**SECTION A**

**Attempt** only three **questions in this section.**

1. Define the term **relative atomic mass**. (02 marks)
2. Explain how **relative atomic mass** can be determined by the **mass spectrometer**. (09 marks)
3. The mass spectrum of an element **Q** contained **four lines** at mass/charge of **54**, **56**, **57** & **58** with relative intensities of **5.84**, **91.68**, **2.17** & **0.31** respectively.
4. Explain what the term **relative intensities mean** and why the mass spectrum of element **Q** contains **4 lines**. (03 marks)
5. Calculate the **relative atomic mass** of element **Q**. (02 marks)
6. Explain why the **values of relative atomic mass** have no units. (01 mark)
7. **Thorium decays** according to the equation below.

+ α X +β Y + β Z

Determine the **mass numbers** and **atomic numbers** of **X**, **Y** & **Z**. (03 marks)

1. Explain the term **melting point**. (01 mark)
2. State the **factors** which **affect the melting point**: (@01 mark)
3. **Metals.**
4. **Molecular substances**.
5. Explain the trend in melting points of the elements in **group (II)** and **group (VII)** of the periodic table. (05 marks)
6. Explain why transition metals of **period 4** tend to have **higher** **melting points** than non-transition metals of the same period. (02 marks)
7. The table below shows melting points of some compounds.



Explain why:

1. The melting point of aluminium chloride is abnormally low compared to that of aluminium oxide. (02 marks)
2. The melting point of calcium oxide is much higher than that of calcium chloride. (02 marks)
3. Determine the freezing point depression for a solution containing **0.025g** of sodium chloride in **200.0g** of water. (03 marks)

(Molar freezing point constant of water, Kf = 1.86°C/mol/k)

1. Explain why a solution of aluminium nitrate turns blue litmus paper red. (03 marks)
2. Be, Mg, Ca, Sr & Ba are elements in group (II) of the periodic table.
3. Describe and explain the trend in the reactivity of the elements with water down the group. (05 marks)
4. Compare the solubility and basicity of the hydroxides of group (II) elements with the hydroxides of group (I). (03½ marks)
5. (i).Explain why beryllium and aluminium show a diagonal relationship. (02 marks)
6. (ii).Write equations to show how beryllium and aluminium each react with concentrated sodium hydroxide solution. (03 marks)
7. G is a chloride of beryllium contains **11.25%** beryllium.
8. Calculate the empirical formula of G. (01½ marks)
9. Determine the molecular formula of G. (01 mark) (Vapour density of G = 80)
10. Write the structural formula of G. (01 mark)
11. Explain why beryllium form more complexes compared to the rest of the group members. (03 marks)
12. Complete the following equations and in each case outline the mechanism for the reaction.





1. Write the IUPAC names of the products in (a) and (b) above. (02 marks)

**SECTION B**

**Attempt** only tWO **questions in this section.**

1. Explain each of the following observations.
2. Dimethylamine is a stronger base than phenylamine. (04 marks)
3. The first ionization energy of aluminium is less than that of magnesium. (03 marks)
4. The pH of a solution of chromium (III) chloride in water is less than 7. (03 marks)
5. Carbon dioxide is a gas at room temperature while silicon dioxide is a high-melting solid. (03 marks)
6. 1-bromohexane undergoes nucleophilic substitution whereas bromobenzene does not. (04 marks)
7. When solid lead (IV) chloride is added to water, white fumes are observed and a brown precipitate is formed. (03 marks)
8. Write equations to show how the following conversions can be effected and indicate reagents and conditions for the reactions.





1. (i).Explain the term colligative property. (01½ marks)
2. (ii).State four colligative properties of a solution. (02 marks)
3. (i).Describe how molecular mas of a substance can be determined by elevation boiling point method. (07 marks)
4. (ii)State three limitations of the methods. (01½ marks)
5. Calculate the boiling point of an aqueous solution of urea,CO(NH2)2 of concentration **12g/dm3** at a pressure of 101.3kpa.assume that the volume of the solute is negligible compared to that of the solution. The melting point elevation constant for water is **0.52°C/mol/kg**) (04 marks)
6. (i).Explain the term mole fraction. (01 mark)
7. (ii).Calculate the mole fraction of sodium chloride in an aqueous solution containing 10.0g of sodium chloride per 100.0g water. (03 marks)
8. Chromium and manganese belongs to transition metal group of elements in the periodic table.
9. Write electronic configuration of chromium and manganese atoms respectively. (01 mark)
10. Write electronic configuration of chromium and mangansese ions in Cr2O72-, Cr2O3 and MnO4-. (01½ marks)
11. Define the term transition element and explain why zinc ion is not considered transition. (04 marks)
12. (i).Write half-cell equation for the reduction of MnO4- to Mn2+ and oxidation of I- to I2 under acidic conditions. (03 marks)
13. (ii).State four properties of transition elements. (02 marks)
14. Briefly describe how the percentage purity of manganese may be determined from an ore containing manganese (IV) oxide. (06½ marks)
15. State the advantages and disadvantages of using potassium manganate (VII) in volumetric analysis. (02 marks)

**Success**

**end**