***P525/ 2***

***CHEMISTRY***

***Paper 2***

***MAY 2024***

***2½hours***

**PRE MOCK SET 1 EXAMINATIONS2024**

**UGANDA ADVANCED CERTIFICATE OF EDUCATION**

**SENIOR SIX**

**CHEMISTRY**

**PAPER 2**

**2 hours 30 minutes**

**INSTRUCTIONS**

Answer **five** questions including **three** from section **A** and **two** from section **B**.

Write the answers in the **answer booklet** provided.

Mathematical tables and graph papers are provided.

**Begin each question on a fresh page.**

Non-programmable scientific electronic calculators may be used.

Illustrate your answers with equations where applicable.

Indicate the questions in the grid below.

Where necessary use (C = 12 , O = 16 , H =1 , Ag = 108 , S = 32 )

**FOR EXAMINER’S USE ONLY**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| QUESTION |  |  |  |  |  | TOTAL |
| MARK |  |  |  |  |  |  |

**SECTION A (60 MARKS)**

Answer **three** questions from this section.

**1.** (a) (i) What is meant by the term steam distillation?(01 mark)

(ii) State **three principles of steam distillation.** (03 marks)

(iii) Describe an experiment for isolating amino benzene from a reaction mixture containing non-volatile impurities. (Use a diagram to illustrate your answer) (05 marks)

(c) (i) Define the term partition coefficient. (01mark)

(ii) A solution containing 6g of Q in 50cm3 of an aqueous solution is in equilibrium at room temperature with 108g of Q in 100cm3 of ether. Calculate the mass of Q that will be extracted by shaking 100cm3 of the aqueous solution containing 10g of Q with two successive portions of 50cm3 of ether. (05 marks)

(d) Ions of a metal M react with excess ammonia to form a complex according to the following equation.

M2+(aq) + nNH3(aq) [M(NH3)n]2+(aq)

25cm3 of 0.2M solution of M ions were mixed with 25cm3 of 1M ammonia solution followed by 50cm3 of trichloromethane in a separating funnel and the mixture shaken until equilibrium was attained at 25oC . It was found that 0.0002 moles of free ammonia were present in the trichloromethane layer. Given that the distribution coefficient, KD for ammonia between water and trichloromethane at room temperature is 25, determine the value of n in the complex.

(05 marks)

**2.** Write the equation for the reaction and outline the mechanism for the reaction when the following were mixed.

(a) Warm fuming sulphuric acid and benzene (04marks)

(b) Benzene and bromine in the presence of hot iron (04marks)

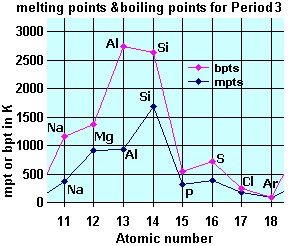
(c) Propan- 2- ol and ethanoyl chloride (04marks)

(d) 2- methyl propene and chlorine water. (04marks)

(e) Benzene and concentrated nitric acid in presence of concentrated

sulphuric acid at 60oC. (04marks)

**3.** The boiling and melting points of period 3 elements are shown in the graph below.



1. Explain why;
2. there is a general increase in melting point from sodium to Aluminium. ( 02
3. there is a general decrease in boiling point from silicon to chlorine. (02

(b) (i) State how electrical conductivity varies among the metals of period 3. (01 mark)

(ii) Explain the above trend in b(i) among the elements. (02 marks)

(c) Describe the reaction(s) of the oxide(s) of chlorine with sodium hydroxide. (06 marks)

d) Write the equation(s) of reaction to show how;

(i) phosphine can be prepared.

(ii) silane reacts with sodium hydroxide. (03 marks)

(iii) chloride(s) of sulphur with water. (03 marks)

**4.** (a) Distinguish between lattice energy and hydration energy. (02 marks)

(b) Explain briefly how the two energy terms in (a) affect the solubility of ionic compounds. (03 marks)

(c) Given the following thermodynamic data.

Standard enthalpy of formation of aluminium fluoride = -1301kJmol-1

Standard enthalpy of atomization of aluminium = +314kJmol-1

Standard enthalpy of bond dissociation of fluorine gas = +158kJmol-1

First ionization energy of aluminium = +577kJmol-1

Second ionization energy of aluminium = +1820kJmol-1

Third ionization energy of aluminium = +2740kJmol-1

First electron affinity of fluorine = -348kJmol-1

1. Define the standard enthalpy of formation. (01mark)

(ii) Draw an energy level diagram for the formation of aluminium fluoride and use it to determine the lattice energy of aluminium fluoride. (06marks)

1. Given that the hydration energies of aluminium ions and fluoride ions are -4690 and -364kJmol-1 respectively. Calculate the enthalpy of solution of aluminium fluoride and hence comment on its solubility in water. (04marks)

(d) State and explain **two** factors that affect the hydration energy.

(04marks)

**SECTION B (40 MARKS)**

Attempt any **two** questions from this section.

**5.** Write equations to show how the following compounds can be synthesized

CHO

1. from benzene diazonium salt. (04marks)

O O

║ ║ (b) HO –C-CH2 CH2 -COH from ethene (04marks)

1. Propene from ethanal (04 marks)
2. CH3CH2NH2 from propanoic acid (04 marks)

(e) Ethoxyethane from but- 2- ene (04marks)

**6.** (a) Define the terms

(i) colligative property (01mark)

(ii) freezing point constant. (01mark)

(b) Describe an experiment that you would carry out to determine the relative molecular mass of a compound using the freezing point method ( using naphthalene as a solvent.) (06marks)

(c) Explain the effect of association of the solute on the relative molecular mass determined by freezing point method. (02marks)

(d) (i) State the law(s) of osmotic pressure. (02marks)

(ii) State the conditions under which these laws are valid. (01mark)

(e) The osmotic pressure of a 1.24% solution of poly(phenylethene) is 2.356x 10-2 mmHg at 25oC.

(i) Calculate the relative molecular mass of poly(phenylethene)

(2½marks)

(ii) Calculate the number of monomer units in poly(phenylethene)

(1½marks)

(iii)Explain why the freezing point method is not suitable for determining the molecular mass of poly(phenylethene) (03marks)

7. Explain each of the following observations;

(a) An aqueous solution of sodium sulphate is neutral to litmus paper while aqueous solution of sodium sulphite turns red litmus paper blue. (04 marks)

(b) When excess carbon dioxide gas was separately bubbled through sodium aluminate solution and sodium carbonate solution both form white precipitate. (04 marks)

(c) When warm concentrated nitric acid was added to sulphur, the yellow solid dissolved with effervescence of reddish brown gas and colourless solution was formed. (04 marks)

(d) The shapes of the molecules BF3 and PCl3 are different. (04 marks)

(e) The melting point of sodium is 980C where as that of magnesium is 6500C. (04 marks)

**8.** Fluorine is in group(VII) of the Periodic Table but it behaves differently from the rest of the group members.

(a) (i) State **three** reasons why fluorine behaves anomalously. (03marks)

(ii) Describe **three** chemical properties of fluorine which are different from the rest of the group members.(Illustrate your answer with equations) (06marks)

(b) Fluorine and chlorine are separately bubbled through aqueous silver nitrate solution.

(i) State what was observed in each case. (02marks)

(ii) Explain your observation is (i) above. (03marks)

1. Describe briefly how potassium chlorate(V) crystals can be

prepared from chlorine. (Diagrams **not** required.) (06marks)

**END.**