NAME:

P525/2
CHEMISTRY
PAPER 2
NOV 2024
2 HRS 30 MINS

S.5
PCB/SM
BCM/ICT
PCM/ICT
BCA/SM
BCG & FCM

FINAL MARKS

%

NYONDO SECONDARY SCHOOL
UGANDA ADVANCED CERTIFICATE OF EDUCATION
S5 PROMOTIONAL EXAMS 2024
CHEMISTRY PAPER 2
DURATION: 2 Hours 30 Minutes

INSTRUCTIONS TO CANDIDATES:

❖ Attempt **any FIVE** questions including **any 3** questions from Section A and **any 2** questions from section B. **ALL** the questions carry equal marks.

❖ The **periodic table**, with **relative atomic masses**, is **attached at the end** of the paper and **graph paper** will be provided however need it.

❖ Begin answering **each** question on a **fresh page**, Answer **booklets are enough**.

❖ Illustrate your answers with **equations where applicable**, **Non-programmable scientific** calculators may be used.

NYONDO SECONDARY SCHOOL
CHEMISTRY DEPARTMENT @2024

1. (a) (i) What is **structural isomerism**? *(01 mark)*

(ii) Describe the three types of structural isomerism giving a suitable example in each case. *(08 marks)*

(b) Complete the following equations and in each case outline a mechanism for the reaction

(i) $CH_3CH = CH_2$ $\xrightarrow{Br_2/CCl_4}$ *(02 marks)*

(ii) ⬡ $\xrightarrow[Heat]{Cl_2/Al}$ *(03marks)*

(iii) ⬡ (with double bond) $\xrightarrow{Cl_2/H_2O}$ *(02 marks)*

(iv) $CH_3CH_2CH_3$ $\xrightarrow{Cl_2/u.v\ light}$ *(04 marks)*
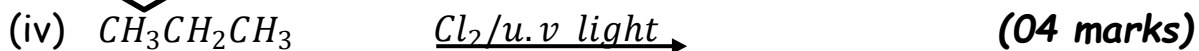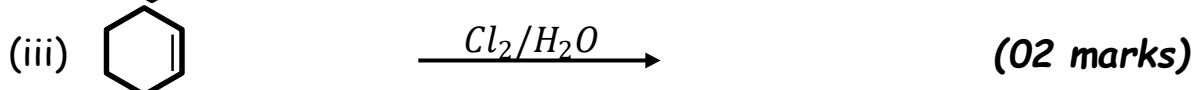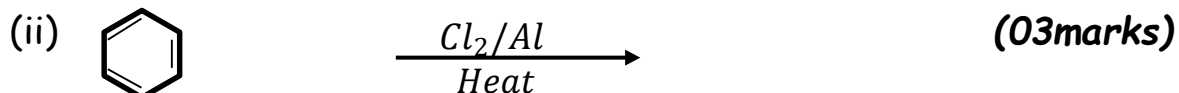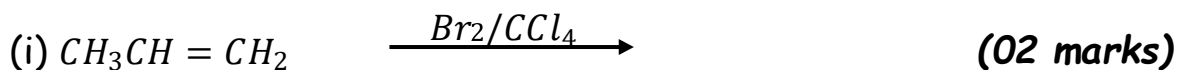
2. (a) Define the term **relative atomic mass**. *(01 mark)*

(b) **(i)** Briefly describe how the relative atomic mass of an element can be determined using a mass spectrometer. (No diagram required) *(08 marks)*

(ii) Copper has a relative atomic mass of 63.55 and consists of two isotopes ^{63}Cu and ^{65}Cu. Determine the percentage composition of the two isotopes in the naturally occurring copper. *(03 marks)*

(iii) When chlorine gas was analyzed in a mass spectrometer, peaks were recorded at mass numbers 70, 72 and 74. Explain this observation *(2½ marks)*

(iv) State **one** advantage of using a mass spectrometer in the determination of relative atomic masses. *(01 mark)*

3. a) Explain what is meant by the term **enthalpy of displacement**. *(01 mark)*

(b) Describe an experiment that can be used to determine the enthalpy of displacement reaction between zinc and copper (II) Sulphate. *(09 marks)*

(c) State what would be observed and write equation for the reaction when:

(i) Copper metal is added to silver nitrate solution.   **(03 marks)**

(ii) Aluminium metal is added to iron (III) Sulphate solution. **(2 ½ marks)**

(d) Explain why;

i.   The enthalpy of neutralization of a strong acid with a base is more exothermic than between a weak acid and a weak base.   **(02 ½ marks)**

ii. The values of enthalpy of hydration are always negative.   **(02 marks)**

4. (Beryllium, magnesium, calcium, strontium and barium are the elements of group (II) of the Periodic Table.
   (a)Describe how the Electropositivity of the elements varies down the group.   **(03 marks)**
   (b) Discuss the reaction of the elements with
      (i) Water   **(04 marks)**
      (ii) Dry air   **(03 marks)**
      (iii) Nitric acid   **(03 marks)**
(c) Describe how
 (i) Beryllium carbide and calcium carbide can be prepared in the laboratory.   **(03 marks)**
 (ii) The carbides in (c) (i) react with dilute hydrochloric acid **(03 marks)**
 (d) Describe how cement is
 (i) Manufactured   **(05 marks)**
 (ii) Used to make concrete.   **(02 marks)**

SECTION B: (40 MARKS)

Answer any **two** *questions from this section*

5. Explain the following observations.

   (a) Aluminium chloride dissolves in methylbenzene whereas sodium chloride does not.   *(04 marks)*

   (b) Carbon tetrachloride is non-polar yet the carbon-chlorine bond is polar.   *(04marks)*

   (c) When lead (IV) oxide is warmed with concentrated hydrochloric acid, effervescence of a greenish yellow gas occurs.   *(04 marks)*

   (d) Sulphur dioxide has a bond angle of 120^0 while Sulphur dichloride has bond angle of 109^0 although both are V-shaped molecules   *(04 marks)*

   (e) Propan-1-ol is a liquid at room temperature whereas propene is a gas at the same temperature   *(04 marks)*

6. When 142cm^3 of a hydrocarbon Y, of formula, C_aH_b and molecular mass 58g was exploded with excess oxygen and cooled to room temperature, the volume of the residual gas was 694cm^3. On treatment with concentrated potassium hydroxide solution, the volume decreased to 126cm^3.

   (a)   (i) Write the equation for combustion of Y.   *(1½ marks)*

          (ii)   Determine the molecular formula of Y.   *(03 marks)*

   (b)   (i) Write the structural formulae and names of possible isomers of Y.   *(04 marks)*

       (ii)   Predict and compare the boiling points of the two isomers in b(i) above.   *(01 mark)*

       (iii)   Explain your answer in b(ii) above.   *(3½ marks)*

   (c)   Y, when heated at 80°C with dibenzoyl peroxide and sulphuryl chloride, formed 1-chlorobutane. Identify Y.   *(01 mark)*

   (d)   Write equation(s), indicating conditions, for the conversion of:

(i)   1-chlorobutane to butan-2-ol   *(04 marks)*

(ii)   Butan-2-ol to $CH_3CHBrCHOHCH_3$ *(02 marks)*

7. (a) Name the structures exhibited by each of the following compounds:

    (i)   Calcium fluoride   *(01 mark)*

    (ii)   Silicon (IV) oxide   *(01 mark)*

    (iii)   Carbon dioxide   *(01 mark)*

  (b)Explain why:

(i)   Carbon dioxide is a gas at room temperature whereas silicon (IV) oxide is a solid at the same temperature. *(03 marks)*

(ii) Potassium chloride is insoluble in ethanol but very soluble in water.

        (04 marks)

(iii) 2, 2-dimethyl propane boils at a lower temperature than n- pentane yet both are of the same molecular weight.

        (04 marks)

  (c)State and briefly explain any **two** factors that in each case determine the strength of a:

    (i)   Covalent bond   *(03 marks)*

    (ii)   Metallic bond.   *(03 marks)*

8. Magnesium, Aluminium, Phosphorus and chlorine are elements of Period 3 of the Periodic Table. Their atomic numbers and melting points are given in the table below.

Element	Atomic	Melting point(°C)
Magnesium	12	649
Aluminium	13	661
Phosphorus	15	44
Chlorine	17	-101

  (b)   Explain the trend in melting point of the elements.   *(06 marks)*

  (c)   Discuss the reactivity of the elements with;

(i)   Water   *(08 marks)*

(ii) Sodium hydroxide   *(06 marks*

END