructed the student to place a healthy potted shoe flower plant in a dark room for 24 hours prior to an experiment on photosynthesis. The purpose of placing it in a dark room is: **[1]**

   a) To activate the chloroplasts in the leaves
   b) To denature the enzymes in the leaves
   c) To increase the intake of carbon dioxide
   d) To destarch the leaves

2. The genetic constitution of an organism is called **[1]**

   a) Phenotype
   b) Genome
   c) Trait
   d) Genotype

3. Organisms which synthesise carbohydrates from inorganic compounds using radiant energy are called **[1]**

   a) Carnivores
   b) Decomposers
   c) Herbivores
   d) Producers

4. Match the following with correct response. **[1]**

Column A	Column B
(i) Temporal lobe	(a) Speech facial muscular activities
(ii) Parietal lobe	(b) Taste, smell touch and conscious association
(iii) Occipital lobe	(c) Auditory reception
(iv) Frontal lobe	(d) Visual perception

   a) (i) - (a), (ii) - (c), (iii) - (b), (iv) - (d)
   b) (i) - (d), (ii) - (a), (iii) - (c), (iv) - (b)
   c) (i) - (c), (ii) - (b), (iii) - (d), (iv) - (a)
   d) (i) - (b), (ii) - (d), (iii) - (a), (iv) - (c)

5. Micro-organisms belong to the group of: **[1]**

a) Decomposers b) Consumers

c) Composers d) Producers

6. Which of the following is an incorrect statement? **[1]**

a) Movement of molecules does not take place among cells b) Organisms grow with time

c) Organisms must repair and maintain their structure d) Energy is essential for life processes

7. Which one of the following is involved in reflex action? **[1]**

a) Exocrine glad b) Endocrine gland

c) Brain d) spinal cord

8. **Assertion (A):** The flowers of papaya is called unisexual flower. **[1]**
Reason (R): The flower contains stamens only as a sex organ.

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.

9. **Assertion (A):** Decomposers keep the environment clean. **[1]**
Reason (R): They recycle matter by breaking down the organic remains and waste products of 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.

10. What are the different methods of contraception? **[2]**

11. What is biomass? State the basic principle behind the working of a biogas plant. Name the main combustible component of biogas and also state its percentage. **[2]**

OR

What is garbage? What does garbage consist of? What is disposal of waste?

12. Write a note on geotropism. **[2]**

13. A plant having blue coloured flowers (BB) is crossed with a plant having white coloured flowers (bb) : **[3]**

a. Name the term used for the trait, which is observed in F_1 generation. Give its gene combination.

b. If the plants obtained in F_1 generation are self-pollinated, write the percentage of (i) plants with flowers of blue colour, and (ii) plants with flowers of white colour in F_2 generation. What did the reappearance of plants with white coloured flowers in F_2 generation indicate?

14. Can you, design any other experiment set-up for testing that CO_2 is produced during respiration? **[3]**

15. **Read the following text carefully and answer the questions that follow:** **[4]**

The most obvious outcome of the reproductive process is the generation of individuals of similar design, but in sexual reproduction they may not be exactly alike. The resemblances as well as differences are marked. The rules of heredity determine the process by which traits and characteristics are reliably inherited. Many experiments have been done to study the rules of inheritance.

i. Why an offspring of human being is not a true copy of his parents in sexual reproduction? (1)

ii. While performing experiments on inheritance in plants, what is the difference between F_1 and F_2 generation? (1)

iii. Why do we say that variations are useful for the survival of a species over time? (2)

OR

Study Mendel's cross between two plants with a pair of contrasting characters. (2)

RRYY $\times$ rryy

Round Yellow Wrinkled Green

He observed 4 types of combinations in F_2 generation. Which of these were new combinations? Why do new features which are not present in the parents, appear in F_2 generation?

16. i. In which form is the information for inheritance of features transmitted from one generation to the next generation? **[5]**

ii. Differentiate between binary fission in Amoeba and Leishmania.

iii. "Fragmentation cannot be a method of reproduction in all multicellular organisms." Justify this statement.

OR

Why do we call pituitary gland as the master gland? Where is it located and what are its functions?

Section B

17. Which of the following statements is not correct? **[1]**

a) Some metals react with acids to give salt and hydrogen.

b) Some non metal oxides react with water to form an acid.

c) All metal oxides react with water to give salt and acid.

d) All metal carbonates react with acid to give a salt, water and carbon dioxide.

18. Which of the given statement is true or false: **[1]**

Statement A: Valeric acid is the common name of hexane.

Statement B: Glycerol is added in the manufacturing of soap.

a) Statement B is true and statement A is false

b) Neither statement A nor statement B is false

c) Both the statements A and B are

d) Statement A is true and statement

false B is false

19. Aluminium foil is used for wrapping food because : **[1]**

a) it is a good conductor of heat b) it is sonorous

c) it is ductile d) it is malleable

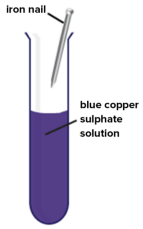
20. Match the following with the correct response: **[1]**

(1) Soap	(A) Sodium salts of long-chain of sulphonic acids
(2) Detergents	(B) Esterification
(3) The reaction of CH_3COOH with metal hydroxides	(C) Neutralization
(4) The reaction of CH_3COOH with alcohols	(D) Sodium salts of long-chain fatty acids

a) (i) - (d), (ii) - (a), (iii) - (c), (iv) - (b) b) (i) - (b), (ii) - (d), (iii) - (a), (iv) - (c)

c) (i) - (a), (ii) - (c), (iii) - (b), (iv) - (d) d) (i) - (c), (ii) - (b), (iii) - (d), (iv) - (a)

21. An iron nail is suspended in $CuSO_4$ solution and kept for a while. The solution: **[1]**



a) Turns green and a coating will be formed on the nail b) Remain blue and no coating will be formed on the nail.

c) Remains blue and a coating is found on the nail d) Turns green and no coating will be formed on the nail.

22. The correct electron dot structure of a water molecule is **[1]**

a) $H:\underset{\cdot\cdot}{O}:H$

b) $H\cdot\underset{\cdot\cdot}{O}\cdot H$

c) $H:\underset{\cdot\cdot}{\overset{\cdot\cdot}{O}}:H$

d) $H:\underset{\cdot\cdot}{\overset{\cdot\cdot}{O}}\cdot H$

23. The acid produced in our stomach during digestion and the base used to neutralise the excess acid during indigestion respectively are: **[1]**

a) HCl, $Ca(OH)_2$ b) Amino acids, $Ca(OH)_2$

c) HCl, $Mg(OH)_2$ d) Lactic acid, $Mg(OH)_2$

24. **Assertion (A):** Solutions of compounds like alcohol and glucose do not show acidic **[1]**

character.

Reason (R): They do not show acidic character because they do not dissociate into ions.

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.

25. Salt X commonly used in bakery products on heating gets converted into another salt Y which itself is used for removal of hardness of water and a gas Z is evolved. The gas C when passed through lime water, turns it milky. Identify X, Y and Z. **[2]**

26. On heating blue coloured powder of copper (II) nitrate in a boiling tube, copper oxide (black), oxygen gas and a brown gas X is formed. **[3]**

i. Write a balanced chemical equation of the reaction.

ii. Identify the brown gas X evolved.

iii. Identify the type of reaction.

iv. What could be the pH range of the aqueous solution of the gas X?

OR

i. Why are the chips packets puffed when we buy them from market?

ii. Paint is applied on articles made up of iron, why?

27. Sample pieces of five metals A, B, C, D and E were added to the tabulated solutions separately. The results observed are shown in the table: **[3]**

Metal	$FeSO_4$	$CuSO_4$	$ZnSO_4$	$AgNO_3$	$Al_2(SO_4)_3$
A	No Change	No Change	No Change	Coating on metal	No Change
B	Grey Deposit on metal	Brown Coating on metal	No Change	Coating on metal	No Change
C	No Change	No Change	No Change	No Change	No Change
D	No Change	--------	No Change	Coating on metal	No Change
E	--------	Brown Coating	New Coating	New Coating	No Change

Based on the observations recorded in the table, answer the following:

(1) Which is the most reactive metal?

(2) Which is the least reactive metal?

(3) What would be observed if metal D were added to a solution of copper (II) sulphate?

(4) What would be observed if metal E were added to a solution of iron (II) sulphate?

(5) Arrange the metals A, B, C, D and E in decreasing order of their reactivity?

28. **Read the following text carefully and answer the questions that follow:** **[4]**

In a balanced chemical reaction, equal number of atoms are present on both sides of reaction. A balanced chemical reaction is based on law of conservation of mass which means that total mass of reactants and products participating in a reaction must be equal. For example, a balanced chemical equation of burning of magnesium in oxygen to form magnesium oxide is written as:

$2Mg + O_2 \longrightarrow 2MgO$

The mass of reactants ($2 \times 24 + 32 = 80$) is equal to the mass of products [$2 \times (24 + 16) = 80$].

i. In a reaction, 35 g of reactant, PQ breaks down into 20 g of product, P and an unknown amount of product, Q. Find the amount of product Q. (1)

ii. The solid mercury (II) oxide is heated, and liquid mercury and oxygen gas are produced. Mention balanced chemical reaction. (1)

iii. Which laws are satisfied by a balanced chemical equation? (2)

OR

In the given chemical reaction, (2)

$2C_6H_{6(l)} + 15O_{2(g)} \longrightarrow mCO_{2(g)} + nH_2O_{(l)}$

Find the values of m and n respectively.

29. A salt X is formed and a gas is evolved when ethanoic acid reacts with sodium hydrogencarbonate. Name the salt X and the gas evolved. Describe an activity and draw the diagram of the apparatus to prove that the evolved gas is the one which you have named. Also, write chemical equation of the reaction involved. **[5]**

OR

i. How is vinegar made?

ii. What is glacial acetic acid? What is its melting point?

iii. Why is butanoic acid a weak acid?

iv. Write the name and the formula of the two compounds formed when the ester, $CH_3COOC_2H_5$ undergoes saponification.

Section C

30. Which of the following statement is incorrect? **[1]**

A. A ray of light passing from an optically rarer medium to an optically denser medium bends away from the normal.

B. A ray of light passing from an optically denser medium to an optically rarer medium bends away from the normal.

C. A ray of light passing from an optically rarer medium to an optically denser medium bends toward the normal.

D. A ray light passing from an optically denser medium to an optically rarer medium bends towards the normal.

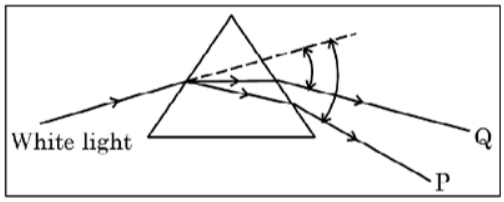
a) A, B and D

b) B and C

c) A and C

d) A and D

31. In the following diagram showing dispersion of white light by a glass prism, the colours **P** and **Q** respectively are- **[1]**



a) Violet and Red
b) Orange and Green
c) Red and Blue
d) Red and Violet

32. **Assertion (A):** The magnetic field lines around a current carrying straight wire do not intersect each other. **[1]**

Reason (R): The magnitude of the magnetic field produced at a given point increases as the current through the wire increases.

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.

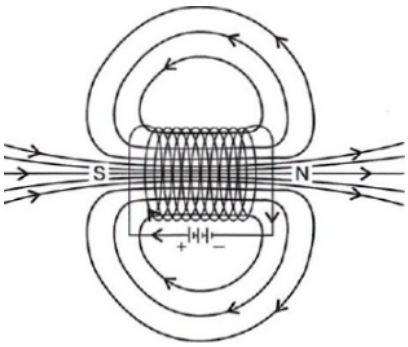
33. A person with myopic eye cannot see objects beyond 1.2metre distinctly. What should be the nature of corrective lenses to restore proper vision? **[2]**

34. Two metallic wires A and B are connected in series. Wire A has length l and radius r, while wire B has length 2l and radius 2r. Find the ratio of total resistance of series combination and the resistance of wire A, if both the wires are of the same material? **[2]**

OR

Calculate the number of electrons constituting one coulomb of charge.

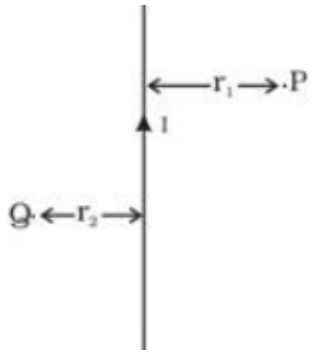
35. We know a current-carrying conductor placed in a magnetic field experiences a force due to which the conductor moves. How do we think the conductor displaces if- **[3]**



i. current in a conductor is increased.
ii. a stronger horse shoe is inserted.

36. A camera in many ways is similar to the human eye, still, there are some basic differences in image formation between the two. Explain. **[3]**

37. AB is a current carrying conductor in the plane of the paper as shown in Figure. **[3]**

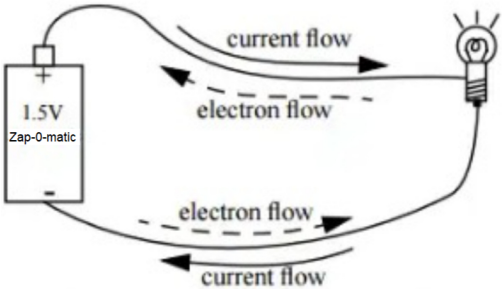


i. What are the directions of magnetic fields produced by it at points P and Q?

ii. Given $r_1 > r_2$, where will the strength of the magnetic field be larger?

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

The rate of flow of charge is called electric current. The SI unit of electric current is Ampere (A). The direction of flow of current is always opposite to the direction of flow of electrons in the current.



The electric potential is defined as the amount of work done in bringing a unit-positive test charge from infinity to a point in the electric field. The amount of work done in bringing a unit positive test charge from one point to another point in an electric field is defined as potential difference.

$V_{AB} = V_B - V_A = \frac{W_{BA}}{q}$

The SI unit of potential and potential difference is volt.

i. Write the formula of voltage in terms of work done, current, time and charge.

ii. What is the number of electrons flowing per second in a conductor if 1 A current is passing through it?

iii. What would be the potential difference between the two terminals of a battery, if 100 joules of work is required to transfer 20 coulombs of charge from one terminal of the battery to other?

OR

The 2 C of charge is flowing through a conductor in 100 ms, then what would be the current in the circuit?

39. A student focussed the image of a candle flame on a white screen using a convex lens. He noted down the position of the candle screen and the lens as under Position of candle = 12.0 cm Position of convex lens = 50.0 cm Position of the screen = 88.0 cm **[5]**

i. What is the focal length of the convex lens?

ii. Where will the image be formed if he shifts the candle towards the lens at a position of 31.0 cm?

iii. What will be the nature of the image formed if he further shifts the candle towards the lens?

iv. Draw a ray diagram to show the formation of the image in case (iii) as said above.

OR

An object 1 m tall is placed on the principal axis of a convex lens and its 40 cm tall image is formed on the screen placed at a distance of 70 cm from the object. What is the focal length of the lens?

Solution

Section A

1.

(d) To destarch the leaves

Explanation:

To destarch the leaves

2.

(d) Genotype

Explanation:

The genotype is the part (DNA sequence) of the genetic makeup of a cell, and therefore of an organism or individual, which determines a specific characteristic of that cell/organism/individual.

3.

(d) Producers

Explanation:

Producers use solar energy to synthesize food from water and carbon-di-oxide. Plants and few micro-organisms are the producers.

Organisms that decompose organic material are called decomposers.

Herbivores are the organisms that feed on plant and its products.

Carnivore are the ones which feed on other organisms.

4.

(c) (i) - (c), (ii) - (b), (iii) - (d), (iv) - (a)

Explanation:

- The Temporal Lobe mainly revolves around hearing and selective listening.
- The parietal lobes can be divided into two functional regions. One involves sensation and perception and the other is concerned with integrating sensory input, primarily with the visual system.
- The occipital lobe is important to be able to correctly understand what your eyes are seeing.
- The frontal lobe is used on an everyday basis. You use it to make decisions, such as what to eat or drink for breakfast, etc.

5. **(a)** Decomposers

Explanation:

Organisms can be grouped as producers, consumers, and decomposers according to the manner in which they obtain their substance from the environment. Micro-organisms belong to the group of decomposers. They break-down the dead remains and waste products of organisms.

6. **(a)** Movement of molecules does not take place among cells

Explanation:

The movement of molecules is a vital process. Movement of molecules in cells takes place in active and passive modes such as diffusion, osmosis, facilitated diffusion, etc.

7.

(d) spinal cord

Explanation:

Reflex action mainly controlled by the spinal cord as it is rapid, involuntary action in response to a specific stimulus.

8. **(c)** A is true but R is false.
Explanation:
Unisexual flowers are those which can have either stamen or carpels as sex organ. It is not true that it has only stamen in it. It can have only carpel also, so either of these will describe a unisexual flower. Thus assertion is true, but reason is false.

9. **(a)** Both A and R are true and R is the correct explanation of A.
Explanation:
Decomposers keep the environment clean by decomposing or consuming the dead remains of other organisms.

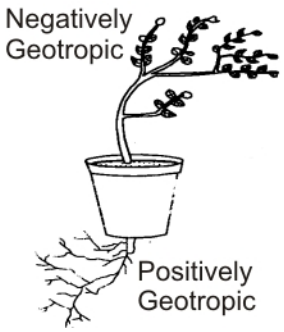
10. Different methods of contraception are-
a) Barrier method - In this method, a device used to prevent the entry of sperms in the female genital tract example - Condom, Diaphragm, Cervical caps.
b) Chemical method - In this method certain drugs (containing hormones) are used by the females. These drugs are avaiblabe in the form of pills. There are two kinds of pills commonly used for preventing pregnancies – oral pills and vaginal pills or creams.
c) Intrauterine contraceptive devices (IUCD'S) – IUCD like copper - T is placed in the uterus - IUCD prevent implantation of the fertilized ovum inside the uterus.

11. Biomass: The waste materials produced by plants and animals from which energy can be obtained on a renewal basis.
Principle: Anaerobic decomposition of biomass.
Main combustible substance: Methane / CH_4
Percentage: 75%

OR

The household wastes or rubbish is called garbage. Every household produces a lot of garbage daily. This garbage includes left over food, fruits and vegetable peels, fallen leaves of potted plants, waste papers, wooden objects, ragged clothes, etc.
Disposal of waste means to get rid of unwanted material and may otherwise require space and cause pollution. The method of waste disposal depends on the nature of waste. Biodegradable waste is to be seperated from non-biodegradable waste as together they cannot be treated well such as recycling etc, causing pollution.

12. The roots of plants bend down and grow towards the soil due to gravity. This is called geotropism. The term geotropism is applied to growth movements induced by stimulus of gravity. Growth of an organ towards the centre of the earth is termed positive geotropism (e.g. main roots are positively geotropic), and growth away from the centre of earth is termed as negative geotropism (e.g. main stems are negatively geotropic). When the axis of an organ grows at right angle to the direction of gravity it is said to be diageotropic (e.g. rhizomes of certain grasses or stolons of potato).



13. a.
- Dominant trait,
- *Bb*

b. i. 75%

ii. 25%

Two copies of the recessive traits (genes) are required for its expression/reappearance.

14. Yes, an experiment set-up by using two-head bottle, water reservior, germinating seed, lime water, beaker and delivery tube.

15. i. In sexual reproduction, a human's offspring is not a true replica of his parents because the genetic material from the mother's and father's gametes is mixed together in humans. So, in addition to some new recombination, the offspring has traits from both parents.

ii. The selected people are crossed to create the F_1 generation, which is the first generation. The F_2 generation is the second one created through the mating of any two members of the F_1 generation.

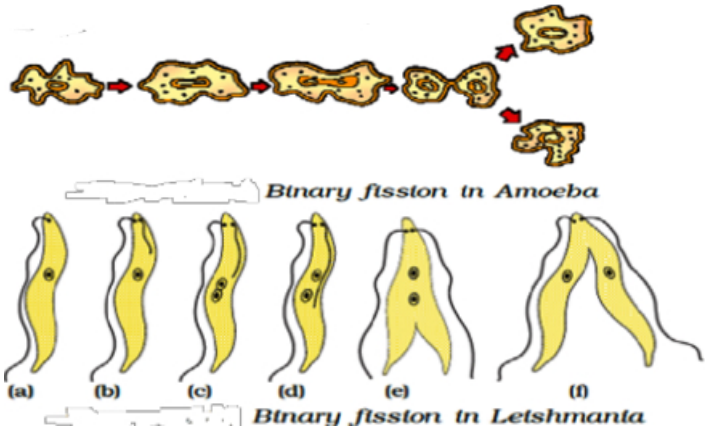
iii. Over time, variations can help a species survive because they give natural selection the starting point from which to work. Any population will always have some variation, and this variation may be advantageous, neutral, or harmful to an individual's chance of surviving.

OR

Yellow and wrinkled seeds and round and green seeds were two novel combinations. These emerge in the F_2 generation as a result of novel combinations of recessive traits whose alleles were present in the F_1 generation but unable to express themselves. In F_2, they appeared by combining in a different way.

16. i. DNA/Deoxyribonucleic acid/gene

ii. **Amoeba-** Splitting of the two cells during division (binary fission) can take place in any plane.
Leishmania- Binary fission occurs in a definite orientation in relation to whip like structure at one end.



iii. Because most multicellular organisms are not simply random collection of cells. They have specialised cells which are organised as tissues and tissues as organs which have been placed at definite position in the body.

OR

The pituitary gland has three lobes that secretes various hormones. It regulates various functions of the body i.e. growth, metabolism, sexual development and system of reproduction. It also controls the functioning of the other endocrine glands. Hence, it is called the master endocrine gland.

Location: Pituitary gland is about the size of a pea and is located in the centre of brain, just below the hypothalamus. It is also known as hypophysis.

Pituitary gland secretes five important hormones. The important hormones secreted by pituitary gland and their functions are listed below:

i. **Growth hormone** regulates the growth and development of bones and muscles.

ii. **Tropic hormone** regulates the secretion from other endocrine glands.

iii. **Prolactin** hormone regulates the function of mammary glands in females.

iv. **Vasopressin hormone** regulates water and electrolyte balance in the body.

v. **Oxytocin hormone** regulates the ejection of milk during lactation.

Section B

17.

(c) All metal oxides react with water to give salt and acid.

Explanation:

Metal oxides are basic in nature. They give alkaline solution when dissolved in water.

18.

(c) Both the statements A and B are false

Explanation:

Valeric acid is another name for pentanoic acid. **Soaps** are sodium or potassium salts of long-chain fatty acids. When triglycerides in fat/oil react with aqueous NaOH or KOH, they are converted into **soap** and glycerol.

19.

(d) it is malleable

Explanation:

it is malleable

20. **(a)** (i) - (d), (ii) - (a), (iii) - (c), (iv) - (b)

Explanation:

- Soaps are sodium or potassium salts of long-chain fatty acids.
- Detergents are sodium salts of a long chain of sulphonic acids.
- The reaction of acetic acid with metal hydroxides is a neutralization reaction.
  $CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$
- The reaction in which a carboxylic acid combines with an alcohol to form an ester is called esterification. When acetic acid CH_3COOH reacts with alcohol, an ester is formed along with water.
  $CH_3COOH + C_2H_5OH \rightarrow CH_3COOC_2H_5 + H_2O$

21. **(a)** Turns green and a coating will be formed on the nail

Explanation:

The solution will turn green due to the formation of iron sulphate. A coating of copper is formed on the nail. Iron is more reactive than copper and displaces it from its solution.

$CuSO_4(aq) + Fe(s) \rightarrow FeSO_4(aq) + Cu(s)$

22.

(c) $H:\underset{\cdot\cdot}{\overset{\cdot\cdot}{O}}:H$

Explanation:

This dot structure shows a complete octet after oxygen shared two electrons with two univalent atoms of hydrogen.

23.

(c) HCl, $Mg(OH)_2$

Explanation:

HCl, $Mg(OH)_2$

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

Explanation:

Solutions of compounds like alcohol and glucose do not show acidic character because like acids such as HCl which dissociates into $H^+$and Cl^- ion these solutions do not dissociate into

ions. Thus both assertion and reason are true and reason is the correct explanation of the assertion.

25.
- Salt **X** is sodium bicarbonate or baking soda ($NaHCO_3$).
- Salt **Y** is sodium carbonate (Na_2CO_3) which is obtained when baking soda is heated.
- Gas **Z** is carbon dioxide (CO_2) which is obtained by heating baking soda and turns lime water milky.

26. i. $\underset{\text{Copper (II) nitrate}}{2Cu(NO_3)_2(s)} \xrightarrow{\text{Heat}} \underset{(Black)}{2Cu\ O(s)} + \underset{(Brown)(X)}{4NO_2(g)} + \underset{Oxygen}{O_2(g)}$

ii. Nitrogen dioxide is the brown gas(X).

iii. Thermal decomposition reaction

iv. pH < 7 because NO_2 dissolves in water to form acidic solution (pH lies below 7).

OR

i. Cooking oil gets oxidized when comes in contact with air and gives a bad smell or turns "rancid". The oxygen present in the chips packet is replaced by flushing nitrogen in the packet, this in turn puffs up the packet.

ii. Iron easily reacts with atmospheric oxygen in presence of slight moisture to give iron oxide. In this process of 'corrosion', the outer layer of iron is oxidized and hence sacrificed leading to the shaping of the iron article. To avoid this oxidation, the article is coated with paint so as to make a barrier between the article's surface and atmosphere.

27. (1) Metal E is most reactive because it displaces zinc from $ZnSO_4$ solution.

(2) Metal C is the least reactive since it has not displaced any of the metals from their respective salt solutions.

(3) Metal D is more reactive than Ag and less reactive than Fe. It can displace Cu from $CuSO_4$ solution.

(4) Since metal E has displaced Zn from $ZnSO_4$ solution, it is more reactive than Zinc. It is therefore expected to be more reactive than iron as well because iron is placed below zinc in the reactive series. Therefore, metal E displaces Fe from $FeSO_4$ solution. A grey /black coating of iron will be deposited on the metal E.

(5) Decreasing order of reactivity E>B>D>A>C

28. i. $\underset{35\ g}{PQ} \longrightarrow \underset{20g\ +\ ?}{P + Q}$

According to law of conservation of mass,
Mass of PQ = Mass of P + Mass of Q
$\therefore$ Mass of Q = (35 - 20)g = 15 g

ii. 2 moles of mercury (II) oxide produce 2 moles of mercury and one mole of oxygen gas.
$2HgO_{(s)} \longrightarrow 2Hg_{(l)} + O_{2(g)}$

iii. The law of conservation of mass is satisfied by a balanced chemical equation.

OR

12 and 6

29. Salt 'X' is sodium ethanoate (CH_3COONa) and the evolved gas is carbon dioxide (CO_2).

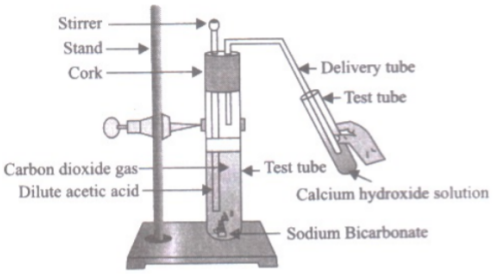
i. Take a test tube and a bent tube.

ii. Take ethanoic acid and sodium bicarbonate solution in the test tube.

iii. Insert the bent tube in the cork and fit the cork at the mouth of the test tube.

iv. Fill lime water in the bent tube so that lime water is in the 'U' portion of this tube.

After some time; it is observed that the lime water turns milky. This confirms that the evolved gas is carbon dioxide. The diagram is given below:



You will observe that the lime water turns milky. This shows that the evolved gas is carbon dioxide. The following reaction takes place between ethanoic acid and sodium hydrogen carbonate.

$CH_3COOH + NaHCO_3 \longrightarrow CH_3COONa + CO_2 + H_2O$

OR

i. vinegar is made by adding 5-8 percent of water in acetic acid.

ii. Pure ethanoic acid is called glacial acetic acid because it form crystals at low temperature. It is a strong acid.

iii. Butanoic acid is a weak acid because it does not ionise completely.

iv. It is a reaction in which ester is heated in presence of a base (mainly NaOH) to give out ethanol & ethanoic acid, this process is used in making of soap.

$CH_3COOC_2H_5 \xrightarrow{NaOH} CH_3COOH + C_2H_5OH$

Ethyl Ethanoate Ethanoic acid Ethanol

Section C

30.

(b) B and C

Explanation:

A ray of light passing from an optically denser medium to an optically rarer medium bends away from the normal, and a ray of light passing from an optically rarer medium to an optically denser medium bends toward the normal.

31. **(a)** Violet and Red

Explanation:

The splitting of white light into its constituent colours is known as light dispersion. The spectrum is the band of seven colours produced by splitting white light. All of the constituent colours of white light have the same velocity in vacuum, but their velocity changes when they pass through a transparent 'medium' like a glass prism. Different colours are diverted by different angles on the prism's initial face. Violet's minimum speed is deviated by the maximum angle, whereas red's maximum speed is distorted by the minimum angle. As a result, the letters 'P' and 'Q' are violet and crimson, respectively.

32.

(c) A is true but R is false.

Explanation:

A is true but R is false.

33. Here, distance of far point, x = 1.2m

For viewing distant objects, focal length of corrective lens, F = -x = -1.2 m

We know that, Power of lens (P) is inversely proportional to the focal length (f).

Therefore, P = $\frac{1}{f} = \frac{1}{-1.2}$ = -0.83D.

Therefore, the person should use the diverging concave lens of power -0.83D.

34. Resistance of wire $A(R_1) = \frac{\rho l}{A} = \frac{\rho l}{\pi r^2}$

Resistance of wire $B(R_2) = \frac{\rho l/}{A/} = \frac{\rho 2l}{\pi(2r)^2} = \frac{\rho 2l}{4\pi r^2}$

Total resistance in series

R=$R_1 + R_2$

R = $\frac{\rho l}{\pi r^2} + \frac{\rho 2l}{4\pi r^2}$

R = $\frac{\rho l}{\pi r^2}(1 + \frac{1}{2}) = \frac{3\rho l}{2\pi r^2}$

Ratio of the total resistance in series to the resistance of A =

$\frac{R}{R_1} = \frac{3\rho l}{2\pi r^2} / \frac{\rho l}{\pi r^2}$

$\frac{R}{R_1} = \frac{3\rho l}{2\pi r^2} \times \frac{\pi r^2}{\rho l}$

$\frac{R}{R_1} = \frac{3}{2}$

So, the required answer =3:2

OR

Charge on an electron = 1.6×10^{-19} C

∴ Number of electrons constituting 1C of charge

$n = \frac{Q}{e}$

= $\frac{1}{1.6} \times 10^{19}$

$= 6.25 \times 10^{18}$

35. As we know, force acting on current carrying conductor is given by the relation:
    F = BIL.
    Here B is strength of the magnetic field, I is the current flowing in conductor and L is the length of the conductor.
    i. When I increase, F also increases hence displacement of the rod increases.
    ii. When a stronger horse shoe magnet is inserted, magnetic field B increases. So force F increase. Hence displacement increases.
36. A camera in many ways is similar to the human eye as both eye and camera has convex lens. But, there are some basic differences in image formation between the two as follows:
    i. In camera, the distance between the lens and the screen can be adjusted but not the focal length of the lens. However, in eye, the ciliary muscles adjust the focal length keeping the distance between the lens and the retina constant.
    ii. The image formed on the retina is temporary and its impression is recorded in the brain as memory. However, the image formed on the film of camera is a permanent record.
37. According to Right Hand Thumb Rule, imagine the straight conductor in your right hand such that the thumb points in the direction of the current, then the direction of curling of fingers of the right hand gives the direction of magnetic field lines. At P, the direction of magnetic field is towards the paper and at point B, the direction of magnetic field is out of the paper. Since $r_1 > r_2$, so the strength of magnetic field at P is less than that at Q.
38. i. $V = \frac{W}{q} = \frac{W}{It}$
    ii. I = 1 A, t = 1 s
    q = It = 1 × 1 = 1C
    $n = \frac{q}{e} = \frac{1}{1.6 \times 10^{-19}} = 6.25 \times 10^{18}$
    iii. The potential difference is the work done in moving a unit of positive electric charge from one point to another.
    W = 100 J, q = 20 C
    $V = \frac{W}{q} = \frac{100}{20} = 5$ V
    OR
    q = 2 C, t = 100 ms = 0.1 s
    $I = \frac{q}{t} = \frac{2}{0.1}$ = 20 A

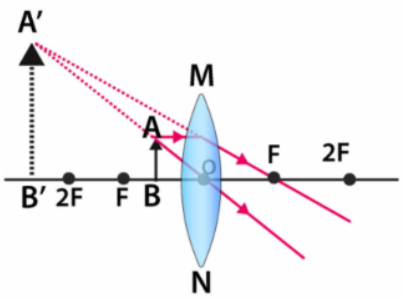
39. Position of the candle flame = 12.0 cm
Position of the lens = 50.0 cm
Position of the screen = 88.0 cm

i. u = 50 - 12 = 38 cm
Image distance v = 88 - 50 = 38 cm
Focal length = $\frac{1}{v} - \frac{1}{u} = \frac{1}{t}$
f = 19 cm

ii. Object distance u = 50 - 31 = 19 cm
Here
Object distance = focal length
Hence the image is formed at infinity.

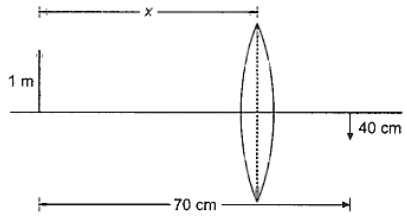
iii. If he further shifts the candle towards the lens. The object comes between F and O. In this case. The image is virtual, enlarged and erect and is formed on the same side of the lens.

iv.



OR

Since, the image is formed on the screen, so the image is real and inverted.
Given: h = 1m = 100 cm, height of image h' = - 40 cm
Let the object be kept at a distance x from the lens which height is 1m



$\therefore$ v = + (70 - x)
Now m $\frac{h'}{h} = \frac{v}{u}$
$\therefore \frac{-40}{+100} = \frac{(70-x)}{-x}$
or 40x = 7000 - 100x
i.e., x = 50 cm
$\therefore$ u = -x = -50 cm
and v = 70 - x = 70 - 50 = 20 cm
Substituting the values of u and v in the lens formula,
$\frac{1}{v} - \frac{1}{u} = \frac{1}{v}$
We have, $\frac{1}{20} - \frac{1}{-50} = \frac{1}{f}$
$\therefore f = +\frac{110}{7}$
= + 14.3 cm
The Focal length of the lens = 14.3 cm.