Class X Session 2026-27
Subject - Science
Sample Question Paper - **10**

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. As compared to daytime, the amount of carbon dioxide released by the plants during night is more because: **[1]**

   a) Plants do not respire during daytime.

   b) It is not produced during daytime.

   c) It is stored in the leaves of plants during daytime.

   d) Major amount of carbon dioxide produced is used up for photosynthesis during daytime.

2. Mendel obtained F_2 generation by **[1]**

   a) cross pollinating both the parents.

   b) self pollinating F_1 generation plants

   c) cross pollinating F_1 generation plants with plants having recessive trait.

   d) cross pollinating F_1 generation plants with plants having dominant trait.

3. In the food chains given below. Select the most efficient food chain in terms of energy: **[1]**

   a) Phytoplankton $\rightarrow$ Zooplankton $\rightarrow$ Small Fish $\rightarrow$ Big Fish

   b) Plants $\rightarrow$ Man

   c) Grass $\rightarrow$ Grasshopper $\rightarrow$ Frog $\rightarrow$ Snake

   d) Plants $\rightarrow$ Deer $\rightarrow$ Lion

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

Column A	**Column B**
(i) Ductless gland	(a) Mammary gland
(ii) Endocrine hormone system	(b) Salivary gland
(iii) Milk	(c) Pancreas

(iv) Glucagon	(d) Thyroid gland

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

5. Amongst the following groups of materials the group which contains only biodegradable materials is : **[1]**

a) Wood, Leather, Paper
b) Polythene, Soap, Wool
c) Plastic, Leather, Grass
d) Glass, Aluminium, Neem leaves

6. The gastric glands present in the wall of the stomach release: **[1]**

a) Pepsin and Salivary amylase
b) Mucus and Trypsin
c) Pepsin and Trypsin
d) Mucus and Pepsin

7. Which of the following statements is not true about a **bud** in **Hydra**? **[1]**

a) It forms due to repeated cell division at one specific site.
b) It detaches from the parent body as soon as it is produced.
c) It is an outgrowth.
d) It becomes a new independent individual.

8. **Assertion (A):** Testes in human males are located outside the abdominal cavity in scrotum. **[1]**
Reason (R): Scrotum provides a lower temperature than the normal body temperature for sperm formation.

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):** Green plants trap only 1% of the energy of sunlight that falls on their leaves. **[1]**
Reason (R): All green plants are the producers in a food chain.

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

11. Differentiate between biodegradable and non-biodegradable wastes. We generate a lot of non-biodegradable wastes in our daily life. Write any two harmful effects caused by these wastes if not disposed off properly. **[2]**

OR

How is ozone formed in the higher levels of the atmosphere? **Damage to the ozone layer is a cause of concern.** Justify this statement.

12. Define reflex action. With the help of a flow chart show the path of a reflex action such as sneezing. **[2]**

13. A pure pea plant having round (R), yellow (Y) seeds is crossed with another pure pea plant having wrinkled (r), green (y) seeds. Subsequently F_1 progeny is self-pollinated to obtain F_2 progeny. **[3]**

a. What do the seeds of F_1 generation look like?

b. Give the possible combinations of traits in seeds of F_2 generation. Also give their ratio.

c. State the reason of obtaining seeds of new combination of traits in F_2 generation.

14. a. A gas is released during photosynthesis. Name the gas and also state the way by which the gas is evolved. **[3]**

b. What are stomata? What governs the opening and closing of stomata?

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

A student crossed pea plants having round and yellow seeds with pea plants having wrinkled and green seeds. He found that only one type of seeds were produced in the F_1 generation. When these F_1 generation pea plants were self - pollinated with each other, then in addition to the seed type of F_1 generation, some new types of seed combinations were also obtained in the F_2 generation.

i. Write any two contrasting visible characters other than the ones shown above, taken by Mendel for his experiment. (1)

ii. Mention the dominant traits observed in F_1 generation. (1)

iii. Give reason why the traits which were not visible in the seeds of F_1 generation reappeared in the seeds of F_2 generation. Write the ratio of different types of seeds obtained in F_2 generation in this case. (2)

OR

What is meant by the terms (I) dominant, and (II) recessive traits? Explain. (2)

16. In human female reproductive system state the changes that take place once fertilisation has taken place. Write the role of placenta in this process. What happens when the egg is not fertilised? **[5]**

OR

i. Name the disorder which a person is likely to suffer from due to the following:

I. Over-secretion of growth hormone

II. Deficiency of oestrogen in females

III. Less secretion of thyroxine

Also name the gland that secretes each of the hormones mentioned above.

ii. How is the timing and amount of hormone released regulated? Explain with the help of an example.

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 correct or wrong: **[1]**

Statement A: Ethane decolorizes bromine water whereas ethyne does not.

Statement B: Mixture of water and alcohol is used in radiators of vehicles in cold countries.

a) Both - Statement A and Statement B - are false.

b) Statement A is true; Statement B is false.

c) Statement B is true; Statement A is false.

d) Both - Statement A and Statement B - are true.

19. Consider the following compounds: **[1]**

I. HCl

II. C_2H_5OH

III. $C_6H_{12}O_6$

IV. H_2SO_4

Which of these compounds do **not** conduct electricity in solution?

a) I and IV

b) III and IV

c) I and II

d) II and III

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

Column A	Column B
(i) Addition reaction	(a) Hydrogenation
(ii) Substitution reaction	(b) Methanol
(iii) Denaturation	(c) Carbon tetrachloride
(iv) Esterification	(d) Ethyl ethanoate

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

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

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

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

21. Aluminum is used for making cooking utensils. Which of the following properties of aluminum are responsible for the same? **[1]**



i. Good thermal conductivity

ii. Good electrical conductivity

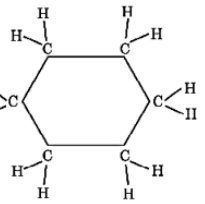
iii. Ductility

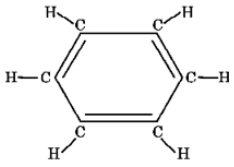
iv. High melting point

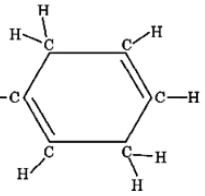
a) (i) and (ii) b) (ii) and (iii)

c) (i) and (iii) d) (i) and (iv)

22. Consider the structures of the three cyclic carbon compounds A, B and C given below and select the correct option from the following: **[1]**

(A) 

(B) 

(C) 

a) A and C are isomers of hexane and B is benzene.

b) A is a saturated cyclic hydrocarbon and B and C are unsaturated cyclic hydrocarbons.

c) A is an isomer of hexane, B is benzene and C is an isomer of hexene.

d) A is cyclohexane and B and C are the isomers of benzene.

23. Four solutions, namely glucose, alcohol, hydrochloric acid and sulphuric acid filled in four separate beakers are connected one by one in an electric circuit with a bulb. The solutions in which the bulb will glow when current is passed are: **[1]**

a) Hydrochloric acid and sulphuric acid b) Glucose and alcohol

c) Alcohol and hydrochloric acid d) Glucose and sulphuric acid

24. **Assertion (A):** Sodium hydroxide reacts with zinc to produce hydrogen gas. **[1]**
Reason (R): Acids react with active metals to produce hydrogen gas.

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. A student working in the laboratory added some water to a syrupy liquid taken in a tube. The tube immediately cracked and the liquid which escaped out of it, produced blisters on the skin of the student. What actually happened? **[2]**

26. Write one chemical equation each for the reactions in which the following changes occur, specifying the change observed : **[3]**

a. Change in colour

b. Change in temperature

c. Formation of precipitate

OR

Write the balanced chemical equation for the following reaction:

i. Phosphorus burns in presence of chlorine to form phosphorus penta chloride.

ii. Burning of natural gas.

iii. The process of respiration

27. a. Write a chemical equation for the reaction in which change in colour is observed when a metal is kept immersed in a salt solution of another metal. **[3]**

b. When hydrogen gas is passed over heated copper(II) oxide, copper and steam are formed. Write the balanced chemical equation with physical states for this reaction. State what kind of chemical reaction is this.

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

When a more reactive element displaces a less reactive element from its compound, it is called a displacement reaction. The reaction is of two types. Single displacement reaction and double displacement reaction.

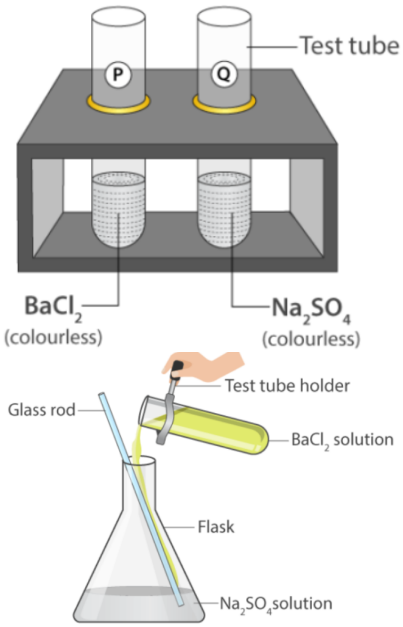
Iron being more reactive than copper displaces copper from an aqueous solution of copper sulphate. This is an example of a single displacement reaction.

On adding silver nitrate solution to sodium bromide, a yellow ppt of silver bromide and solution of sodium nitrate is formed. This is an example of a double displacement reaction.

i. When dil. sulphuric acid is added to pieces of iron sulphide, hydrogen sulphide gas is produced and soluble ferrous sulphate is formed. Which chemical reaction is involved in this process? (1)

ii. Mention reaction which is used for the preparation of oxygen gas in the laboratory. (1)

iii. What are the products formed in the double displacement reaction discussed below? (2)



OR

Which elements displace aluminum from its salt? (2)

29. A neutral organic compound **X** (Molecular formula C_2H_6O) on reacting with acidified **[5]**

$K_2Cr_2O_7$ gives an organic compound **Y** which is acidic in nature. **X** reacts with **Y** on warming in the presence of conc. H_2SO_4 to give a sweet smelling compound **Z**.

i. Identify **X**, **Y** and **Z**.

ii. Write the chemical equations for the reactions in the conversion of (1) **X** to **Y** and (2) **X** to **Z**.

iii. State the role of (1) acidified $K_2Cr_2O_7$ in the conversion of **X** to **Y** and (2) conc. H_2SO_4 in the reaction of **X** and **Y**.

iv. Name the reaction which occurs when **Z** reacts with an alkali.

OR

a. Carry out following conversions:

i. Ethanol to ethene

ii. Ethanol to Ethanoic acid

b. Differentiate between addition reaction and substitution reaction. Give one example of each.

Section C

30. Find the incorrect statement: **[1]**

A. Convex mirrors are used by the dentist to see the large images of teeth of patients.

B. Convex mirrors are used as rear-view mirrors in cars, motorcycles, scooters, etc

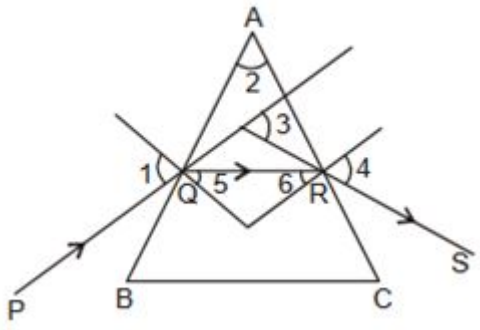
C. Concave mirrors are used for shaving purpose.

D. Concave mirrors are used by doctors to focus light inside the ear or inside the mouth for medical examination.

a) (B) b) (C)

c) (A) d) (D)

31. What is the relation between angles 1, 2, 3 and 4? **[1]**



a) $\angle 1 + \angle 2 = \angle 3 + \angle 4$ b) $\angle 2 + \angle 3 = \angle 1 + \angle 4$

c) $\angle 1 + \angle 3 = \angle 2 + \angle 4$ d) $\angle 2 + \angle 3 + \angle 4 = \angle 1 + \angle 4$

32. **Assertion (A):** A solenoid tends to expand, when a current passes through it. **[1]**

Reason (R): Two straight parallel metallic wires carrying current in same direction attract each other.

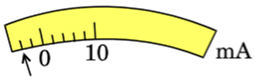
a) Both A and R are true and R is the correct explanation of A.

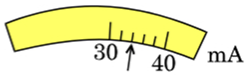
b) Both A and R are true but R is not the correct explanation of A.

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

33. Write the conditions for observing a rainbow. Show, by drawing a suitable diagram, how one understands the formation of a rainbow? **[2]**

34. The rest position of the needles in a milliammeter and voltmeter, not in use, are as shown in Figure A. When a student uses these instruments in his experiment, the readings of the needles are in the positions shown in Figure B. Determine the correct values of current and voltage the student should use in his calculations. **[2]**





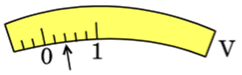


Figure A

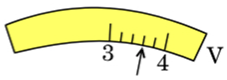


Figure B

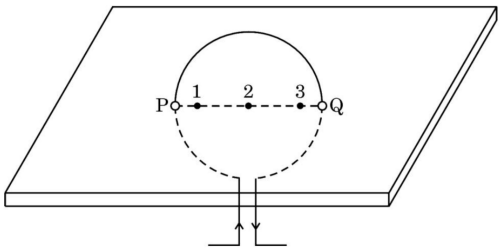
OR

a. Write the mathematical expression for Joule's law of heating.

b. Compute the heat generated while transferring 96000 coulomb of charge in two hours through a potential difference of 40 V.

35. Consider a rectangular cardboard having two holes P and Q through which a current carrying circular loop has been inserted as shown in the diagram. **[3]**

a. Make this diagram on your answer sheet and draw three magnetic field lines, one each passing through the points 1 (near P), 2 (at the centre of the loop) and 3 (near Q).



b. List two factors on which the intensity of the magnetic field produced at the centre of the loop depends.

c. Name the rule you will apply to determine the direction of magnetic field produced due to a current carrying straight conductor.

36. Why do different rays deviate differently in the prism? **[3]**

37. What is a Solenoid? Draw the pattern of the magnetic field lines around a current carrying solenoid. Mark on the pattern the region where the magnetic field is uniform. **[3]**

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

The electrical energy consumed by an electrical appliance is given by the product of its power rating and the time for which it is used. The SI unit of electrical energy is Joule. Actually, Joule represents a very small quantity of energy and therefore it is inconvenient to use where a large quantity of energy is involved. So for commercial purposes, we use a bigger unit of electrical energy which is called kilowatt-hour. 1 kilowatt-hour is equal to 3.6×10^6 joules of electrical energy.

i. The energy dissipated by the heater is E. When the time of operating the heater is doubled, what would be the energy dissipated? (1)

ii. The power of a lamp is 60 W. What will be the energy consumed in 1 minute? (1)

iii. The electrical refrigerator rated 400 W operates 8 hours a day. The cost of electrical energy is ₹ 5 per kWh. Find the cost of running the refrigerator for one day. (2)

OR

Calculate the energy transformed by a 5 A current flowing through a resistor of 2Ω for 30 minutes. (2)

39. A concave lens of focal length 60 cm is used to form an image of an object of length 9 cm kept at a distance of 30 cm from it. Use lens formula to determine the nature, position and length of the image formed. Also draw labelled ray diagram to show the image formation in the above case. **[5]**

OR

a. What is a lens? List two main categories of lenses. In which category is a double concave lens placed?

b. A convex lens of focal length 15 cm forms a real image at a distance of 20 cm from its optical centre. Find the position of the object. Is the image formed by the lens magnified or diminished?

Solution

Section A

1. **(d)** Major amount of carbon dioxide produced is used up for photosynthesis during daytime.
Explanation:
Major amount of carbon dioxide produced is used up for photosynthesis during daytime.

2. **(b)** self pollinating F_1 generation plants
Explanation:
Self-pollinating F_1 generation plants.

3. **(b)** Plants $\rightarrow$ Man
Explanation:
Plants $\rightarrow$ Man

4. **(c)** (i) - (b), (ii) - (d), (iii) - (a), (iv) - (c)
Explanation:
   - The ductless gland secretes substances known as hormones directly into the bloodstream rather than through ducts.
   - Exocrine glands such as salivary glands discharge their products through ducts.
   - The milk-producing gland of women or other female mammals.
   - Insulin and glucagon are hormones that help regulate the levels of blood glucose, or sugar, in your body.

5. **(a)** Wood, Leather, Paper
Explanation:
Wood, Leather, Paper

6. **(d)** Mucus and Pepsin
Explanation:
Mucus and Pepsin

7. **(b)** It detaches from the parent body as soon as it is produced.
Explanation:
It detaches from the parent body as soon as it is produced.

8. **(a)** Both A and R are true and R is the correct explanation of A.
Explanation:
Human testes are located outside the abdominal cavity in a pouch called the scrotum. The goal is to keep the scrotal temperature lower than the internal body temperature.

9. **(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.

10. 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.

11.

Biodegradable waste	Non-biodegradable waste
Wastes that are broken down by biological processes into simpler substances.	Wastes that are not broken down by biological processes into simpler substances.

Harmful effects:

- Excessive use cause pollution.
- Pesticides enter the food chain and cause biomagnification in humans and other animals.
- Clogging of drains.
- Death of cattle due to ingestion of plastics

OR

Ozone is formed in upper atmosphere by the reaction of ultraviolet UV radiations on oxygen O_2 molecule. The damage to ozone layer is a cause of concern to us as due to its damage more ultraviolet rays reach the earth's surface causing various health hazards.

12. Reflex action is a sudden/spontaneous/immediate action in response to the environment/stimulus e.g. sneezing.

Stimulus $\rightarrow$ Receptors (Nose) $\rightarrow$ Sensory neuron $\rightarrow$ Spinal cord (Relay neuron) $\rightarrow$ Motor neuron $\rightarrow$ Effector (Muscles) $\rightarrow$ Response

13. a. Round, yellow
b. round yellow : 9
round green : 3
wrinkled yellow : 3
wrinkled green : 1
c. Traits are inherited independently/Independent assortment of the traits.

14. a. Oxygen (O_2) is released during photosynthesis.

During photosynthesis, plants absorb carbon dioxide and sunlight to produce carbohydrates. The solar energy trapped by chlorophyll breaks down water molecules by the process of photolysis. It is a type of photo-oxidation reaction that releases oxygen.
This released oxygen gets emitted in the atmosphere.

b. Stomata are the tiny pores present on the surface of leaves which helps in gaseous exchange and transpiration. When water moves inside the guard cells, they swell and become turgid which facilitates the opening of the stomata. Stomata generally open in the presence of light, allowing for the uptake of carbon dioxide needed for photosynthesis. This is because photosynthesis requires light energy to proceed, and carbon dioxide is needed as a substrate. Similarly, when water moves out of the cell, the cell becomes flaccid which promotes the closing of the stomata. This occurs due to the difference in solute concentration. Stomata tend to close when water availability is limited to prevent excessive water loss through transpiration. This helps conserve water and maintain hydration within the plant.

15. i. i. Flower color (purple or white)
ii. Plant size (tall or dwarf)

ii. In F_1 generation round and Yellow seeds were observed that mean round and Yellow are dominant traits.

iii. The traits which were not show in $_{F1}$ generation were recessive traits that do not show their presence in front of dominant genes.
Ratio of types if seeds in F_2 generation is 9 : 3 : 3 : 1

OR

I. The trait that first appears or is visibly expressed in the organism is called the dominant trait.

II. The trait that is present at the gene level but is masked and does not show itself in the organism is called the recessive trait.

16. After fertilization, a zygote is formed, which marks the beginning of a new life. The zygote undergoes repeated cell divisions and develops into an embryo. This embryo becomes implanted in the lining of the uterus, where it continues to grow. The placenta, a special tissue formed between the mother and the embryo, plays an essential role in supplying oxygen and glucose from the mother's blood to the developing embryo. It also helps remove waste products produced by the embryo. Throughout pregnancy, the placenta ensures proper nourishment and protection. If fertilization does not occur, the thickened uterine lining is no longer needed. It gradually breaks down and is expelled from the body through the vagina as blood and mucus, a process known as menstruation.

OR

i. I. Over-secretion of growth hormone - gigantism and growth hormones is secreted by anterior pituitary gland.

II. Deficiency of estrogen in females caused female hypogonadism. It is secreted from ovaries.

III. Less secretion of thyroxine caused hypothyroidism. It is secreted thyroid gland.

ii. In humans, the timing and amount of hormone secretion are regulated by the feedback mechanism by the end product. For example, the pancreas is triggered to release the insulin when the positive feedback is given by the increase of sugar level in blood.

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) Statement B is true; Statement A is false.

Explanation:

- The bromine water test is a test for unsaturated hydrocarbons. Ethane undergoes addition reaction and decolorizes bromine water. Similarly, ethyne also decolorizes bromine water.
- The mixture of water and alcohol is used in radiators of vehicles in cold countries. Alcohol is used for antifreeze mixture. Antifreeze is an additive that lowers the freezing point of a water-based liquid.

19.

(d) II and III

Explanation:

II and III

20.

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

Explanation:

- Hydrogenation is an addition reaction. The addition of hydrogen to an unsaturated hydrocarbon to obtain a saturated hydrocarbon is called hydrogenation.
- Carbon tetrachloride is a product of a substitution reaction - a characteristic property of saturated hydrocarbons.
- Alcohol meant for industrial purposes is made unfit for human consumption by adding small amounts (about 5%) of methanol to alcohol. The mixture is known as denatured spirit or denatured alcohol.
- Ethyl ethanoate is a product of esterification.
  $CH_3COOH + C_2H_5OH \rightarrow CH_5COOC_2H_5 + H_2O$

21. **(d)** (i) and (iv)
Explanation:
Aluminium has good thermal conductivity and high melting point. These properties are useful in the making of utensils. The commonly used metals in making utensils are copper, steel (an alloy of iron) and aluminium.
Copper and aluminium are the most preferred due to their conduction of heat.

22. **(a)** A and C are isomers of hexane and B is benzene.
Explanation:
A and C are isomers of hexane and B is benzene.

23. **(a)** Hydrochloric acid and sulphuric acid
Explanation:
Hydrochloric acid and sulphuric acid

24. **(b)** Both A and R are true but R is not the correct explanation of A.
Explanation:
Sodium hydroxide is a strong base, reacts with active metal (zinc) to produce H_2 gas. The reaction is given as follows:
$Zn(s) + 2NaOH(aq) \longrightarrow Na_2ZnO_2(aq) + H_2(g)$

25. The syrupy liquid in the test tube was conc. H_2SO_4. When water was added to the concentrated acid it liberated a large amount of heat which broke the test tube and burnt the skin of student causing blisters.



26. a. $2Cu + O_2 \xrightarrow{\Delta} 2CuO$
Reddish brown → Black

b. $CaO + H_2O \rightarrow Ca(OH)_2 +$ heat / rise in temperature

c. $BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2NaCl$
White precipitate

OR

Balanced chemical equations are as follow:

i. $P_4(s) + 10Cl_2(g) \longrightarrow 4PCl_5(s)$

ii. $CH_4(g) + 2O_2(g) \longrightarrow CO_2(g) + 2H_2O(l)$ + Heat energy

iii. $C_6H_{12}O_6\ (s) + 6O_2(g) + 6H_2O \longrightarrow 6CO_2(aq) + 12H_2O\ (l)$ + Energy

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

(Copper sulphate) (Iron sulphate)

Blue Light Green

b. $CuO(s) + H_2(g) \xrightarrow{\text{Heat}} Cu(s) + H_2O(g)$

- Redox reaction

28. i. Double displacement reaction

ii. $2KClO_3 \xrightarrow[Catalyst]{Heat} 2KCl\ (s) + 3O_2\ (g)$

It is a decomposition reaction and endothermic in nature.

iii. Barium Sulphate, Sodium Chloride

OR

Ca elements displace aluminium from its salt.

29. i. Compound X is C_2H_5OH

Y is ethanoic acid (CH_3 - COOH)

Z is ethyl ethanoate (CH_3 - COO - CH_2 - CH_3)

ii. (1) Conversion of X to Y

CH_3 - CH_2 - OH + 2[O] ($KMnO_4$) $\longrightarrow$ CH_3 - COOH + H_2O.

(2) Conversion of X to Z

CH_3 - COOH + CH_3 - CH_2OH (Conc.H_2SO_4) $\longrightarrow$ CH_3 - COO - C_2H_5 + H_2O

iii. (1) When ethanol undergoes oxidation reaction (controlled combustion) with acidified potassium dichromate, it gets oxidised to form an acidic compound, Y, called ethanoic acid.

(2) Ethanol reacts with ethanoic acid in the presence of concentrated sulphuric acid to release a sweet smelling ester, Z, called ethyl ethanoate.

iv. The reaction of ethyl ethanoate with sodium hydroxide is also called saponification reaction.

OR

a. i. Ethanol to ethene

$C_2H_6O \rightarrow CH_2CH_2 + H_2O$

ii. Ethanol to Ethanoic acid

$CH_3CH_2OH \rightarrow CH_3COOH$

b. Formation of larger molecules by addition of more radicals is known as addition reaction. For example; ethene is converted into ethane when heated with the catalyst nickel.

$CH_2 = CH_2 + H_2$ + (Nickel catalyst) ? CH_3 - CH_3

Replacement of a functional group or any atom by another atom or functional group is known as substitution reaction. Substitution reactions are single displacement reactions. Example- When methane reacts with chlorine gas in the presence of sunlight, it gives chloromethane and hydrogen chloride.

$CH_4 + Cl_2$ + Sunlight ? CH_3Cl + HCl

Section C

30.

(c) (A)

Explanation:

Concave mirrors are used by the dentist to see the large images of teeth of patients since concave mirrors form enlarged images. Concave mirrors are also used for shaving purpose. Convex mirrors form diminished images. They are used as rear-view mirrors in cars, motorcycles, scooters, etc since they give a wide field of view.

31.

(b) ∠2+ ∠3= ∠1+ ∠4

Explanation:

Only this option is correct

32.

(d) A is false but R is true.

Explanation:

When current flows through a solenoid, the currents in the various turns of the solenoid are parallel and in the same direction. Since the current flowing through parallel wires in the same direction lead to force of attraction between them, the turns of the solenoid will also attract each other and as a result the solenoid tends to contract.

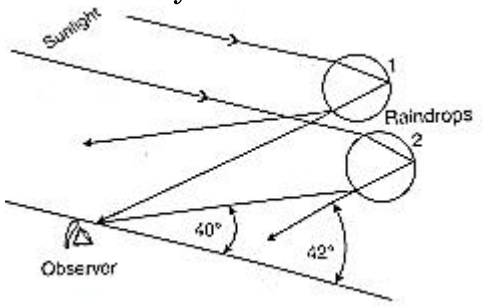
33. The conditions for observing a rainbow are:

i. The sun comes out after a rainfall.

ii. The observer stands with the sun towards His/her back.

Formation of a rainbow :

The rays of light reach the observer through a refraction, followed by a reflection and a refraction. Figure shows red light, from drop 1 and violet light from drop 2, reaching the observer's eye.



34. The correct values of current and voltage the student should use in his calculations are 38 mA, 3.2 V

OR

a. The mathematical expression of the Joules Law of heating is: $H = I^2 Rt$

Here, H is a heating effect, I is the current flowing through the device and t is the time taken.

b. Given:

Amount of charge transferred = 96000 C

Time taken = 2hrs = $2 \times 60 \times 60$ sec = 7200 sec

Potential difference = 40 V

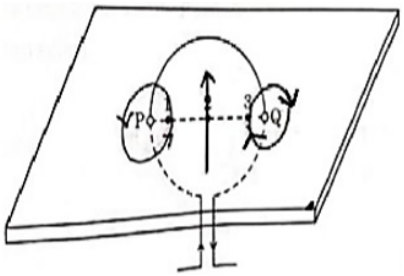
Heat generated = $V \times I \times t$

and we know that; $I = \frac{Q}{t}$

So, $H = VQ$

$= 40 \times 96000$

$= 3.84 \times 10^6$ J

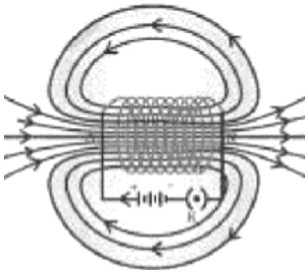
35. a. 

b.
- Strength of the current in the loop
- No. of turns of loop

c. Right hand thumb rule

36. Different wavelengths deviate differently in the prism because the angle of refraction for different colours having different wavelengths is different while passing through the glass prism (medium). A light ray is refracted when it passes from one medium to another at an angle and its speed changes. At the interface, it is bent in one direction if the material it enters is denser (when light slows down) and in the other direction if the material is less dense (when light speeds up). Because different wavelengths (colours) of light travel through a medium at different speeds, the amount of bending is different for different wavelengths. Violet is bent the most and red the least because violet light has a shorter wavelength, and short wavelengths travel more slowly through a medium than longer ones do.

37. A coil of insulated copper wire wound in the form of a cylinder is a solenoid. When current is passed through a solenoid, it produces magnetic field lines like a bar magnet. The pattern of magnetic field lines of a solenoid is shown in the figure. Inside the solenoid, field lines are parallel to each other This indicates that the magnetic field is uniform .



38. i. $E \propto t$

When the time of operating the heater is doubled, the energy dissipated is doubled.

ii. Given: P = 60 W, t = 1 min

E = $60 \times 1 \times 60$ = 3600 J

iii. Given: P = 400 Ω, t = 8 hour

E = 400×8 = 3200 Wh = 3.2 kWh

Cost = 3.2×5 = ₹ 16

OR

Given: I = 5A, R = 2Ω, t = 30 min

E = $I^2Rt = 5 \times 5 \times 2 \times 30 \times 60$

E = 90000 J = 90 kJ

39. Concave lens-

focal length $(f) = -60\ cm$

Object length $(h) = 9\ cm$

Object distance $(u) = -30\ cm$

Lens formula, $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

$\frac{1}{v} = \frac{1}{f} + \frac{1}{u}$

$v = \frac{-1}{60} + \left(\frac{-1}{30}\right)$

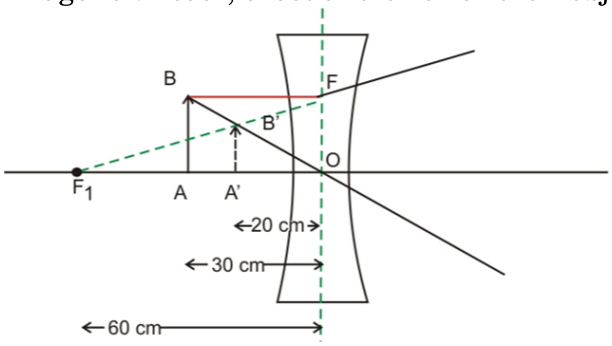
$m = \frac{v}{u} = \frac{-20}{-30} = \frac{2}{3}$

$m = \frac{h'}{h} \Rightarrow h' = m \times h$

$h' = \frac{2}{3} \times 9$

$h' = 6\ cm$

Image is virtual, erect and smaller than object.



OR

a. A transparent material bounded by two surfaces of which one or both surfaces are spherical / curved.

a. Converging lens

b. Diverging lens

Double concave lens is a diverging lens.

b. To find the position of the object, we can use the lens formula:

f = 15 cm, v = 20 cm, u = ?

$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

$\Rightarrow \frac{1}{u} = \frac{1}{v} - \frac{1}{f}$

$= \frac{1}{20\ cm} - \frac{1}{15\ cm}$

$= \frac{4-3}{60}$

u = -60 cm.

image is diminished.