1. (a) Give the meaning of the following:

(i) Empirical Formula

(ii) Molecular Formula

 (b) Compound **Z** has 8.32g of lead (Pb), 1.28g sulphur (S) and 2.56g of Oxygen (O).

What is the simplest formula and molecular formula of **Z** if molecular weight of compound **Z** is 303g/mol?

1. (a) Write the symbols of the following Latinized atoms.

 (i) Potassium (ii) Calcium (iii) Sodium (iv) Lead

 (b)Write the electronic configuration of

 (i) Cl- (ii) Ca2+ (iii) Na

1. (a) Why are metals used as:

 (i) Reducing agents?

 (ii) Conductors of electricity?

 (b) Give the name of the metal which meet the following information.

 (i) The metal which must be kept in kerosene to protect it from air and water.

 (ii) The metal which is found in limestone

 (iii) The metal in a green coloured carbonate which gives a black residue on heating or black residue.

 (iv) The metal of which its oxide is yellow when hot and white when cold.

1. When zinc granules and diluted sulphuric acid are reacted together, a gas **M** is produced. The gas produced is collected by downward displacement of water. Use this information to answer the questions below;
2. Name the gas **M** produced
3. How is the gas tested?
4. Why is the gas collected by downward displacement of water?
5. List six apparatus used in the preparation of gas **M**
6. Write one use of gas **M**
7. (a) Define the following terms

 (i) Mole (ii) Molar solution

 (b) Calculate the number of moles in the following.

(i) 1.6g of Oxygen atom

(ii) 7.1g of Chlorine molecule

 (iii) 6.0g of Carbon

 (c) How many atoms are there in

 (i) 0.23g of Na

 (ii) 5moles of HCl

1. Atoms of element A, B, C and D have atomic numbers 6, 8, 17 and 20 respectively.

(a) Write electronic structure of these elements.

 (b) Write down the formulae of the simplest compounds formed when:

 (i) A and B combine chemically

 (ii) C and D combine chemically

 (c) Draw the electronic diagram of compound formed when atoms of element B react with each other.

1. (a) Give definitions of the following

 (i) Base (ii) Acid

 (b) Using chemical equations write three chemical properties of Acids

 (c) Explain two applications of Acid-base neutralization

1. (a) 25 cm3 of 0.1 M HCl were neutralized by 23 cm3 of Sodium hydroxide solution.

 Calculate the concentration of the alkali in grams per litre.

 b) Suggest a suitable indicator for the following titrations:

 (i) Hydrochloric acid against ammonia solution

 (ii) Sulphuric acid against Sodium hydroxide solution

 (iii) Ethanoic acid against potassium hydroxide solution

1. (a) Write a balanced chemical equation when:-
2. Aluminium chloride reacts with sodium hydroxide
3. Potassium nitrate is decomposed thermally.
4. Carbon dioxide dissolves in lime water.
5. Sodium hydroxide reacts with sulphuric acid

 (b) Complete and balance the following chemical equation

1. H2(g) + O2(g) H2O(l)
2. NaCl(aq)  + H2SO4(l)
3. Pb(NO3)2(aq) + Na2SO4(aq)
4. (a) State the first law of Electrolysis.

(b) An element **X** has relative atomic mass 88. When an electric current of 0.5A was

passed through a fused chloride of **X** for 32 minutes and 10 seconds, 0.44g of **X** was deposited at the cathode.

 (i) Calculate the charge in Faradays needed to liberate one mole of **X**.

 (ii) Write the formula of the hydroxide of **X**.

 (iii) Mention any three industrial application of electrolysis.

1. Write an essay about hard water by using the following guidelines.

 (i) Define hard water

 (ii) State the types of hardness of water and explain their causes.

 (iii) Describe two methods of removing hardness of water.

 (iv) State the advantages of hard water.

 (v) State the disadvantages of hard water.

1. (a) Define the following;
2. Rate of chemical reaction.
3. Reversible reaction

 (b) Consider the following reaction

 **A2 (g) + 3B2 (g) 2AB3 (g) ΔH= - 578kJ/mol**

 At which direction the equilibrium will shift when:

1. Temperature is raised
2. Pressure of AB is reduced
3. Suitable catalyst added in the system
4. What does the negative sign signifies on the equation above

 (c) Draw energy level diagram for the above reaction.

 (d) State Le Chatellier’s principle

 (e) Explain four factors affecting the rate of chemical reaction