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RESOURCEFUL MOCK 2017

Uganda Advanced Certificate of Education

CHEMISTRY P525/1

TIME: 2¾ HOURS

INSTRUCTIONS TO CANDIDATES

Answer **all** questions in section **A** and **six** questions in section **B**

All questions must be answered in the spaces provided

Mathematical tables (3 -figure tables) are adequate or non -programmable scientific electronic calculators may be used.

Illustrate your answers with equations where necessary

- Molar gas constant, $R = 8.31 \text{ JK}^{-1}\text{mol}^{-1}$
- Molar volume of gas at s.t.p is 22.4 litres
- Standard temperature = 273K
- Standard pressure = 101325 Nm^{-2}
- Faraday constant = 96500C

For Examiner's use only																	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total

SECTION A

Answer **all** questions from this section

1. The standard electrode potentials for the system $\text{Ag}_{(s)}/\text{AgCl}_{(s)}/\text{CuCl}_{2(aq)}/\text{Cu}_{(s)}$ are +0.223 and +0.340 volts respectively.

a. Write the equations for the half-cell reactions that take place at the:

i) Anode [1mk]

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ii) Cathode [1mk]

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b. Write the overall equation for the cell reaction. [1mk]

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c. Calculate:

i) The e.m.f of the cell [1mk]

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ii) The standard free energy of the cell [1½ mks]

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d. i) State whether the reaction is feasible or not

[½ mk]

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ii) Give a reason for your answer in d (i)

[½ mk]

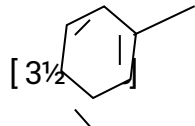
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2. Complete the following equations and outline a mechanism for the reaction in each case.

a.  $\text{NHCH}_3 + (\text{CH}_3\text{CO})_2\text{O}$

[3½

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Mechanism

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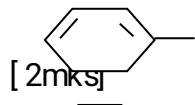
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b.  $\text{CH}_2 = \text{CH}_2\text{Br} + \text{CH}_3\text{ONa}^+ \longrightarrow \text{CH}_3\text{OH}$

[2mks]

heat

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Mechanism

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3. a) Calculate the molecular mass of a compound, a 2% aqueous solution of which boils at 99.977°C when the boiling point of pure water is 99.800°C . [K_b [water] = 5.2°C per 100g mol^{-1}] [2½ mks]

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- b) State any assumptions you made in calculation [2mks]

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4. Beryllium is in group (II) of the Periodic Table but it resembles aluminium which is in group (III) in some of its properties.

a. State four properties in which beryllium resembles aluminium. [4mks]

[illegible]

b. Give one reason for the anomalous behaviour of beryllium. [1mk]

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5. a) Propene was passed through bromine water

i) State what was observed [1mk]

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ii) Write the equation for the reaction [1mk]

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b) Write a mechanism for the reaction in (a) above. [3mks]

[illegible]

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6. Ethylamine ionizes when dissolved in water

a) Write:

i) Equation for the ionization of ethylamine [1½ mks]

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ii) The expression for the ionization constant, K_b
[½ mk]

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b) If the ionization constant of ethylamine is $1.78 \times 10^{-4} \text{ mol dm}^{-3}$ at 25°C [$K_w = 1 \times 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$ at 25°C]

i) Calculate the PH of a 0.01M solution of ethylamine [3½ mks]

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ii) State the assumptions you made in your calculation. [1mk]

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7. The molecular formula of compound X, is C_8H_8O . Compound X burns with a sooty flame and forms a yellow precipitate with Brady's reagent.

a. Write the structural formulae and names of all the possible isomers of X. [02]

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

i) Identify X

[½ mk]

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ii) Write equations to show how X can be synthesized from an alkene. [2mks]

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8. 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.

a. Identify Q [½ mk]

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b. Write equation for the reaction that took place when Q was heated with concentrated sulphuric acid. [1½ mks]

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c. Write the equation(s) for the reaction(s) that would take place when excess ammonia solution is added to a solution of Q. [2mks]

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9. a) Define the term 'heat of precipitation.' [1mk]

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b) 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°C . Assuming that the container had negligible heat capacity and the specific heat capacity of the resulting mixture is $4.2\text{Jg}^{-1}\text{ }^{\circ}\text{C}^{-1}$, calculate the heat of precipitation of barium sulphate.

[$3\frac{1}{2}$ mks]

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SECTION B

Answer **six** questions from this section

10. methanoic acid (bp 101°C) and water are miscible in all proportions. They form a maximum boiling point mixture containing 78% methanoic acid which boils at 108°C .

a. Sketch a labeled boiling point diagram for mixtures of methanoic acid. [3mks]

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b. Briefly describe

i) Why methanoic and water form a maximum boiling point mixture [4mks]

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ii) What happens when a mixture containing 30% methanoic acid is [2mks]

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

a.



[4mks]

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[2mks]

Equation

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Observation

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- c. Potassium iodide solution is added to iron (III) sulphate solution. [2½ mks]

Equation

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Observation

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- d. Ethyne is bubbled through ammonia cal copper (I) chloride solution. [2mks]

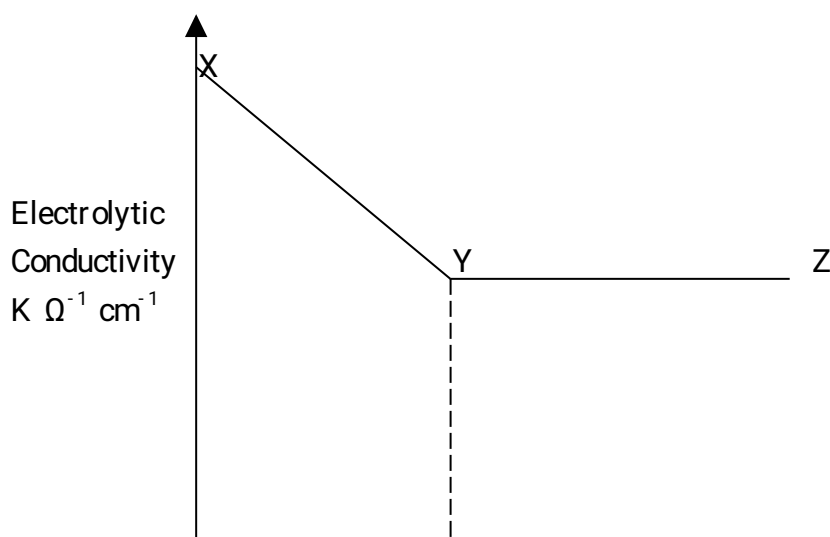
Equation

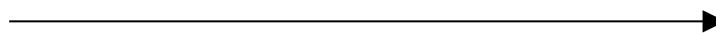
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Observation

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





Volume of ammonia solution

Explain the shape of the curve (XYZ)

[4mks]

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b) The molar conductivities of copper (II) ethanoate, copper (II) chloride and hydrochloric acid are 195 , 266 and $426.2\Omega^{-1}\text{ cm}^2\text{ mol}^{-1}$ respectively at infinite dilution at 25°C .

Calculate

i) Molar conductivity of ethanoic acid at infinite dilution.

[$1\frac{1}{2}$ mks]

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a. i) Calculate the empirical formula of R. [2mks]

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

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

State what was observed and write equation for the reaction that took place

[2mks]

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ii) To the second part of the solution was added concentrated hydrochloric acid drop wise until in excess.

State what was observed and write equation for the reaction. [2½ mks]

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c. The resultant in b (ii) was diluted.

i) State what was observed

[½ mk]

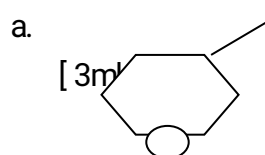
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ii) Write the equation for the reaction that took place.

[1mk]

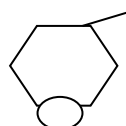
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15. Name one reagent that can be used to distinguish between the following pairs of compounds and state what would be observed in each case if the reagents reacted with the compounds.



COCH_2CH_3

and



COCH_3

Reagent

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Observation

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b. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$ and $(\text{CH}_3)_3\text{COH}$ [3mks]

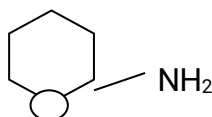
Reagent

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Observation

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c. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{NH}_2$ and [3mks]



Reagent

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Observation

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16. a) What is meant by the term 'common ion effect'? [2mks]

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Write:

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i) Lead (II) ions

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ii) Chloride ions

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17. a) Distinguish between a thermoplastic and a thermosetting plastic. [2mks]

b) The structural formula of polyvinyl chloride (P.V.C) is;
 $(\text{CH}_2 - \text{CHCl} - \text{CH}_2 - \text{CHCl})_n$
 Write:

i) the structural formula and name of the monomer [2mks]

ii) the equation for the reaction leading to the formation of P.V.C [1mk]

18

c) The osmotic pressure of a solution containing 4.0 g dm^{-3} of polyvinyl chloride in tetrachloromethane is 68 NM^{-2} at 20°C .

Calculate the number of monomer units in the polyvinyl chloride. [3mks]

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d) Give one use of polyvinyl chloride. [1mk]

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END