**Name:……………………………………………………… ….Index No…………………**

**Signature: ………………………………………………………………………………….**

**P525/1**

**Chemistry**

**Paper 1**

***Uganda Advanced Certificate of Education***

**CHEMISTRY**

**PAPER ONE**

**2 HOURS 45 MINUTES**

**INSTRUCTIONS TO CANDIDATES**

* Attempt **all** questions in section **A** and only **Six** in section **B.**
* All questions are to be answered in the spaces provided.
* A periodic table with relevant atomic masses is provided at the end of the paper.
* Mathematical tables (3 – figure table) and silent non programmable scientific calculators may be used.
* Illustrate your answers with equations where applicable.
  + Molar gas constant, R = 8.31JK – 1 mol – 1
  + Molar volume of gas at s.t.p is 22.4 litres.

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| **For Examiner’s use only** | | | | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
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**SECTION A**

**Answer all questions from this section.**

1. The standard electrode potentials for the system Ag(s)/AgCl(s)/CuCl2(aq)/Cu(s) are +0.223 and +0.30 volts respectively.
2. Write the equation for the half-cell reactions that take place at the:
3. Anode 1mk

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1. Cathode 1mk

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1. Write the overall equation for the reaction. 1mk

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1. Calculate:
2. The e.m.f. of the cell 1mk

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1. The standard free energy of the cell. 1.5mks

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1. (i) state whether the reaction is feasible or not. 0.5mks

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(ii) Give a reason for your answer in d (i) above. 0.5mks

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1. Complete the following equations and outline a mechanism for the reaction in each case.
2. 3.5mks



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1. Calculate the molecular mass of a compound, a 2% aqueous solution of which boils at 99.977oC when the boiling point of pure water is 99.800oC.

(Kb(water)=5.2oC per 100gmol-1) 3mks

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1. State any assumption (s) you made in the calculation. 2mks …………………………………………………………………………………………………………………………

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1. Beryllium is in group(II) of the Periodic Table but it resembles aluminium which is in group(III) in some of its properties.
2. State four properties in which Beryllium resembles Aluminium. …………………………………………………………………………………………………………………………

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1. Give one reason for the anomalous behaviour of Beryllium.

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1. Propene was passed through bromine water.
2. State what was observed.

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1. Write equation for the reaction. ………………………………………………………………………………………………………………………..

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1. Write a mechanism for the reaction in (a) above.

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1. Ethylamine ionizes when dissolved in water.
2. Write:
3. Equation for the ionization of ethylamine.

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1. The expression for the ionization constant, Kb. ………………………………………………………………………………………………………………

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1. If the ionization constant of ethylamine is 1.78x10-4moldm-3at 25oC.

(Kw=1x10-14mol2dm-6 at 25oC)

1. Calculate the pH of a 0.01M solution of ethylamine.

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1. State the assumptions you made in your calculations.

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1. The molecular formula of a compound X, is C8H8O. compound X burns with a sooty flame and forms a yellow precipitate with Brady’s reagent.
2. Write the structural formulae and names of all the possible isomers of X.

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1. X reacted with iodine in aqueous solution of sodium hydroxide to form a yellow precipitate.
2. Identify X.

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1. Write equations to show how X can be synthesized from an alkene.

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1. Compound Q is a green solid. Q dissolved in water to give a green solution. The solution of Q formed a red precipitate when reacted with butanedione dioxime solution. When Q was heated with concentrated sulphuric acid, ethanedioic acid was formed.
2. Identify Q.

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1. Write equation for the reaction that took place when Q was heated with concentrated sulphuric acid.

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1. Write the equation(s) for the reaction(s) that would take place when excess ammonia solution is added to a solution of Q.

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1. Define the term ‘heat of precipitation’.

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1. 25.0cm3 of 0.5M barium nitrate solution was added to 25cm3 of 0.5M sodium sulphate solution in an insulated container.

The temperature of the resulting mixture rose by 30 0C. Assuming that the container had negligible heat capacity and the specific heat capacity and the specific heat capacity of the resulting mixture is 4.2Jg-1 0C-1, calculate the heat of precipitation of barium sulphate.

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**SECTION B**

**Answer six questions from this section.**

1. Methanoic acid (bp 101oC) and water are miscible in all proportions. They form a maximum boiling point mixture containing 78% methanoic acid which boils at 108oC.
2. Sketch a labeled boiling point diagram for mixtures of methanoic acid.

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1. What happens when a mixture containing 30% methanoic acid is distilled.

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1. Write equations to show how the following compounds can be synthesized and, in each case, indicate the conditions for the reaction.



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1. State what would be observed and write equation for the reaction that would take place when;
2. Aqueous iron(II) sulphate solution is added to acidified potassium chromate(VI) solution.

Equation

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1. Hydrogen peroxide is added to acidified potassium manganate (VII) solution.

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1. Potassium iodide solution is added to iron(III) sulphate solution.

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(d) Ethyne is bubbled through ammoniacal copper (I) chloride solution.

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1. The conductimetric curve for the titration of hydrochloric acid and ammonia solution is given below.



Explain the shape of the curve (XYZ)

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1. The molar conductivities of copper(II)ethanoate, copper(II) chloride and hydrochloric acid are 195, 266 and 426.2Ω-1cm2mol-1 respectively at infinite dilution at 25oC.

Calculate;

1. Molar conductivity of ethanoic acid at infinite dilution

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1. Dissociationconstant Ka of a 0.01M ethanoic acid solution (the electrolytic conductivity of ethanoic acid is 1.66x10-4Ω-1cm-1)

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1. Compound R contain copper 37.2%, chlorine 41.7% and water 21.1%.
2. Calculate the empirical formula of R

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1. Determine the molecular formula of R (Vapour density of R=85.5)

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1. A solution of R in water was divided into two parts.

The first part of the solution was tested with blue litmus paper.

1. State what was observed.

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1. The resultant solution in b(i) was diluted.
2. State what was observed.

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1. Write equation for the reaction that took place.

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1. Name one reagent that can be used to distinguish between the following pairs of compounds and state what would be observed in each case if the reagents reacted with the compounds.



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1. What is meant by the term *‘common ion effect’*?

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1. Lead(II) chloride is sparingly soluble in water.

Write;

1. The equation of solubility of lead(II) chloride in water.

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1. The expression for the solubility product, Ksp of lead(II) chloride.

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1. The solubility product Ksp, of lead(II) chloride is 2.0x10-5mol3l-3 at 25oC. Calculate the concentration of the following ions in a saturated solution of lead(II) chloride.
2. Lead(II) ions.

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1. Chloride ions.

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1. Calculate the concentration of lead(II) nitrate that should be added to the saturated solution in (c) in order to reduce the concentration of the chloride ions to a third of its original value.

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1. Distinguish between a thermoplastic and a thermosetting plastic.

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1. The structural formula of polyvinyl chloride (P.V.C) is;



Write;

1. The structural formula and name of the monomer.

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1. The equation for reaction leading to the formation of P.V.C

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1. The osmotic pressure of a solution containing 4.0gdm-3 of polyvinyl chloride in tetra chloromethane is 68Nm-2 at 20oC.

Calculate the number of monomer units in the polyvinyl chloride.

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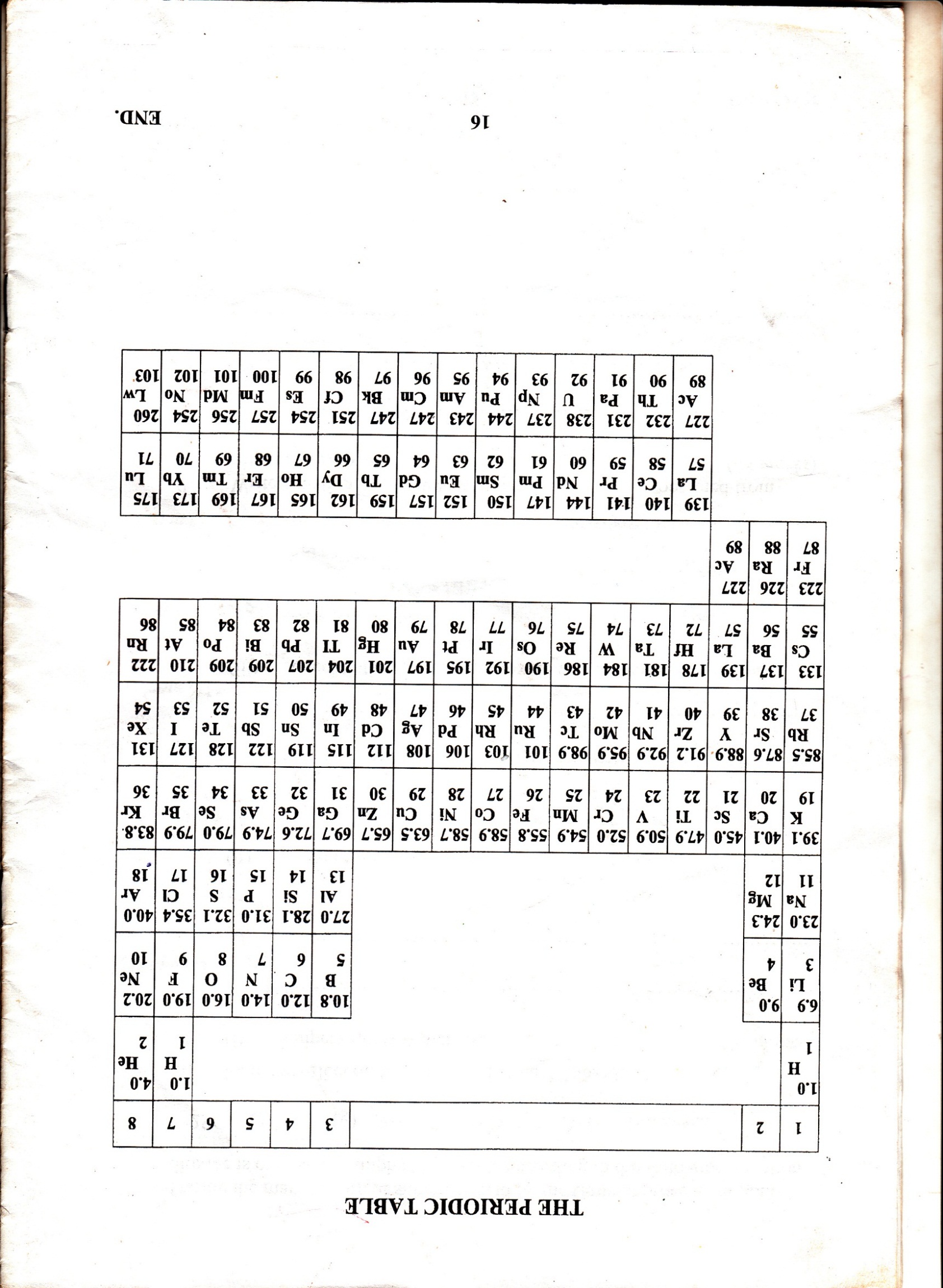
1. Give one use of polyvinyl chloride.

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***END***