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P525/2
Chemistry
Paper 2
2 ½ HOURS
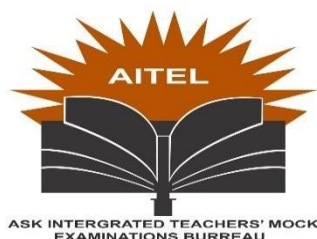
AITEL PRE-REGISTRATION ASSESSMENTS

S.6 PRE-REGISTRATION ASESSMENT

UGANDA ADVANCED CERTIFICATE OF EDUCATION

CHEMISTRY

PAPER 2

TIME: 2 HOURS 30 MINUTES

INSTRUCTIONS TO CANDIDATES:

  - Attempt **five** questions in section including **three** questions from section **A** and any
     two questions from section **B.**

SECTION A:

1. (a) (i) What is meant by the term **solvent extraction**? (01mk) ii)
   State **three** limitations of solvent extraction. (1 ½ mks) iii)
   State why in solvent extraction, small portions are preferred to big volumes.

   (02mks)

   b) 0.9656 g of Iodine was shaken with a mixture of 50 cm^3 of trichloromethane and 50cm^3 of water in a separating funnel for some time until equilibrium was attained at 25°C.
   After the layer had settled, 25 cm3 of the aqueous layer required 4.4 cm^3 of 0.01 m sodium thiosuphate solution using starch as an indicator.

   i) Determine the distribution coefficient of Iodine between trichloromethane and water at 25°C. (5 ½ mks)

   ii) If 50 cm^3 of trichloromethane layer in (b) (i) above was again shaken with 100 cm^3 of water at 25°C, determine the mass of Iodine that remained in the trichloromethane layer. (03mks)

   iii) Explain why trichloromethane is a better solvent in the extraction of iodine than water. (02mks)

   iv) Describe briefly how the formula of the silver complex $[Ag (NH_3)_2]^+$ can be determined in the laboratory. (05mks)

2. (a) Write equations to show how the following compounds can be prepared;

   i) Phenylamine (aniline)

   ii) Aminoethane (ethylamine) (04mks) b) Explain the difference in basicity of the compounds in (a) above. (03mks)

   c) Write equations showing each of the compounds in (a) react with;

   i) Ethanoyl chloride

   ii) Acidified solution of sodium nitrite at 5°C (02mks)

   d) (i) Write a mechanism for the reaction of ethanoyl chloride with ethylamine.

   (03mks)

   ii) How can the reaction in (c) (ii) above be used to distinguish between phenylamine

   and ethylamine. (01mk)

e) Phenyalamine can be converted to $C_6H_5N^+N^-Cl$ write equations (reagents and conditions to be given) for the conversion of diazonium salt into;

   i) Iodo benzene ii)
   Benzoic acid

3. (a) What is meant by the terms;

  i) Initial rate   (01mk) ii) Activated complex   (01mk)

  b) The rate equation for the reaction

$$S_2O_{82\ -(aq)} + 2I^-_{(-aq)} \longrightarrow 2\ SO_{42\ -(aq)} + I_{2\ (aq)} \text{ is}$$

$$\text{Rate} = K[S_2O_8{}^{2-}]\ [I^-]$$

i) State how the rate would be affected if the concentrations of the reactants are both doubled.   (01mk) ii) Describe an experiment to determine the order of the reaction with respect to $S_2O_8{}^{2-}$ in the laboratory.

  c) The table below shows the kinetic data for the reaction between potassium Iodide and potassium peroxosulphate.

Time (min)	$[S_2O_{82-}]$ mol dm $_{-3}$
30	0.190
60	0.130
90	0.082
120	0.053
150	0.035

Plot a graph of $10g_{10}[S_2O_8{}^{2-}]$ against time and use it to determine;

i)   The initial concentration of $S_2O_8{}^{2-}$ (01mk)

ii) The rate constant of the reaction and state its units.   (03mks)

d) State and explain one factor that affects the activation energy of the reaction.

(03mks)

4. (a) Write the name and formula of the ore from which aluminium metal is extracted.

(02mks)

b) Outline the steps used in the extraction of aluminium from its ore. Your answer should include all the necessary equations (No diagram is required). c) In the extraction of aluminium, state

i) Why a low voltage is used.   (01mk) ii) One disadvantage involved (01mk)

d) State **two** uses of aluminium in relation to its properties.   (02mks)

e) How and under what conditions does aluminium react to form aluminium chloride, Al_2Cl_6?   (02mks)

SECTION B

Attempt <u>**two**</u> questions from this section.

5. (a) State what would be observed and write equations for the reaction which takes place when dilute sodium hydroxide is added until in excess to; i) $Al^{3+}_{(aq)}$ ii) $Mn^{2+}_{(aq)}$

iii) $Sn^{4+}_{(aq)}$ (08mks)

b) Discuss the reactions between halogens and;

i)   Water   (02mks) ii) Sodium hydroxide solution   (07mks)

6. (a) A compound **M, C_7H_14O_2** reacted with sulphuric acid on heating to form compounds **P, C_4H_10O** and **C_3H_6O_2**. P reacted with sodium with effervescence but had no effect on litmus paper.

i) Write the names and structural formulae of all the possible isomers of **P**. (04mks)
ii) Name a reagent that can be used to distinguish between the isomers in (i) and state what would be observed if the isomers are reacted with the reagent. (04mks)

b) **P** reacted with acidified dichromate solution to give **W**, which formed a **yellow solid** when reacted with alkaline iodine solution;

i)   Identify **P**, **W** and the **yellow solid**.   (03mks)

ii) Name the reagent that can be used to identify the functional group in P. (01mk)

c) Write equations and indicate a mechanism for the reaction between P and;

   i)   Concentrated orthophosphoric acid   (04mks) ii) Ethanoyl chloride (03mks)

7. (a) Describe briefly how the halogen which is described as greenish yellow gas can be produced on a commercial scale.   (05mks)

   b) Describe briefly how this gas can be converted to potassium chlorate (V) crystals.

                                                                                                 (05mks)

   c) 2.0 g of mixture of potassium chloride and potassium chlorate were dissolved in 250 cm^3 of water. 10.0 cm^3 of the solution was mixed with excess potassium Iodide. The Iodine liberated required 8.00 cm^3 of a 0.2M sodium thiosalphate solution for complete reaction.
   Calculate the percentage of potassium chlorate in the mixture.   (06mks)

   d) Explain why chlorine is more soluble in dilute sodium hydroxide than in water.
                                                 (04mks)

8. Explain the following observations;

   a) Ice is less dense than water and floats on water.   (04mks)

   b) Methanioc acid reacts with ammoniacal silver nitrate solution, whereas ethanoic acid does not.   (04mks)

   c) The first electron affinity of the halogens decrease down the group, however the first electron affinity of fluorine is abnormally high.   (04mks)

d) When ammonia solution is added to silver nitrate solution, a brown precipitate soluble in excess ammonia is formed. (04mks)

e) The boiling point of ethanol is 78°C whereas that of methoxymethane is 24°C yet both ethanol and methoxymethane have the same molecular mass. (04mks)

END