**MOCK SET I EXAMINATIONS 2019**

Uganda Advanced Certificate of Education

CHEMISTRY PAPER  
P525/2

Time: 2 Hours

**Instructions to Candidates**

* *Answer* ***five*** *questions, including* ***three*** *from* ***section A*** *and any* ***two*** *from section* ***B****.*
* *Additional questions answered will not be marked.*
* *Begin each question of fresh page.*
* *Mathematical tables and graph papers are provided.*
* *Non programmable scientific electronic calculator may be used.*
* *Illustrate your answer with questions where applicable*

*(H = 1, C = 12, O = 16, N = 14, S = 32)*

**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 cm3 of trichloromethane and 50cm3 of water in a separating funnel for some time until equilibrium was attained at 25oC.

After the layers had settled, 25 cm3 of the aqueous layer required 4.4 cm3 of 0.01M sodium thiosuphate solution using starch as an indicator.

1. Determine the distribution coefficient of Iodine between trichloromethane and water at 25oC. (5 ½ mks)
2. If 50 cm3 of trichloromethane layer in (b) (i) above was again shaken with 100 cm3 of water at 25oC, determine the mass of Iodine that remained in the trichloromethane layer. (03mks)
3. Explain why trichloromethane is a better solvent in the extraction of iodine than water. (02mks)
4. Describe briefly how the formula of the silver complex [Ag (NH3)­2­]**+** can be determined in the laboratory. (05mks)
5. (a) What is meant by the terms;
6. Initial rate (01mk)
7. Activated complex (01mk)

b) The rate equation for the reaction

 is Rate = 

1. State how the rate would be affected if the concentrations of the reactants are both doubled. (01mk)
2. Describe an experiment to determine the order of the reaction with respect to in the laboratory.

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

|  |  |
| --- | --- |
| Time (min) | [] mol dm -3 |
| 30 | 0.190 |
| 60 | 0.130 |
| 90 | 0.082 |
| 120 | 0.053 |
| 150 | 0.035 |

Plot a graph of 10g10[] against time and use it to determine;

1. The initial concentration of  (01mk)
2. 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)

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

(02mks)

b) Outline the steps used in the extraction of aluminum from its ore. Your answer should include all the necessary equations (No diagram is required). (8 marks)

c) In the extraction of aluminum, state

1. Why a low voltage is used. (01mk)
2. One disadvantage involved (01mk)

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

e) How and under what conditions does aluminum react to form aluminum chloride, Al2Cl6? (02mks)

(f) State why soap is not used in washing aluminum source pans (3 marks)

Illustrate your answer using equations

1. (a) A compound **M, C7H14O2** reacted with sulphuric acid on heating to form compounds **P, C4H10O** and **C3H6O2**. **P** reacted with sodium with effervescence but had no effect on litmus paper.
2. Write the names and structural formulae of all the possible isomers of **P**. (04mks)
3. 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;

1. Identify **P**, **W** and the **yellow solid**. (03mks)
2. 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;

1. Concentrated orthophosphoric acid (04mks)
2. Ethanoyl chloride (03mks)

**SECTION B**

Attempt **two** questions from this section.

1. Using equations only, show how the following inter conversions of compounds can be carried out in the laboratory.
2. Ethanol to methylpropanoate. (4 Marks)
3. Butane-1,4-dioic acid from bromoethane. (3 ½ Marks)
4. C6H5NHCH3 from benzene. (4 ½ Marks)
5. (CH3)2COHCH2CH3 from 1-chloropropane. (4 Marks)
6. Nylon-6,6 from cyclohexene (4 Marks)
7. Explain the following observations;
8. Ice is less dense than water and floats on water. (04mks)
9. Methanioc acid reacts with ammoniacal silver nitrate solution, whereas ethanoic acid does not. (04mks)
10. The first electron affinity of the halogens decrease down the group, however the first electron affinity of fluorine is abnormally high. (04mks)
11. When ammonia solution is added to silver nitrate solution, a brown precipitate soluble in excess ammonia is formed. (04mks)
12. The boiling point of ethanol is 78oC whereas that of methoxymethane is 24oC yet both ethanol and methoxymethane have the same molecular mass. (04mks)
13. The atomic numbers and melting points of the oxides of period 3 elements are shown in the Table below.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Element | Na | Mg | Al | Si | P | S | Cl |
| Atomic number | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| Oxide | Na2O | MgO | Al2O3 | SiO2 | P2O5 | SO3 | Cl2O7 |
| Melting point oC | 1275 | 2827 | 2007 | 1607 | 560 | 30 | -91 |

1. i) Plot a graph of melting points of oxides against atomic number of elements. (4mks)

ii) Explain the shape of the graph. (6½ marks)

1. Write equation to show the reaction between,
2. Water and P2O5 (1½ marks)
3. Sodium hydroxide and

Al2O3 (2½marks)

SiO2 (2½ marks)

SO3 (1½ marks)

1. Hydrochloric acid and Al2O3 (1½marks)

8.(a) Explain what meant by the terms

(i) Enthalpy of solution (2 marks)

(ii) Enthalpy of hydration (2 marks)

(b) State two factors that affect the enthalpy of hydration. (2 marks)

(c) Describe how you would determine the standard enthalpy of solution of potassium

iodide. (7 marks)

(d) The lattice energy of potassium iodide is +649 Kjmol - 1. The enthalpy of hydration of

potassium ion is − 321 Kjmol - 1 and that of iodide ions is - 296 Kjmol -1

(i) Determine the enthalpy of solution of potassium iodide (2 marks)

(ii) Explain why potassium iodide is soluble in water (2 marks)

(iii) Sketch a potential energy diagram for the dissolution of potassium iodide in b (ii)

above (3 marks)

**END**

