STANDARD HIGH SCHOOL ZZANA

Uganda Advanced Certificate of Education

CHEMISTRY

Paper 2

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer **five** *(5) questions in this paper including* **three** *(3) questions from Section* **A** *and any* **two** *(2) questions from Section* **B**.

Begin each question on a **fresh** *page, therefore all answers* **must** *be Cleary shown on the same sheet of answer sheet.*

No paper should be given for rough work.

Silent non – programmable electronic scientific calculators may be used.

Mathematical tables and graph papers are to be provided.

Illustrate your answers with relevant chemical equations where applicable.

Where necessary use $C = 12$, $O = 16$, $H = 1$, 1 mole of a gas occupies $22400cm^3$ at stp.

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SECTION A: (60 marks)

*Answer **three** questions from this section.*

1. The elements Be, Mg, Ca, Sr and Ba belong to group II of the periodic table.
    (a) Explain how the following factors vary with the group.

        (i)   electro positivity,   (04 marks)

        (ii)   ionisation energy,   (03 marks)

        (iii) atomic radius.   (04 marks)

    (b) Beryllium can react with sodium hydroxide solution like aluminium unlike other group II members.

        (i)   Write the equation for the reaction of beryllium and aluminium with sodium hydroxide solution.   (03 marks)

        (ii)   Mention **three** properties in which beryllium shows similarities with aluminium.   (03 marks)

        (iii) Explain why beryllium differs from other members of group II in chemical behavior.   (02 marks)

        (iv) Name **two** other elements which show similar relationships like beryllium and aluminium.   (01 mark)

2. (a) Write equations to show how the following compounds can be synthesized.   (04 marks)

        (i)   phenyl amine from nitro benzane,

        (ii)   amino ethane from bromo ethane,

        (iii) propan-2-one from propan-2-ol,

        (iv) ethanol from chloroethane.

    (b) Which one of phenyl amine and ethyl amine is a stronger base?
    Explain your answer.   (03 marks)

    (c) Write equations for each of the compounds phenylamine and ethylamine reacting with;
        (i)   ethanoyl chloride,   (02 marks)

        (ii)   acidified solution of sodium nitrite at 5^oC,   (02 marks)

    (d) Phenylamine can be converted to benzene diazonium chloride. Write equations for the conversion of diazonium salt into:

        (i)   iodobenzene,   (01 mark)

   (ii)   benzoic acid.   (04 marks)

3. (a) (i) What is meant by a weak acid? (02 marks)

   (ii) Calculate the pH of a $0.4M$ ethanoic acid solution. State any assumptions made $(Ka = 1.8 \times 10^{-5} mol\ dm^{-3})$. (04 marks)

   (b) (i) What is meant by a buffer solution. (04 marks)

   (ii) Calculate the pH of a buffer solution made by mixing $15cm^3$ of $0.01M$ ethanoic acid, $Ka = 1.8 \times 10^{-5} mol\ dm^{-3}$ with $25cm^3$ of $0.1M$ sodium ethanoate solution. (04 marks)

   (c) Draw a graph to show the pH changes when a strong acid is titrated with a weak base and explain it's shape. (06 marks)

4. (a) (i) Define the term standard electrode potential. (02 marks)

   (ii) Give reasons why it is not possible to measure standard electrode potential absolutely. (02 marks)

   (iii) Explain the factors that affect the value of standard electrode potential. (06 marks)

   (b) Describe;

   (i) a standard hydrogen half cell, (02 marks)

   (ii) how you would measure standard electrode potential of a material in a solution of it's ions. (03 marks)

   (c) The standard electrode potential of copper and zinc are given below.

   $Cu^{2+}(aq) + 2e \rightarrow Cu(s) \quad E = +0.34V$

   $Zn^{2+}(aq) + 2e \rightarrow Zn(s) \quad E = -0.76V$

   Write the cell notation for a zinc / copper cell and calculate the emf of the cell. (03 marks)

   (d) State **two** ways by which an electrolytic cell differs from an emf cell. (02 marks)

SECTION B: (40 marks)

*Answer **two** questions from this section.*

5. (a) Briefly describe how sulphuric acid can be manufactured from iron pyrite. (08 marks)

   (b) Describe the process of extraction of iron from haematite. (12 marks)

6. (a) (i) Define a primary standard. (01 mark)

   (ii) State any **four** properties of a primary standard. (04 marks)

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(iii) Name **one** other substance other than oxalic acid which can be used as a primary standard for potassium manganate(VII). (01 mark)

(b) Explain why hydrochloric acid is not used to acidify solution of potassium manganate(VII). (04 marks)

(c) Acidified potassium manganate(VII) reacts with oxalic acid.

Write the;

(i) half equations for the reaction, (02 marks)

(ii) overall equation for the reaction. (02 marks)

(d) $10.0 cm^3$ of $0.02M$ manganate(VII) ion solution required exactly $16.65 cm^3$ of a solution containing $3.78 gl^{-1}$ of $X_2C_2O_4 . 2H_2O$. Calculate the atomic mass of X. (06 marks)

7. For each of the following pairs of compounds, name **one** reagent that can be used to

(i) test for the functional group,

(ii) distinguish between each of the pairs.

Your answer should include the relevant observations. (05 marks each)

(a) $CH_3CH_2CH_2OH$ and $CH_3C(CH_3)_2OH$.

(b) $CH_3 \overset{\overset{\displaystyle O}{||}}{C} CH_3$ and $CH_3CH_2CH_2CHO$

(c) CH_3CHO and $CH_3CH_2CH_2CHO$.

(d) CH_2OH and OH

8. (a) Magnesium and barium react with steam and water respectively. State what is observed and write equations for the reactions in each case. (06 marks)

(b) Compare the reaction of beryllium and barium with sulphuric acid under various conditions. (08 marks)

(c) Describe the reactions of fluorine, chlorine and bromine with water. (06 marks)

END

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