



I.C.S.E.

10

# CHEMISTRY

WORKSHEETS AND ASSIGNMENTS



# CONTENTS

- 1** Periodic Table
- 2** Chemical Bonding
- 3** Acids, Bases And Salts
- 4** Analytical Chemistry
- 5** Mole Concept And Stoichiometry
- 6** Electrolysis
- 7** Metallurgy
- 8** Hydrochloric Acid
- 9** Ammonia
- 10** Nitric Acid
- 11** Sulphuric Acid
- 12** Organic Chemistry



# 1

# PERIODIC TABLE

- State the number of elements in Period 1, Period 2 and Period 3 of the Periodic Table.
- Name the elements in Period 1.
- What happens to atomic size of elements on moving from left to right in a period?
- What is the common feature of the electronic configuration of the elements at the end of Period 2 and Period 3?
- If an element is in group 7 (or group 7A), is it likely to be metallic or non-metallic in character?
- Supply the missing word from those in brackets: "If an element has one electron in its outermost energy level, then it is likely to be \_\_\_\_\_ (metallic/non-metallic)"
- Complete the following sentences using the correct word.
  - The properties of the elements are a periodic function of their \_\_\_\_\_ (atomic number, mass number, relative atomic mass).
  - Moving across a \_\_\_\_\_ of the Periodic Table, the elements show increasing \_\_\_\_\_ character (group, period, metallic, non-metallic).
  - The elements at the bottom of a group would be expected to show \_\_\_\_\_ metallic character than the element at the top (less, more).
  - The similarities in the properties of a group of elements is because they have the same \_\_\_\_\_ (atomic number, electronic configuration, number outer electrons).
- What is meant by a Group in the Periodic Table?
- Within a group where would you expect to find the element with:
  - the greatest metallic character?
  - the largest atomic size?
- State whether the ionization potential increases or decreases on going down a Group.
- How many elements are there in Period 2?
- The following table represent The first three periods of the modern periodic table. Study the table and answer the questions that follow:

HYDROGEN 1 <b>H</b> 1.01							HELIUM 2 <b>He</b> 4.00
LITHIUM 3 <b>Li</b> 6.94	BERYLLIUM 4 <b>Be</b> 9.01	BORON 5 <b>B</b> 10.81	CARBON 6 <b>C</b> 12.01	NITROGEN 7 <b>N</b> 14.01	OXYGEN 8 <b>O</b> 16.00	FLUORINE 9 <b>F</b> 19.00	NEON 10 <b>Ne</b> 20.18
SODIUM 11 <b>Na</b> 22.99	MAGNESIUM 12 <b>Mg</b> 24.31	ALUMINUM 13 <b>Al</b> 26.98	SILICON 14 <b>Si</b> 28.09	PHOSPHORUS 15 <b>P</b> 30.97	SULFUR 16 <b>S</b> 32.07	CHLORINE 17 <b>Cl</b> 35.45	ARGON 18 <b>Ar</b> 39.95
POTASSIUM 19 <b>K</b> 39.10	CALCIUM 20 <b>Ca</b> 40.08						

- (i) Write the formula of the sulphate of the element with atomic number 13.
- (ii) What type of bonding will be present in the oxide of the element with atomic number 1?
- (iii) Which features of the atomic structure accounts for the similarities in the chemical properties of the elements in group 7A of the periodic table?
- (iv) Name the elements which has the highest ionization potential.
- (v) How many electrons are present in the valency shell of the element with the atomic number 18?
- (vi) What is the name given to the energy released when an atom in its isolated gaseous state accepts an electron to form an anion?
- (vii) What is the electronic configuration of the element in the third period which gains one electron to change into an anion?
- (viii) Fill in the blanks: *"The atomic size \_\_\_\_\_ as we move from left to right across the period, because the \_\_\_\_\_ increases but the \_\_\_\_\_ remains the same."*

13. The electro-negativities (according to Pauling) of the elements in period 3 of the Periodic Table are as follows with the elements arranged in alphabetical order:

Al	Cl	Mg	Na	P	S	Si
1.5	3.0	1.2	0.9	2.1	2.5	1.8

- (i) Arrange the elements in the order in which they occur in the Periodic Table from left to right. (The group 1 element first, followed by the group 2 element and so on, up to group 7.)
- (ii) Choose the word or phrase from the brackets which correctly completes each of the following statements:
- (a) The element below sodium in the same group would be expected to have a \_\_\_\_\_ (lower/higher) electro-negativity than sodium and the element above chlorine would be expected to have a \_\_\_\_\_ (lower/higher) ionization potential than chlorine.
- (b) On moving from left to right in a period, the number of shells (remains the same/increases/decreases).
- (c) On moving down a group, the number of valence electrons (remains the same/increases/decreases).
14. Parts (i) to (v) refer to changes in the properties of elements on moving left to right across a period of the Periodic Table. For each property, choose the correct option.

- (i) The non-metallic character of the elements:
- (a) decreases
- (b) increases
- (c) remains the same
- (d) depends on the period.
- (ii) The electro-negativity:
- (a) depends on the number of valence electrons
- (b) decreases
- (c) remains the same
- (d) increases.

---

---

(iii) The ionization potential:

- (a) goes up and down
- (b) decreases
- (c) increases
- (d) remains the same.

(iv) The atomic size:

- (a) decreases
- (b) increases
- (c) remains the same
- (d) sometimes increases and sometimes decreases.

(v) The electron affinity of the elements in group 1 to 7:

- (a) goes up and then down
- (b) decreases and then increases
- (c) increases
- (d) decreases.

15. The elements of one short period of the Periodic Table are given below in order from left to right:

**Li Be B C O F Ne**

- (i) To which period do these elements belong?
- (ii) One element of this period is missing. name the missing element and where should it be placed?
- (iii) Which one of the elements in this period shows the property of catenation?
- (iv) Place the 3 elements fluorine, beryllium and nitrogen in the order of increasing electronegativity.
- (v) Which one of the above elements belongs to the halogen series?

16. A group of elements in the Periodic Table are given below (Boron is the first member of the group and Thallium is the last): **Boron, Aluminium, Gallium, Indium, Thallium.**

Answer the following questions in relation to the above group of elements:

- (i) Which element has the most metallic character?
- (ii) Which element would be expected to have the highest electro-negativity?
- (iii) If the electronic configuration of Al is 2,8,3. how many valence electrons are present in Thallium?
- (iv) The atomic number of boron is 5. Write the chemical formula of the compound formed when Boron reacts with Chlorine.
- (v) Will the elements in the group to the right of this Boron group be more metallic or less metallic in character? Justify your answer

- Elements X, Y, Z have atomic numbers 6, 9 and 12 respectively. Which one:
  - forms anion – negative ion;
  - forms cation – positive ion;
  - has 4 electrons the outermost orbit.
- Name a covalent compound which becomes electrovalent when dissolved in water.
- Elements A, B and C have atomic number 9, 20 and 10 respectively.
  - State which one is (1) a non-metal; (2) a metal; (3) chemically inert.
  - Write down the formula of the compound formed by two of the above elements.
- Draw electron dot diagram to depict the formation of :
  - Magnesium oxide from  $^{24}\text{Mg}_{12}$  and  $^{16}\text{O}_8$ .
  - a molecule of chlorine from two atoms of  $^{35}\text{Cl}_{17}$ .
- (a) Write down the electronic configuration of the following: (i)  $^{27}\text{X}_{13}$  (ii)  $^{35}\text{Y}_{17}$ .  
(b) Write down the number of electrons in X & neutrons in Y & the formula of the compound formed by X & Y.
- Covalent compounds are usually liquids or gases. Explain.
- Draw electron diagrams for the formation of : (i) sodium chloride (ii) hydrogen sulphide  
 $[\text{}^{23}_{11}\text{Na}; \text{}^{35}_{17}\text{Cl}; \text{}^1_1\text{H}; \text{}^{32}_{16}\text{S}]$
- State two differences normally found between the properties of ionic and covalent compounds.
- Show the formation of carbon tetrachloride molecule using an electron “dot and cross” diagram.
- State two differences between the properties of carbon tetrachloride and sodium chloride.
- Element X is a metal with a valency 2. Element Y is a non-metal with a valency 3.
  - Write equations to show how X and Y form ions.
  - If Y is a diatomic gas, write the equation for the direct combination of X and Y to form a compound.

(iii) If the compound formed between X and Y is melted and an electric current passed through the molten compound, the element X will be obtained at the ..... and Y at the ..... of the electrolytic cell. (Provide the missing words).
- Compound X consists of molecules. Choose the letter corresponding to the correct answer from the choices A, B, C and D given below :
  - The type of bonding in X will be :
    - Ionic
    - Electrovalent
    - Covalent
    - Molecular



---

(ii) X is likely to have a :

- (A) low melting point and high boiling point
- (B) High melting point and low boiling point
- (C) low melting point and low boiling point
- (D) high melting point and high boiling point.

(iii) In the liquid state, X will

- (A) become ionic
- (B) be an electrolyte
- (C) conduct electricity
- (D) not conduct electricity.

13. Electrons are getting added to an element Y.

- (i) Is Y getting oxidized or reduced?
- (ii) What charge will Y have after the addition of electrons?
- (iii) Which electrode will Y migrate to during the process of electrolysis?

14. Answer the following:

- (i) Acids dissolve in water and produce positively charged ion. Draw the structure of these positive ions.
- (ii) Explain why carbon tetrachloride does not dissolve in water?
- (iii) Elements Q and S react together to form an ionic compound. Under normal conditions which physical state will the compound QS exist in?
- (iv) Can Q and S both be metals?

15. (i) What is lone pair of electrons?

- (ii) Draw an electron dot diagram of a hydronium ion and label the lone pair of electrons.
- (iii) Name a neutral covalent molecule which contains one lone pair electrons.

16. (i) Name the charged particles which attract one another to form electrovalent compounds.

(ii) In the formation of electrovalent compounds, electrons are transferred from one element to another. How are electrons involved in the formation of a covalent compound?

(iii) The electronic configuration of nitrogen is 2, 5. How many electrons in the outer shell of a nitrogen atom are not involved in the formation of nitrogen molecule?

(iv) In the formation of magnesium chloride (by direct combination between magnesium and chlorine), name the substance that is reduced.

# 3

# ACIDS, BASES AND SALTS

---

1. State what would you see when Lead nitrate crystals are heated in a dry test-tube?

2. How will you convert the followings :



3. (i) Define an acid.

(ii) What is an alkali?

(iii) Explain the meaning of the term acid salt.

4. Answer the following questions relating to salts and their preparation :

a) What is salt ?

b) What kind of salt is prepared by precipitation ?

c) Name a salt prepared by direct combination. Write the equation for the reaction that takes place when preparing the salt you have named.

d) What procedure would be used to prepare Sodium salt such as Sodium sulphate. (Give the name of the procedure only).

5. For each of the salts A, B, C and D, suggest a suitable method of preparation which relates to its description given below :

a) 'A' is Sodium salt.

b) 'B' is an insoluble salt.

c) 'C' is a soluble salt of Copper.

d) 'D' is a soluble salt of Zinc.

6. (a) Define pH-scale.

(b) The pH value of pure water is 7. Compare the pH values of Sulphur dioxide solution and Ammonia solution with that of pure water.

7. Sulphuric acid can be used to prepare a number of gases in the laboratory. Write balanced equation for reaction in which the following gases are obtained using dilute Sulphuric acid as one of the reactants.

(a) Hydrogen

(b) Carbon dioxide

(c) Sulphur dioxide.

8. What is the meaning of the term Water of Crystallization?

- 
- 
9. Name :
- (i) two bases which are not alkalis.
  - (ii) a normal salt and acid salt of same acid.
  - (iii) a salt insoluble in cold water but soluble in hot water.

10. From the following list of substances, choose those which meet the description given below :

Ammonium chloride, Ammonium nitrate, Chlorine, dilute Hydrochloric acid, Iron, Lead nitrate,  
Magnesium (IV) oxide, Silver nitrate, Sodium nitrate, Sulphur.

Two compounds whose aqueous solution gives white precipitate with dilute Hydrochloric acid.

11. What do you see when Barium chloride solution is added to dilute Sulphuric acid?

12. A solution has a pH of 7. Explain how you would :

- (i) increase its pH.
- (ii) decrease its pH.

13. If a solution changes the colour of litmus from red to blue, what can you say about its pH?

14. What can you say about the pH of a solution that liberates Carbon dioxide from Sodium carbonate?

15. Write equations for each of the following reactions:

- (i) Chlorine is passed over heated iron.
- (ii) Copper sulphate solution is added Sodium hydroxide solution.

1. Using Sodium hydroxide solution, how would you distinguish :

(i) Zinc nitrate (or sulphate) solution and Calcium nitrate solution?

(ii) Iron (II) chloride from Iron (III) chloride?

(iii) Lead hydroxide from Magnesium hydroxide?

2. (i) Sodium hydroxide solution is added to solution A. A white precipitate is formed which is insoluble in excess of Sodium hydroxide solution. What is the metal ion present in solution A?

(ii) When Ammonium hydroxide solution is added to solution B a pale blue precipitate is formed. This pale blue precipitate dissolves in excess of Ammonium hydroxide giving an inky blue solution. What is the cation present in solution B? What is the probable colour of solution B?

3. You are given the three white powders Calcium carbonate, Lead carbonate and Zinc carbonate. Describe the tests you would carry out in solution to identify the metal in each of the above compounds. Indicate clearly how you would prepare the solutions for the tests.

4. Write an equation for the following reaction :

*Copper sulphate solution is added to Sodium hydroxide solution.*

5. Three test-tubes contain Calcium nitrate solution, Zinc nitrate solution and Lead nitrate solution respectively. Each solution is divided into two portions (i) and (ii). Describe the effect of :

(i) Adding Sodium hydroxide to each portion in turn till it is in excess.

(ii) Adding Ammonium hydroxide to each portion in turn till it is in excess.

6. State what do you observe when : Ammonium hydroxide is added to Iron (III) sulphate solution.

7. The following table shows the tests a student performed two aqueous solutions A and B. Write down the observations (i) and (ii) that were made.

Test	Observation	Conclusion
(i) To solution A, Sodium hydroxide solution was added.	(i)	A contains $\text{Fe}^{3+}$ ions
(ii) To solution B, Ammonium hydroxide solution was added slowly till in excess.	(ii)	B contains $\text{Cu}^{2+}$ ions

8. How would you distinguish between  $\text{Zn}^{2+}$  and  $\text{Pb}^{2+}$  using ammonium hydroxide solution?

9. Write observations and balanced equations for the following reactions.

(i) Sodium hydroxide is added drop wise till in excess to a solution of Zinc sulphate.

(ii) Ammonium hydroxide is added first in a small quantity and then in excess to a solution of copper sulphate.

(iii) Excess of Ammonium hydroxide is added to a substance obtained by adding hydrochloric acid in silver nitrate solution.

10. Sodium hydroxide solution is added first in a small quantity, then in excess to the aqueous salt solution of copper (II) sulphate, zinc nitrate, lead nitrate, calcium chloride and iron (III) sulphate. Copy the following table and write the colour of the precipitate in (i) to (v) and the nature of the precipitate (soluble or insoluble) in (vi) to (x).

Aqueous salt solution.	Colour of precipitate when NaOH is added in a small quantity.	Nature of precipitate (soluble or insoluble) when NaOH is added in excess.
Copper (II) sulphate	(i)	(vi)
Zinc nitrate	(ii)	(vii)
Lead nitrate	(iii)	(viii)
Calcium chloride	(iv)	(ix)
Iron (II) sulphate	(v)	(x)

11. The questions (i) to (v) refer to the following salt solutions listed A to F:

- (A) Copper nitrate
- (B) Iron (II) sulphate
- (C) Iron (III) chloride
- (D) Lead nitrate
- (E) Magnesium sulphate
- (F) Zinc chloride.

(i) Which two solutions will give a white precipitate when treated with dilute hydrochloric acid followed by barium chloride solution?

(ii) Which two solutions will give a white precipitate when treated with dilute nitric acid followed by silver nitrate solution?

(iii) Which solution will give a white precipitate when either dilute hydrochloric acid or dilute sulphuric acid is added to it?

(iv) Which solution becomes a deep/inky blue colour when excess of ammonium hydroxide is added to it?

(v) Which solution gives a white precipitate with excess ammonium hydroxide solution?

12. From the list of substances given – Ammonium sulphate, Lead carbonate, chlorine, Copper nitrate, Ferrous sulphate – State a solution of the compound which gives a dirty green precipitate with sodium hydroxide.

13. Write a balanced equation for the reaction between – aluminium oxide and sodium hydroxide solution.

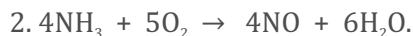
14. Give one test to distinguish between the following : - Iron (III) chloride solution and copper chloride solution.

# 5

# MOLE CONCEPT AND STOICHIOMETRY



If a given experiment results in  $2500\text{ cm}^3$  of  $\text{H}_2$  being produced, what volume of  $\text{O}_2$  is liberated at the same time under the same conditions of temperature and pressure.



If 27 litres of reactants are consumed, what volume of nitrogen monoxide (Nitric oxide) is produced at the same temperature and pressure.

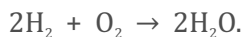
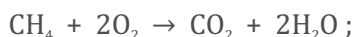


If all volumes are measured at the same temperature and pressure. Calculate the volume of  $\text{N}_2\text{O}$  required to give  $150\text{ cm}^3$  of steam.

4. What volume of oxygen would be required for the complete combustion of 100 litres of ethane according to the following equation.



5. What vol. of  $\text{O}_2$  is required to burn completely a mixture of  $22.4\text{ dm}^3$  of  $\text{CH}_4$  and  $11.2\text{ dm}^3$  of  $\text{H}_2$ . The reaction are :



6. 560 ml of carbon monoxide is mixed with 500 ml of oxygen and ignited. The chemical equation for the reaction is as follows:



Calculate the volume of oxygen used and carbon dioxide formed in the above reaction.

7. Each of two flasks contains 2.0 g of gas at the same temperature and pressure. One flask contains oxygen and the other hydrogen. (a) Which sample contains the greater number of molecules. (b) If the  $\text{H}_2$  sample contains N molecules, how many are in the  $\text{O}_2$  sample. [H = 1; O = 16].

8.  $112\text{ cm}^3$  of gaseous fluoride of phosphorus has a mass 0.63 g. Calculate its relative molecular mass. If the molecule of the fluoride contains only one atom of phosphorus, then determine the formula of the phosphorus fluoride. [F = 19; P = 31].

9. When heated, potassium permanganate decomposes according to the following equation:



Given that the molecular mass of potassium permanganate is 158, what volume of oxygen (measured at room temperature) would be obtained by the complete decomposition of 15.8 g of potassium permanganate? (Molar volume at room temperature is 24 litres.)

10. A flask contain 3.2 g of Sulphur dioxide. Calculate the following:

(i) The moles of Sulphur dioxide present in the flask.

(ii) The number of molecules of Sulphur dioxide present in the flask.

(iii) The volume occupied by 3.2 g of Sulphur dioxide at S. T. P. (S = 32, O = 16).

11. The volume of gases A, B, C and D are in the ratio, 1 : 2 : 2 : 4 under the same conditions of temperature and pressure:

- (i) Which sample of gas contains the maximum number of molecules?
- (ii) If the temperature and the pressure of gas A are kept constant, then what will happen to the volume of A when the number of molecules is doubled?
- (iii) If this ratio of gas volumes refers to the reactants and products of a reaction, which gas law is being observed?
- (iv) If the volume of A is actually  $5.6 \text{ dm}^3$  at S. T. P. calculate the number of molecules in the actual volume of D, at S. T. P. (Avogadro's Number is  $6 \times 10^{23}$ ).
- (v) Using your answer from (iv) state the mass of D if the gas is Di-nitrogen dioxide ( $\text{N}_2\text{O}$ ). (N = 14; O = 16).

12. (i) Calculate the number of moles and the number of molecules present in 1.4 g of ethylene gas. What is the volume occupied by the same amount of ethylene?

(ii) What is the vapour density of ethylene?

(Avogadro's Number =  $6 \times 10^{23}$ ; Atomic weight of C = 12, H = 1; Molar volume = 22.4 litres at S. T. P.)

13. A sample of ammonium nitrate when heated yields 8.96 litres of steam (measured at S.T.P.).



- (i) What volume of dinitrogen oxide is produced at the same time as 8.96 litres of steam?
- (ii) What mass of ammonium nitrate should be heated to produce 8.96 litres of steam? (Relative molecular mass of ammonium nitrate is 80).

14. Under the same conditions of temperature and pressure, you collect 2 litres of Carbon dioxide, 3 litres of Chlorine, 5 litres of Hydrogen, 4 litres of Nitrogen and 1 litre of Sulphur dioxide. In which gas sample will there be:

- (i) the greatest number of molecules?
- (ii) the least number of molecules?

Justify your answer.

15. The gases Chlorine, Nitrogen, Ammonia and Sulphur dioxide are collected under the same condition of temperature and pressure. Copy the following table which gives the volume of gases collected and the number of molecules (X) in 20 litres of Nitrogen.

You are required to complete the table giving the number of molecules in the other gases in terms of X :

Gas	Volume (litres)	Number of molecules
Chlorine	10	
Nitrogen	20	X
Ammonia	20	
Sulphur dioxide	5	

---

---

16. Samples of the gases  $O_2$ ,  $N_2$ ,  $CO_2$  and  $CO$  under the same conditions of temperature and pressure contain the same number of molecules represented by  $X$ . The molecules of Oxygen ( $O_2$ ) occupy  $V$  litres and have a mass of 8 gms. Under the same conditions of temperature and pressure:

(i) What is the volume occupied by:

(1)  $X$  molecules of  $N_2$

(2)  $3X$  molecules of  $CO$ ?

(ii) What is the mass of  $CO_2$  in grams?

(iii) In answering the above questions, whose law has been used?

( $C = 12$ ,  $N = 14$ ,  $O = 16$ ).

17. When heated, potassium permanganate decomposes according to the following equation :



Some potassium permanganate was heated in a test tube. After collecting one litre of oxygen at room temperature, it was found that the test-tube had undergone a loss in mass of 1.32 g. If one litre of hydrogen under the same condition of temperature and pressure has a mass of 0.0825 g, calculate the relative molecular mass of oxygen.

18. Name the term which defines the mass of a given volume of a gas compared to the mass of an equal volume of hydrogen.

19. Find the relative molecular mass of a gas, 0.546 g of which occupies 360  $cm^3$  at  $87^\circ C$  and 380 mm Hg pressure. [1 litre of hydrogen at s.t.p. weigh 0.09 g].



- An electrode 'A' is connected to the positive terminal of a battery and electrode 'B' to the negative terminal.
  - Give the names of the electrodes A & B.
  - Which electrode is the oxidizing electrode.
- State the appropriate term used for: – A liquid or solution, which conducts electricity with accompanying chemical change.
- Electrons are getting added to an element Y.
  - Is Y getting oxidized or reduced?
  - What charge will Y have after the addition of electrons?
  - Which electrode will Y migrate to during electrolysis?
- Explain how electrolysis is an example of redox reaction.
- What kind of particles will be found in a liquid compound which is a non-electrolyte?
- Complete the sentence by choosing the correct words – Electrolysis is the passage of ..... [electricity / electrons] through a liquid or a solution accompanied by a ..... [physical / chemical] change.
- Name a liquid which is a non-electrolyte.
- Name one substance which contains: (i) ions only (ii) molecules only (iii) both ions and molecules.
- What is meant by the term 'electrolyte'.
  - What are the particles present in a compound which is non-electrolyte?
  - If an electrolyte is described as a 'strong electrolyte', what does this mean.
- Explain why
  - solid sodium chloride does not allow electricity to pass through.
  - copper, though a good conductor of electricity, is a non-electrolyte.
- Classify the following substances under three headings: (i) Strong Electrolytes (ii) Weak Electrolytes (iii) Non electrolytes – Acetic acid, ammonium chloride, ammonium hydroxide, carbon tetrachloride, dilute hydrochloric acid, sodium acetate, dilute sulphuric acid.
- Fill in the blanks: -
  - As we descend the electrochemical series containing cations, the tendency of the cations to get \_\_\_\_\_ [oxidized / reduced] at the cathode increases.
  - The [higher / lower] \_\_\_\_\_ the concentration of an ion in a solution, the greater is the probability of its being discharged at its appropriate electrode.

---

13. (i) Name a solid which undergoes electrolysis when molten.

(ii) What should be the physical state of lead bromide if it is to conduct electricity?

(iii) What particles are present in pure lead bromide? Write the equations for the reactions which take place at the electrodes during the electrolysis of lead bromide.

(iv) Supply the word [or words] that will make the sentence into a correct statement which is to be written down again completely : - The electrolysis of lead bromide liberates lead and bromine.

14. If the compound formed between X [a metal with valency 2] and Y [a non-metal with valency 3] is melted and an electric current passed through the molten compound, the element X will be obtained at the \_\_\_\_\_ and Y at the \_\_\_\_\_ of the electrolytic cell. [Provide the missing words.]

15.(i) Write the equations of the reactions which take place at the cathode and anode when acidified water is electrolyzed.

(ii) Name the gas released at the cathode when acidulated water is electrolyzed.

(iii) Copy and complete the following sentence: With platinum electrodes hydrogen is liberated at the \_\_\_\_\_ and oxygen at the \_\_\_\_\_ during the electrolysis of acidified water.

(iv) When the electrolysis of acidified water is carried out: [1] What is the ratio of the volume of hydrogen produced to the volume of oxygen. [2] Give the equation for the discharge of ions at the cathode.

16. (i) If HX is a weak acid, what particles will be present in its dilute solution apart from those of water.

(ii) Write down the words or phrase from the brackets that will correctly fill in the blanks in the following: (1) Pure water consists almost entirely of \_\_\_\_ (ions / molecules). (2) We can expect that pure water \_\_\_\_\_ (will / will not) normally conduct electricity.

(iii) To carry out the so-called "electrolysis of water", sulphuric acid is added to water. How does the addition of sulphuric acid produce a conducting solution.

17. (i) State what is observed when copper sulphate solution is electrolyzed using a platinum anode.

(ii) What ions must be present in a solution used for electroplating a particular metal.

(iii) A solution of silver nitrate is a good electrolyte but it is not used for electroplating an article with silver.

(iv) Choosing only words from the following list write down the appropriate word to fill in the blanks below: -

'anions, anode, cathode, cations, electrode, electrolyte, nickel, voltameter'.

To electroplate an article with nickel requires an (a) \_\_\_\_\_ which must be a solution

containing (b) \_\_\_\_\_ ions. The article to be plated is placed as the (c) \_\_\_\_\_ of the cell in

which the plating is carried out. The (d) \_\_\_\_\_ of the cell is made from pure nickel. The

ions which are attracted to the negative electrode and discharged are called (e) \_\_\_\_\_ .

18. (a) Select the correct compound from the list – Ammonia, Copper oxide, Copper sulphate, Hydrogen chloride, Hydrogen sulphide, Lead bromide – which matches with the description given below:

(i) A solution of this compound is used as the electrolyte when copper is purified.

(ii) When the compound is electrolyzed in the molten state, lead is obtained at the cathode.

(b) Write two applications of electrolysis in which the anode diminishes in mass.

(c) Complete the following table which refers to two practical applications of electrolysis :

	Anode	Electrolyte	Cathode
Silver plating of spoon		Solution of potassium argentocyanide	
Purification of copper			

19. The following questions refer to the electrolysis of copper sulphate solution with copper electrodes:

(i) Compare the change in mass of the anode.

(ii) What is seen to happen to the colour of the copper sulphate solution if platinum electrodes are used? Explain this observation.

(iii) What is the practical application of the electrolysis of copper sulphate solution? Briefly describe one such application.

20. Choose A, B, C or D to match the descriptions (i) to (v) below. Some alphabets may be repeated.

A. non-electrolyte.

B. strong electrolyte.

C. weak electrolyte.

D. metallic conductor.

(i) Molten ionic compound.

(ii) Carbon tetrachloride.

(iii) An aluminium wire.

(iv) A solution containing solvent molecules, solute molecules and ions formed by the dissociation of solute molecules.

21. (i) Here is an electrode reaction:



At which electrode (anode or cathode) would such a reaction take place? Is this an example of oxidation or reduction?

(ii) A solution contains magnesium ions ( $\text{Mg}^{2+}$ ) iron (II) ions ( $\text{Fe}^{2+}$ ) and copper ions ( $\text{Cu}^{2+}$ ). On passing an electric current through this solution which ions will be the first to be discharged at the cathode? Write the equation for the cathode reaction.

(iii) Why is carbon tetrachloride, which is a liquid, a non-electrolyte?

1. Element X is a metal with a valency 2. Element Y is a non-metal with a valency 3.

(i) Write equations to show how X and Y form ions.

(ii) If Y is a diatomic gas, write the equation for the direct combination of X and Y to form a compound.

2. (i) Complete the missing statements: "Metals are \_\_\_\_\_ while non-metals are poor conductor of heat. Metals are malleable while non-metals are \_\_\_\_\_. Metals form positive ions while non-metals form \_\_\_\_\_. Non-metals form acidic oxides while metals form \_\_\_\_\_."

(ii) Name: (a) The metal which is liquid at room temperature. (b) The allotrope of the non-metal carbon which conducts electricity. How many valence electrons are present in (c) metals (d) non-metals.

(iii) What metallic property is shown by the non-metal graphite.

(iv) X is an element in the form of a powder. X burns in oxygen and the product is soluble in water. The solution is tested with litmus. Write down only the word which will correctly complete each of the following:

(a) If X is a metal, then the litmus will turn \_\_\_\_\_. If X is non-metal, then the litmus will turn \_\_\_\_\_.

(b) If X is a reactive metal, then \_\_\_\_\_ will be evolved when X reacts with dilute sulphuric acid.

(c) If X is a metal it will form \_\_\_\_\_ oxide, which will form \_\_\_\_\_ solution with water.

(d) If X is a non-metal it will not conduct electricity unless it is carbon in the form of \_\_\_\_\_.

(v) Compare the properties of a typical metal and a non-metal on the basis of the following:

(a) Electronic configuration

(b) Oxidizing or reducing action

(c) Nature of the oxides

(d) Conductivity of heat and electricity.

(vi) Name: (a) A non-metal that has a metallic lustre and sublimates on heating.

(b) An allotrope of a non-metal that allows electricity to pass through it.

3. (i) Cations are formed by \_\_\_\_\_ (loss / gain) of electrons and anions are formed by (loss / gain) of electrons. [Choose the correct words to fill in the blanks.]

(ii) State the term used for: An oxide, which forms salts when it reacts with both acids and alkalis.

(iii) When a metal atom becomes an ion:

(a) it loses electrons and is oxidized

(b) it gains electrons and is reduced

(c) it gains electrons and is oxidized

(d) it loses electrons and is reduced.

4. (i) With reference to the reduction of copper oxide, iron (II) oxide, lead (II) oxide and magnesium oxide by hydrogen, place the oxides in order of increasing ease of reduction.

(ii) Write balanced equations for the following reactions: (a) Reduction of copper oxide by hydrogen. (b) Reduction of iron (III) oxide by carbon monoxide. (c) Reduction of lead (II) oxide by carbon.

(iii) A strip of copper is placed in four different colourless salt solutions. They are  $\text{KNO}_3$ ,  $\text{AgNO}_3$ ,  $\text{Zn}(\text{NO}_3)_2$ ,  $\text{Ca}(\text{NO}_3)_2$ . Which one of the solutions will finally turn blue.

(iv) Select the correct compound from the list – Ammonia, Copper oxide, Copper sulphate, Hydrogen chloride, Hydrogen sulphide, Lead carbonate – which matches with the description given below:

(a) This compound can be reduced to copper when heated with coke.

(b) A white solid which gives a yellow residue on heating.

5. (i) Name: (a) a carbonate not decomposed by heat. (b) a green carbonate which turns black on heating.

(ii) From the metals copper, iron, magnesium, sodium and zinc, select a different metal in each case which :

(a) Does not react with dilute hydrochloric acid.

(b) can form  $2^+$  and  $3^+$  ions.

(c) has a hydroxide that reacts with both acids and alkalis.

(d) does not react with cold water but reacts with steam when heated.

(e) Arrange the metals in decreasing order of reactivity.

6. (i) Name the process of heating an ore to a high temperature in the presence of air.

(ii) By what chemical process is the amount of carbon in cast iron decreased to make steel.

7. (i) For each substance listed below, explain its significance in the extraction of aluminium: (a) Bauxite (b) Sodium hydroxide (c) Cryolite (d) Graphite.

(ii) Relating to the extraction of aluminium by electrolysis: (a) Give the equation for the reaction which takes place at the cathode. (b) Explain why it is necessary to renew the anode periodically.

(iii) In order to obtain aluminium, the following inputs are required: Bauxite, sodium hydroxide and graphite. The aluminium compound in bauxite is aluminium oxide and the main impurity is iron (III) oxide. Aluminium is obtained by the electrolysis of aluminium oxide dissolved in cryolite.

(1) When bauxite is treated with sodium hydroxide solution what happens to the (a) aluminium oxide (b) iron (III) oxide.

(2) Name the process used for the purification of bauxite.

(3) Write the equation for the action of heat on aluminium hydroxide.

(4) Write the formula of cryolite.

(iv) Aluminium is extracted from its chief ore, bauxite.

(a) Write three balanced equations for the purification of bauxite by Hall's process.

(b) Name the chemical used for dissolving  $\text{Al}_2\text{O}_3$ . In which state of subdivision is the chemical used.

(c) Write an equation for the reaction which takes place at the anode during the extraction of aluminium by the electrolytic process.

(d) Mention one reason for the use of aluminium in thermite welding.

(v) A to F below relate to the source and extraction of either Zinc or Aluminium.

A: Bauxite, B: Coke, C: Cryolite, D: Froth floatation, E: Sodium hydroxide solution, F: Zinc blend.

(a) Write down the three letters each from the above list which are relevant to – (1) Zinc (2) Aluminium.

(b) Fill in the blanks using the most appropriate words from A to F : - (1) "The ore from which aluminium is extracted must first be treated with \_\_\_\_\_ so that pure Aluminium oxide can be obtained."

(2) "Pure Aluminium oxide is dissolved in \_\_\_\_\_ to make a conducting solution."

(c) Write the formula of Cryolite.

(vi) Name the compound added to lower the fusion temperature of the electrolytic bath in the extraction of Al.

(vii) Write down the word which correctly completes the following sentence: - "By dissolving aluminium oxide in cryolite a \_\_\_\_\_ [conducting / non-conducting] solution is produced".

(viii) Why is so much graphite required for this electrolytic process. Write the equation for the reaction which take place at the cathode.

8. (i) Write the equations for the reaction of zinc with each of the following: -

(a) Sodium hydroxide solution. (b) Dilute sulphuric acid. (c) Copper sulphate solution.

(ii) Write the balanced equations for the preparation of the following compounds (as the major product) starting from iron and using only one other substance:

(a) iron (II) chloride (b) iron (III) chloride (c) iron (II) sulphate (d) iron (II) sulphide.

(iii) Write balanced equation for – Al powder when warmed with hot and concentrated caustic soda solution.

(iv) To protect iron from rusting it is coated with a thin layer of zinc. Name the process. (v) Which particular property of cast iron makes it unsuitable for the construction of bridges.

9. (i) What is an alloy?

(ii) An alloy usually has some property which makes it particularly useful. What is the special property of:

(a) Duralumin (b) Type metal.

(iii) Which metal is added to steel to make stainless steel.

(iv) Are liquid zinc and liquid lead miscible or immiscible? Name the alloy formed between Zn and Cu.

(v) List 1 contains metals / alloys 1, 2, 3, 4, 5 and list 2 contains their uses A, B, C, D, E.

List 1. Metal / Alloy	List 2. Uses
1. Aluminium	A. Steel making
2. Lead	B. Aeroplane wings
3. Brass	C. Galvanizing
4. Iron	D. Radiation shield
5. Zinc	E. Electric fittings

Copy and complete the following table writing down the letter for the correct use of each metal / alloy. An answer may be used only once. The first has been done for you.

Metal / Alloy	1	2	3	4	5
Uses	B				

- From the list given below choose the compounds whose aqueous solution give white precipitate with dilute HCl: *Ammonium chloride, ammonium nitrate, chlorine, dilute hydrochloric acid, iron, lead nitrate, manganese (IV) oxide, silver nitrate, sodium nitrate, sodium nitrite, sulphur.*
- State what you observe when silver nitrate solution is added to dilute hydrochloric acid?
- What must be added to sodium chloride to obtain hydrogen chloride? Write the equation for the reaction.
- What would you see when hydrogen chloride mixes with ammonia?
- Hydrogen chloride dissolves in water forming an acidic solution.
  - Name the experiment which demonstrates that hydrogen chloride is very soluble in water.
  - Give three distinct tests [apart from using an indicator] you would carry out with this solution to illustrate the typical properties of an acid.
- Write the equation for the reaction of hydrochloric acid with each of the following:
  - lead nitrate solution
  - manganese
  - Oxide.
- Write the equation for:
  - The preparation of hydrogen chloride from sodium chloride and sulphuric acid. State whether the sulphuric acid should be concentrated or dilute.
  - The reaction of hydrogen chloride with ammonia.
- Name one lead compound that can be used to oxidize hydrogen chloride to chlorine?
- From the following gases -  $\text{NH}_3$ ,  $\text{Cl}_2$ ,  $\text{HCl}$ ,  $\text{SO}_2$ , select the gas that matches the description given below and answer the questions that follows: When gas C is mixed with gas B, dense white fumes are seen and there is no other product [gas B turns moist red litmus paper blue].
  - What is the name of gas C.
  - What is the name of the product of the reaction gas B and gas C.
- What happens [state your observations] when dil. HCl is added to lead nitrate solution?
- Manganese (IV) oxide, lead (IV) oxide and red lead [ $\text{Pb}_3\text{O}_4$ ] react with conc. HCl liberating chlorine.
  - What is the common property being shown by these metal oxides.
  - Write the equation for the reaction of conc. HCl with  $\text{Pb}_3\text{O}_4$ .
- Write the observations and balanced equations for the following reaction: Excess of ammonium hydroxide is added to a substance obtained by adding hydrochloric acid in silver nitrate solution?

13. From the gases - ammonia, hydrogen chloride, hydrogen sulphide, sulphur dioxide – Select the following:  
The gas which gives a white ppt. when reacted with  $\text{AgNO}_3$  soln. acidified with dilute nitric acid ?

14. Write a balanced equation for the reaction of red lead (trilead tetraoxide) warmed with conc.  $\text{HCl}$  ?

15. A solution of hydrogen chloride in water is prepared. The following substances are added to separate portions of the solution :-  
Substances Added Gas evolved Odour  
Calcium carbonate Magnesium ribbon  
Manganese oxide with heating Sodium sulphide  
Complete the table by writing the gas evolved in each case and its odour ?

16. Write balanced equations for the following reactions :-

- Copper oxide and dilute Hydrochloric acid.
- Manganese
- Oxide and concentrated Hydrochloric acid.

17. i. Name the experiment illustrated in the diagram alongside.

ii. Which property of hydrogen chloride is demonstrated by this experiment.

iii. State the colour of the water that has entered the round-bottomed flask.

18. Select the correct compound from the list –

Ammonia, Copper oxide, Copper sulphate, Hydrogen chloride,  
Hydrogen sulphide, Lead bromide –

Which matches with the description given below:

*This compound can be oxidized to chlorine?*

19. Write balanced chemical equation for the reaction of zinc and dilute hydrochloric acid?

20. State what is observed when hydrochloric acid is added to silver nitrate solution.

21. Write a balanced chemical equation for the reaction of calcium bicarbonate & dil. Hydrochloric acid?

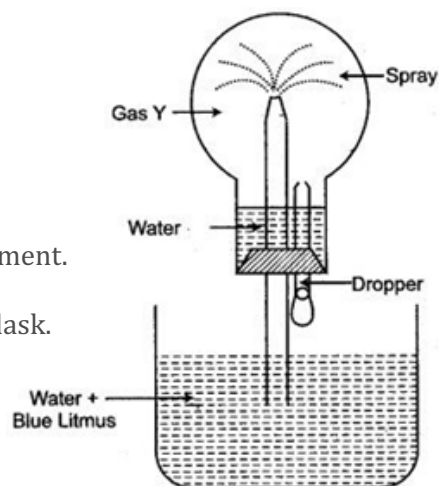
22. Write balanced equation for the following reaction: Sodium chloride from sodium carbonate solution and dilute hydrochloric acid

23. You enter a laboratory after a Class has completed the Fountain Experiment. How will you be able to tell whether the gas used in the experiment was hydrogen chloride or ammonia?

24. Write balanced equations for the reaction of dilute hydrochloric acid with each of the following:

- Iron
- Sodium hydrogen chloride
- Iron iv. sulphide
- Sodium sulphite
- Sodium thiosulphate solution.

25. When silver nitrate solution is added to a solution of a salt, a white precipitate, insoluble in dilute nitric acid, is formed, identify the anion present in the salt.





1. What do you observe when ammonia gas is bubbled through red litmus solution?
2. Write an equation for solutions of ammonium chloride and sodium hydroxide are heated.
- 3.(i) What is the purpose of Haber's Process?  
(ii) Name the gaseous inputs of the Haber's Process and state the ratio by volume in which the gases are mixed.  
(iii) What is done to increase the rate of reaction in the Haber Process?  
(iv) Give two different ways by which the product can be separated from the reactants.
4. Write equation(s) for the following:
  - A. burning of ammonia in oxygen
  - B. catalytic oxidation of ammonia.
  - (i)What would you observe in A.?
  - (ii) Name the catalyst used in B.
  - (Iii). In the reaction referred to in B the catalyst glows red hot . Give reason?
  - (iv) What is the name of the industrial process which starts with the reaction referred to in B.
- 5.(i) How soluble is ammonia in water?  
(ii) Give two reasons to show that the solution of ammonia in water contains hydroxide ions. [i.e. properties of base]  
(iii) Name a simple method you would employ to prepare ammonium salts in your laboratory.
6. State what you observe when a piece of moist red litmus paper is placed in a gas jar of ammonia.
7. Ammonium salts decomposes on heating. What other property do ammonium salts have in common?
8. The following reactions are carried out:
  - A: Nitrogen + metal  $\rightarrow$  compound X
  - B: X + water  $\rightarrow$  ammonia + another compound
  - C: Ammonia + metal oxide  $\rightarrow$  metal + water + N<sub>2</sub>.One metal that can be used for reaction A is magnesium.
  - i. Write the formula of the compound X formed.
  - ii. Write the correctly balanced equation for reaction B where X is the compound formed.
  - iii. What property of ammonia is demonstrated by reaction C

- 
9. Industrially, ammonia is obtained by direct combination between nitrogen and hydrogen.
- Write the correctly balanced equation for the direct combination of nitrogen with hydrogen.
  - Which of the metals iron, platinum or copper catalyse this direct combination.
  - Is the formation of ammonia promoted by the use of high pressure or low pressure.
10. Is ammonia more dense or less dense than air. What property of ammonia is demonstrated by the Fountain Experiment. Write the balanced equation for the reaction between ammonia and sulphuric acid.
11. Choose the correct word from the brackets for each sentence and write a balanced equation for the same:
- Ammonium chloride is a soluble salt prepared by \_\_\_\_ [precipitation, neutralization.]
  - When ammonium chloride is heated, it undergoes thermal \_\_\_\_ [decomposition / dissociation.]
  - Heating ammonium chloride with sodium hydroxide produces \_\_\_\_ [ammonia, nitrogen.]
12. State what do you observe when: Neutral litmus solution is added to an alkaline solution.
13. Name [formula is not acceptable] the gas produced in the following reaction: Warming ammonium sulphate with sodium hydroxide solution.
14. Write the equation for the preparation of  $\text{NH}_3$  from ammonium chloride and calcium hydroxide.
15. What are the product formed when ammonia is oxidized with copper oxide.
16. From the following gases: ammonia, chlorine, hydrogen chloride, sulphur dioxide, select the gas that matches the description given below:
- The gas [B] turns moist red litmus paper blue.
  - Write the equation for the reaction that takes place when gas [B] is passed over heated  $\text{CuO}$ .
17. Name a gas whose solution in water is alkaline.
18. How would you distinguish between  $\text{Zn}^{2+}$  and  $\text{Pb}^{2+}$  using ammonium hydroxide solution.
19. Write the equation for the formation of ammonia by the action of water on magnesium nitride.
20. How is ammonia collected. Why is ammonia not collected over water.
21. Which compound is normally used as a drying agent for ammonia.
22. From the gases - ammonia, hydrogen chloride, hydrogen sulphide, sulphur dioxide – Select the following:
- When this gas is bubbled through copper sulphate solution, a deep blue coloured solution is formed.
  - This gas burns in oxygen with a green flame.
23. Write the equation for the reaction in the Haber's process that forms ammonia. State the purpose of liquefying the ammonia produced in the process.
24. Write an equation for the reaction of chlorine with excess of ammonia.
25. Name the ion other than ammonium ion formed when ammonia dissolves in water.
26. Write the equation for the following reactions which result in the formation of ammonia:
- A mixture of ammonium chloride and slaked lime is heated.
  - Aluminium nitride and water.

---

27. Select the correct compound from the given which matches the description given below–

**Ammonia, Copper oxide, Copper sulphate, Hydrogen chloride, Hydrogen sulphide, Lead bromide**

*Although this compound is not a metal hydroxide, its aqueous solution is alkaline in nature.*

28. From the list of substances given –

**Ammonium sulphate, Lead carbonate, Chlorine, Copper nitrate, Ferrous sulphate – State:**

*Name a compound which on heating with sodium hydroxide produces a gas which forms dense white fumes with hydrogen chloride.*

29. State what is observed when excess of ammonia is passed through an aqueous solution of lead nitrate.

30. Name the substance used for drying ammonia.

31. Write a balanced chemical equation to illustrate the reducing nature of ammonia.

32. With reference to Haber's process for the preparation of ammonia, write the equation and the conditions required.

33. Write the balanced equation for the following reaction:

*Ammonium sulphate from ammonia and dilute sulphuric acid.*

34 (i) Of the two gases, ammonia and hydrogen chloride, which is more dense? Name the method of collection of this gas.

(ii) Give one example of a reaction between the above two gases which produces a solid compound.

35. Write a balanced equation for a reaction in which ammonia is oxidized by:

i. A metal oxide

ii. A gas which is not oxygen.

36. You enter a laboratory after a Class has completed the Fountain Experiment. How will you be able to tell whether the gas used in the experiment was hydrogen chloride or ammonia

1. Identify the following substances: A dilute acid 'B' which does not normally give hydrogen when reacted with metals but does give a gas when it reacts with copper.

2. Copy and complete the following table relating to an important industrial process. Output refers to the product of the process not the intermediate steps.

Name of process	Inputs	Catalyst	Equation for catalysed reaction	Output
	Ammonia + air			Nitric acid

3. What is the property of nitric acid which allows it to react with copper.

4. Write the equation for the following reaction: Dilute nitric acid and copper.

5. Write a balanced equation for the reaction of nitrogen monoxide and oxygen.

6. Answer the following questions:

- Write the equation for the preparation of nitric acid from potassium nitrate.
- What compounds are required for the laboratory preparation of nitric acid?
- Choose the correct word from the brackets to complete the sentence. Sodium nitrate reacts with \_\_\_\_\_ [concentrated / dilute] sulphuric acid to produce nitric acid. Write equation for the same.

7. Answer the following questions:

- When nitric acid is prepared by the action of concentrated sulphuric acid on potassium nitrate, what is the special feature of the apparatus used?
- Explain why only all-glass apparatus should be used for the preparation of nitric acid by heating concentrated sulphuric acid and potassium nitrate.

8. The first step in the manufacture of  $\text{HNO}_3$  is the catalytic oxidation of  $\text{NH}_3$ . Name the catalyst used.

9. Answer the following questions:

- State why pure nitric acid takes on a yellowish-brown colour when exposed to light.
- Account for the yellow colour that appears in concentrated nitric acid when it is left standing in an ordinary glass bottle.
- State what is observed when nitric acid is kept in a reagent bottle for a long time.

10. Answer the following questions:

- State the conc. acid which will oxidize Sulphur directly to  $\text{H}_2\text{SO}_4$ . Write the equation for the same.
- Write a balanced equation for the reaction of Sulphur and hot concentrated nitric acid.
- Dilute nitric acid is generally considered a typical acid except for its reaction with metals. In what way is dilute nitric acid different from other acids when it reacts with metals.

## EXERCISE 1:

1. Name the oxide of Sulphur which reacts with water to give sulphuric acid.
2. In the Contact Process, the direct reaction between oxide of Sulphur and water is avoided. In this process, what does the oxide of Sulphur react with instead of water and what is the name of the product?
3. (a) What is the purpose of the Contact Process.  
(b) Name the catalyst used in the Contact Process.  
(c) Write the balanced equation for the reaction in the process which takes place in the presence of catalyst.
4. (a) Name the catalyst used industrially which speeds up the conversion of  $\text{SO}_2$  and  $\text{SO}_3$  in the production of sulphuric acid in the laboratory or industrially.  
(b) Write the equation for the conversion of Sulphur dioxide to Sulphur trioxide. Why does this reaction supply energy?  
(c) What is the name of the compound formed between  $\text{SO}_3$  and sulphuric acid.
5. State the name of the process by which  $\text{H}_2\text{SO}_4$  is manufactured. Name the catalyst used.
6. Name the catalyst which helps in the conversion of Sulphur dioxide to Sulphur trioxide.
7. In the Contact Process for the manufacture of sulphuric acid, Sulphur trioxide is not converted to sulphuric acid by reacting it with water. Instead a two-step procedure is used. Write the equations for the two steps involved.
8. Name the process used for the large-scale manufacture of sulphuric acid.
9. Write correctly balanced equation for the reaction between Iron and dilute sulphuric acid.
10. Write correctly balanced equations for the reaction of dilute sulphuric acid with each of the following
  - (a) Copper carbonate
  - (b) Lead nitrate solution
  - (c) Zinc hydroxide.
11. Write a balanced equation for the reaction between zinc and dilute sulphuric acid.
12. Write equation for
  - (a) Dilute  $\text{H}_2\text{SO}_4$  – producing  $\text{H}_2$ .
  - (b) Between  $\text{Pb}(\text{NO}_3)_2$  solution and dil.  $\text{H}_2\text{SO}_4$ .
13. State the substance/s reacted with dilute or concentrated sulphuric acid to form the following gases:
  - (a) Hydrogen (b) Carbon dioxide.State whether the acid used in each case is dilute or concentrated.
14. Write the equation for the laboratory preparation of:
  - (a) Sodium sulphate using dilute sulphuric acid.
  - (b) Lead sulphate using dilute sulphuric acid.

---

## EXERCISE 2:

1. What do you see when concentrated sulphuric acid is added to copper sulphate-5-water.
2. "Concentrated sulphuric acid is used in the laboratory preparation of nitric acid and hydrochloric acid because it is \_\_\_\_\_ [less volatile / stronger] in comparison to these two acids."
3. Write the equations for the laboratory preparation of the following salts using sulphuric acid.
  - (a) Copper sulphate from copper.
  - (b) Lead sulphate from lead nitrate.
4. Choose the property of sulphuric acid (A, B, C or D), which is relevant to each of the preparations [a] to [c]  
A: Dil. acid (typical acid properties), B: Non-volatile acid, C: Oxidizing agent, D: Dehydrating agent.
  - (a) Preparation of hydrogen chloride.
  - (b) Preparation of ethane from ethanol.
  - (c) Preparation of copper sulphate from copper oxide.
5. Which property of sulphuric acid accounts for its use as a dehydrating agent.
6. Concentrated sulphuric acid is both an oxidizing agent and a non-volatile acid. Write one equation each to illustrate the above-mentioned properties of sulphuric acid.
7. What do you observe when barium chloride solution is added to dilute sulphuric acid.
8. Supply the word (or words) that will make the sentence into a correct statement and rewrite the sentence. Copper sulphate crystals are dehydrated by sulphuric acid.
9. Explain how a reagent chosen from ammonium hydroxide, barium chloride, sodium chloride, sodium hydroxide, sulphuric acid and nitric acid enables to distinguish between the two acids mentioned therein.
10. Write balanced equation for the reaction between
  - (a) Potassium hydrogen carbonate and dilute sulphuric acid.
  - (b) Sodium nitrate and concentrate sulphuric acid.

1. (i) Define the term 'catenation'.  
 (ii) Which one of the elements – Li, Be, B, C, O, F, Ne shows the property of catenation.
2. (i) State the term for:- *Compounds having the same general formula and similar chemical properties.*  
 (ii) Name:

(a) The compound with – OH and with – COOH as the part of its structure.

(b) Homologue of homologous series with general formula  $C_nH_{2n}$  from the compounds given:

*Ethane, Ethene, Ethanoic acid, Ethyne, Ethanol.*

3. (i) State the structural formula of ethane.  
 (ii) Draw the structural formula of the two isomers of Butane. Give the correct IUPAC name of each.  
 (iii) From the following list, write down the appropriate words to fill in the blanks (a) to (e) below: - Addition, carbohydrates,  $C_nH_{2n-2}$ ,  $C_nH_{2n}$ ,  $C_nH_{2n+2}$ , electrochemical, homologous, hydrocarbons, saturated, substitution, unsaturated.

The alkane from an (a) \_\_\_\_\_ series with the general formula (b) \_\_\_\_\_.

The alkanes are (c) \_\_\_\_\_ (d) \_\_\_\_\_ which generally undergo (e) \_\_\_\_\_ reaction.

4. (i) For each of the compounds

(a) Ethane,

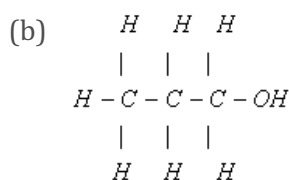
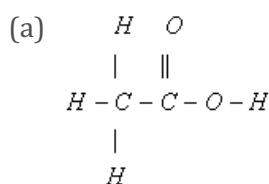
(b) Vinegar [acetic acid] and

(c) Marsh gas [methane], draw the relevant structural formula.

What word is used to describe the above three compounds taken together?

(ii) Draw the structural formula of ethane. What is the feature of the ethane structure which allows ethane to react with chlorine in the way it does.

(iii) Give the correct IUPAC name and the functional group for each of the compounds whose structural formulae are given below:



5. (i) What is the special feature of the structure of : (a)  $C_2H_4$  (b)  $C_2H_2$ .
- (ii) What type of reaction is common to both these compounds?
- (iii) Give the name and structural formula of (a) a saturated hydrocarbon, (b) an unsaturated hydrocarbon with a double bond.
- (iv) Copy and complete the following sentence: A saturated hydrocarbon will undergo \_\_\_\_\_ reactions whereas the typical reaction of an unsaturated hydrocarbon is \_\_\_\_\_.
- (v) State the term defined by the following :- Compounds containing carbon and hydrogen only.
- (vi) State the general formula for a saturated hydrocarbon and give one example and structural formula of the same.
- (vii) Draw the structural formula of ethyne. How does the structure of alkynes differ from that of alkenes.
- (viii) Fill in the blanks with the correct words : -

*Alkanes are the (a) \_\_\_\_\_ [analogous / homologous] series of (b) \_\_\_\_\_ [saturated / unsaturated] hydrocarbons. They differ from alkanes due to the presence of (c) \_\_\_\_\_ [double / single] bonds. Alkenes mainly undergo (d) \_\_\_\_\_ [addition / substitution] reactions.*

6. (i) Which compound is heated with soda lime to obtain  $C_2H_6$  in the laboratory . Write the equation for the same.
- (ii) Write the equation for the preparation of  $CH_4$  from anhydrous sodium ethanoate [sodium acetate].
7. (i) What type of reaction has taken place between ethane and chlorine.
- (ii) Write the equation of the complete combustion of ethane.
- (iii) What is the type of reaction taking place between ethane and chlorine to form mono-chloro-ethane.
- (iv) Write the equation for the preparation of carbon tetrachloride from methane.
- (v) Write a balanced equation for the reaction of ethane and oxygen in presence of molybdenum oxide.
8. (i) Name a solid used instead of conc.  $H_2SO_4$  to prepare ethylene by the dehydration of ethanol.
- (ii) Write the equation for the preparation of ethylene from ethyl alcohol.
9. (i) Write a balanced equation for the reaction between ethene and hydrogen.
- (ii) State what do you observe when ethene is bubbled through a solution of bromine in carbon tetrachloride.
- (iii) The reaction between ethene and chlorine forms only one product. Name the type of this equation.
- (iv) Ethylene forms an addition product with  $Cl_2$ . Name the product and give its structural formula.
10. (i) Write down the equation for the preparation of ethyne from calcium carbide.
- (ii) Burning of acetylene (ethyne) in oxygen produces a very hot flame. What is this hot flame used for.
- (iii) State one use of acetylene.



11. (i) What is the type of reaction between ethene and chlorine.
- (ii) What feature of the ethene structure makes such a reaction possible.
- (iii) Name the product of the reaction between ethene and chlorine.
- (iv) What is the special feature of the structure of ethyne.
- (v) Ethanol can be converted to ethene which can then be changed to ethane. Choose the correct word or phrase from the brackets to complete the following sentences : -
- (a) The conversion of ethanol to ethene is an example of \_\_\_\_ (dehydration / dehydrogenation).
- (b) Converting ethanol to ethene requires the use of \_\_\_\_ (concentrated hydrochloric acid / concentrated nitric acid / concentrated sulphuric acid).
- (c) The conversion of ethene to ethane is an example of \_\_\_\_ (hydration / hydrogenation).
- (d) The catalyst used in the conversion of ethene to ethane is commonly \_\_\_\_ (iron / nickel / cobalt).
- (vi) From the list given : - ethanol, ethane, methanol, methane, ethyne and ethene. Name a compound : -
- (a) Formed by the dehydration of ethanol by concentrated sulphuric acid.
- (b) Which will give a red precipitate with ammoniacal cuprous chloride solution.
- (c) Which forms methanoic acid on oxidation in the presence of copper at 200°C.
- (d) Which has vapour density 14 and turns alkaline  $\text{KMnO}_4$  green.
- (e) Which forms chloroform on halogenation in the presence of sunlight.
- (f) Which decolourises bromine solution in carbon tetrachloride.
- (vii) Write balanced equations for the preparation of the following : -
- (a) Ethane from sodium propionate
- (b) Ethene from ethanol.
- (c) Ethyne from calcium carbide.
- (d) Ethanoic acid from ethane.
- (viii) Name a reagent which can be used to distinguish between Ethane and ethene.
- (ix) Write the equation for the preparation of ethylene from ethyl alcohol.
- (x) Name a compound which will give acetylene gas when treated with water.
- (xi) Write the equations for the following laboratory preparations : -
- (a) Ethane from sodium propionate.
- (b) Ethene from Iodoethane.
- (c) Ethyne from calcium carbide.
- (d) Methanol from Iodomethane.
- (xii) Draw the structural formula of a compound with two carbon atoms in each of the following cases : -
- (a) An alkane with a carbon to carbon single bond.
- (b) An alcohol containing two carbon atoms.
- (c) An unsaturated hydrocarbon with a carbon to carbon triple bond.





# QUEST COACHING CLASSES

ICSE & CBSE: 7th, 8th, 9th, 10th, 11th, 12th

*An IITian's Perspective*



Learn At Quest



9860237373  
8554013436  
9850161030

MATHEMATICS

PHYSICS

CHEMISTRY

BIOLOGY



Concept Based Learning



Regular Tests & Assessment



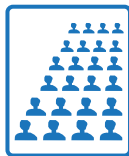
Numerical Solving Sessions



Regular SWOT Analysis



Training Through Digital Projector



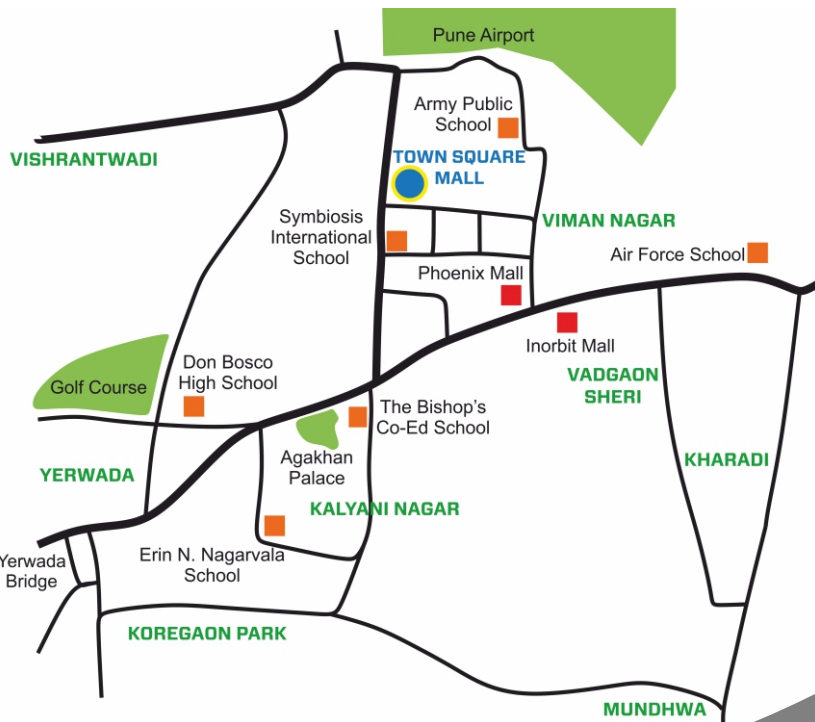
State Of The Art Classroom



Chapter-wise Modules & Question Banks



IITian Faculty



## LOCATION

Quality, Environment,  
Town Square Mall,  
2nd Floor,  
New Airport Road,  
Viman Nagar,  
Pune