Chemistry

PERIODIC TABLE

1. An element A ha an atomic number 11.

a. Represents its electronic configuration.

b. To which group of periodic table, does it belong?

c. What is its Valency?

d. Write the formula of its oxide.

2. The table given below shows the mass number of neutrons in four elements P, Q, R and S.

Elements	P	Q	R	S
Mass number	12	20	23	35
Number of neutrons	6	10	12	18

a. Write down the atomic number of S.

b. Write down the electronic configuration of S.

c. To which group, does S belong?

d. To which period, does S belong/

e. What will be the nature(ionic or covalent) of compound formed by (i) R and S? (ii) P and S?

3. Among the elements given in the list below, pick out the element which is (i) most electropositive (ii) Most E.N (iii) a noble gas.

Li, Be, B, C, N, O, F, Ne, Mg, Al, Si, P, S, Cl, K, Ca, C

4. The atoms A and B have electronic configuration (2,8,18,2) and (2,6) respectively.

a. To which periods, do A and B belong?

b. To which groups, do A and B belong?

c. What is the valency of A and B with respect to hydrogen?

d. What is the formula of compound of A and B? Is the compound ionic or covalent in nature?

MOLE CONCEPT AND STOICHIOMETRY

1. A sample of coal gas contained 45% H_2, 30% CH_4, 20% CO and 5% C_2H_2 by volume. 100ml of this gaseous mixture was mixed with 160 ml of oxygen and exploded. Calculate the volume and the composition of the resulting mixture, when cooled to room temperature and pressure.

2. A compound has O = 61.32%, S = 11.15%, H = 4.88% and Zn = 22.65%. The relative molecular mass of the compound is 287 amu. Find the molecular mass of the compound, assuming that all the hydrogen is present as water of crystallization. [Zn = 65]

3. A 2.00 g sample containing Na_2CO_3 and $NaHCO_3$ loses 0.248 g when heated to 300oC, the temperature at which $NaHCO_3$ decomposes to Na_2CO_3, CO_2 and water.

4. 1.84g of a mixture of $CaCO_3$ and $MgCO_3$ are heated strongly till no further loss of weight takes place. The residue weighs 0.96g. Find the percentage composition of the mixture.

5. 24ml of methane were mixes with 106 ml of oxygen and the mixture was exploded. The product, after cooling, measured 82ml, of which 58 ml were unused oxygen. Show that these results illustrate Gay-Lussac's law.

METALLURGY

1. What is the percentage of silver in 'German Silver'
2. What is the role of limestone in the extraction of iron?
3. Among the metals aluminium, silver, gold and iron, which one is protected by a layer of its own oxide?
4. Why is zinc not extracted from Zinc Oxide through reduction using CO?
5. Two elements X and Y are stored under water and kerosene oil, respectively. When small piece of each element is left open in air, both start warming up. The product in each case is dissolved in water. The solution from the residue X was found to be acidic while that of residue Y was basic.
    A. identify elements X and Y. support your answer with suitable explanation.
    B. Write the balanced equation for the reaction of elements X and Y on exposure to air
    C. Write balanced equation for reaction of products formed in (B) with H_2O
6. A certain metal does not liberate hydrogen from dil.H_2SO_4 but it displaces Cu from aq. $CuSO_4$. State the most likely place for the metal in the activity series.
7. A metal 'A' in the form of turnings reacted with a hot con.dibasic acid H_2B and produces a deep blue solution of salt AB. When a wire of metal C is put in the solution of AB, the deep blue colour gets slowly discharged leaving behind a colourless CB salt solution and A was generated. Identify A, H_2B, AB, C and CB, and also, explain the observations.
8. Give reason for the following:
    a. Nitric acid can be stored in an Al container but NaOH cannot be sotored in it.
    b. Al is more abundant than gold in the earth crust, yet it is gold and not Al that has been known to man since ancient times.
9. Explain the following:
    a. Cast iron is used to make castings.
    b. Zinc is used in dry cells and to make alloys
    c. a mixture of Al powder and linseed oil is used to paint iron poles.
    d. Thin Al foils are used in food packing
    e. Metals act as reducing agents.

ELECTROLYSIS

1. Why is the electrolysis of acidulated water considered as an example of catalysis?
2. Prolonged electrolysis of $CuSO_4$ solution between platinum electrodes, results in the formation of hydrogen gas at the cathode and oxygen gas at the anode. Why?
3. When a zinc rod is placed in a solution of silver nitrate, a white ppt is formed while no ppt is formed when a silver rod is dipped in a solution of Zinc nitrate. Explain?
4. Why is copper sulphate solution not kept in iron vessels?
5. A solution of cane sugar does not conduct electricity but a solution of NaCl is a good conductor. Give reason.
6. In the electrolysis of acidified water dilute sulphuric acid is preferred to dilute nitric acid for acidification. Explain

CHEMICAL BONDING

1. An element A has four electrons in the outermost shell of its atom and combine with another element B, having seven electrons in the outermost shell of its atom. The compound does not conduct electric current and fails to give a precipitate with a solution of $AgNO_3$. What is the nature of the chemical bond in the compound? Write the electron dot structure of its molecule.
2. NaCl is a electrovalent compound while hydrogen chloride is a covalent compound. But both form ions in their aqueous solution. explain.
3. An element M burns in oxygen to form an electrovalent compound MO. What compounds do you expect if the element is made to combine with chlorine and sulphur?
4.

Element	Atomic number
A	Z-1
B	Z
C	Z+1
D	Z-1

In the table given above, A, B, C and D are elements. Given B is an inert gas (not Helium), what type of bonding would take place between. A) A and C, and B) A and D?

5. Why NaCl gives a white precipitate with $AgNO_3$ but CCl_4 does not?
6. An element 'X' has two electrons in the outermost shell of its atom and combines with an element having seven electrons in the outermost shell of its atom.
   A. Write the formula of the compound formed.
   B. What type of bond will be formed between X and Y?
   C. is it soluble in water or benzene
7. Why HCl molecule is polar while Cl_2 molecule is non polar?
8. Why is HCl predominantly covalent in gaseous state but it ionizes in aqueous solution?

ANALYTICAL CHEMISTRY

1. A yellow solution of a metal salt yields a reddish brown precipitate with caustic soda solution. The precipitate does not dissolve in excess of the alkali. The reddish brown ppt on strong heating leaves behind a red powder, insoluble in water but soluble in dilute HCl.
   A. Prove that the metal iron present in the salt.
   B. Write the chemical equation for the reaction involved.
2. A compound (A) on strong heating gives two oxides of sulphur. On adding aqueous NaOH solution to its aqueous solution, a dirty green precipitate is obtained which starts turning brown on exposure to air. Identify (A) and give chemical equations
3. The hydroxides of Al and Fe are insoluble in water but NaOH is used to separate one from the other. Why?