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

*P525/1*

*Chemistry*

*Paper 1*

*June/July 2016*

**Uganda Advanced Certificate of Education**

**CHEMISTRY**

**Paper 1**

**TIME: 2 ¾ HOURS**

**INSTRUCTIONS TO CANDIDATES:**

* *This paper consists of two sections* ***A*** *and* ***B***
* *Section* ***a*** *is compulsory.*
* *Attempt* ***only six*** *questions in section* ***B***
* *Answers must be written in the spaces provided* ***only***

|  |
| --- |
| **For Examiner’s Use Only** |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**SECTION A: (46 MARKS)**

**Answer all questions in this section**

1. (a) Write the equation of reaction between sodium hydroxide and
2. Lead (IV) oxide (1 ½ marks)

………………………………………………………………………………………………………………………………………………………………………………………………

1. Chromium (III) oxide (1 ½ marks)

……………………………………………………………………………………………………………………………………………………………………………………………...

(b) Concentrated nitric acid was added to a solution of manganese (II) sulphate followed by lead (IV) oxide

 (i) State what was observed (½ marks)

………………………………………………………………………………………………………………………………………………………………………………………………

 (ii) Write equation for the reaction (1 ½ marks)

………………………………………………………………………………………………………………………………………………………………………………………………

1. (a) The emission spectrum of the element hydrogen contains several series of lines.
2. Give a general expression for the energy of the lines in a hydrogen line spectrum.

(01 mark)

………………………………………………………………………………………………………………………………………………………………………………………………

1. What do the different lines in a given series have in common (01 marks)

………………………………………………………………………………………………………………………………………………………………………………………………

(b) The frequency of hydrogen at the point of ionization is 32.8 x 1014 Hz. Calculate the ionization energy of hydrogen in KJmol – 1 (03 marks)

(Planks constant = 6.6 x 10 – 34 Js)

………………………………………………………………………………………………………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………

1. Complete the following organic equations and in each case name the main organic product

C

O

1. CH3 CH3  (i) CH3MgI

ɩɩ

(ii) H+

 Name …………………………………………………………………….. (01mark)

 H

 l

1. CH3C = CH2 Mn$\overbar{O}$4/$\overbar{O}$H(aq)

Name ……………………………………………………………………….. (01 mark)

C

 ɩ

CH3

1. n(CH2 = CH= CH2) Catalyst

Name ………………………………………………………………………… (01mark)

 CH2CH2OH Conc H2SO4

 180oC

Name ………………………………………………………………………… (01 mark)

1. (CH3COO)2Ca heat

Name ………………………………………………………………………… (01 mark)

1. Silver chromate is sparingly soluble in water.
2. Write
3. Equation for the solubility of silver chromate in water (01mark)

……………………………………………………………………………………………………………………………………………………………………………………

1. The expression for the solubility product of silver chromate (01mark)

……………………………………………………………………………………………………………………………………………………………………………………

1. Calculate the solubility of silver chromate in the presence of 0.005M potassium chromate (VI) solution (Ksp = 9 x 10 – 12 mol3dm-9) (03marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. Complete the following equations and in each case outline the mechanism for the reaction
2. CH3CH = CH2 h+ӏH2O (02 marks)

 Heat

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. CH3CH = CH2

H+

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. State what is observed and write equations for the reactions that would take place when sodium hydroxide solution is added to;
2. Iron (II) sulphate solution

Observation (1 ½ marks)

………………………………………………………………………………………………………………………………………………………………………………………………

Equation (1 ½ marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. Chromium (III) sulphate solution

Observation (1 ½ marks)

………………………………………………………………………………………………………………………………………………………………………………………………

Equation (1 ½ marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. (a) State Raoults’ law (01 mark)

………………………………………………………………………………………………………………………………………………………………………………………………

………………………………………………………………………………………………

 (b)A solution contains 1 mole of trichloro methane and 4 moles of propanone has a vapour pressure of 0.4 atmospheres at 25oC. At this temperature the vapour pressures of pure trichloro methane and propanone are 0.359 and 0.453 atmospheres respectively.

(i) Calculate the vapour pressure of the solution. State your assumption(s)

………………………………………………………………………………………………………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

(ii) State whether trichloro methane and propanone form a minimum or maximum boiling azeotrope. Give a reason.

………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. (a) A chloride of chromium X contains 19.512% chromium, 39.96% chlorine and the rest water of crystallization.

Determine:

1. The empirical formula of X (1 ½ marks)

………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

1. The molecular formula of X (Vapour density of X is 133.25) (1 mark)

………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. An aqueous solution of X was treated with excess sodium hydroxide solution followed by hydrogen peroxide.
2. State what was observed. (1 mark)

………………………………………………………………………………………………

………………………………………………………………………………………………

1. Write equation for the reaction which took place. (1 mark)

………………………………………………………………………………………………

………………………………………………………………………………………………

1. (a) Draw the structure and name the shape of the following oxyanions of sulphur

|  |  |  |
| --- | --- | --- |
| Oxyanion  | Structure  | Shape  |
| SO32 –  |  |  |
| S2O32 –  |  |  |

 (02 marks)

1. Write the equation of reaction between
2. S2O3 2 –  and Iodine solution (1 ½ marks)

………………………………………………………………………………………………

………………………………………………………………………………………………

(ii) S2O82- and potassium iodide (1 ½ marks)

………………………………………………………………………………………………………………………………………………………………………………………………

**SECTION B (54marks)**

***Attempt only six questions in this section***

1. Elements tin and lead belong to group (IV) of the periodic table. Describe the reactions of the elements with;
2. Water (03 marks)

………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. Concentrated sulphuric acid (03 marks)

………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. Alkalis (03 marks)

………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. (a) Define the terms
2. Eutectic point (2 marks)

………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………

1. Eutectic mixture (2 marks)

………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………

(b) Two metals A and B form an eutectic mixture with an eutectic point of 80oC and 72% B. Draw a well labeled phase diagram for the two metals. (Melting points of A and B are 242 oC and 185 oC) (04marks)

 (c) State two similarities between eutectic mixture and a metal (1 mark)

………………………………………………………………………………………………

………………………………………………………………………………………………

1. The molecular formula of an organic compound Q is C4H8O. Compound Q forms a yellow precipitate with Brady’s reagent
2. Write the structural formulae and names of all the possible isomers of A (2 marks)

………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. Q reacted with iodine in an aqueous solution of sodium hydroxide to form a yellow precipitate
2. Identify Q (01 mark)

………………………………………………………………………………………………

………………………………………………………………………………………………

1. Write the equation for the reaction which took place (1 ½ marks)

………………………………………………………………………………………………

………………………………………………………………………………………………

1. Write;
2. equations indicating conditions to show how Q can be converted to an alkene

(2 marks)

………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. equation and outline the mechanism for the reaction between Q and Brady’s reagent (2 ½ marks)

………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. (a) Explain the term buffer solution (02marks)

………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

(b) The graph below shows the changes in PH during the titration of a weak acid ( ethanoic acid) with a strong alkali (sodium hydroxide)

14 Z

12 Y

10

 8

 6 x

 4 w

 2

 Volume of NaOH(aq) added

 •

1. Explain the shape of the graph (5 ½ marks)

………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. Calculate the PH at mid point of titration (Ka CH3COOH) = 1.8 x 10 – 5 moldm-3) (1 ½ marks)

………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. (a) Outline the industrial preparation of sulphuric acid from zinc sulphide (*use equations* *only*) (06 marks)

………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

(b) Write equation of reaction between sulphuric acid and;

 (i) Calcium phosphate (1½ marks)

………………………………………………………………………………………………

………………………………………………………………………………………………

 (ii) Propon – 2– ol (1 ½ marks)

………………………………………………………………………………………………

………………………………………………………………………………………………

1. Name a reagent(s) that can be used to distinguish between the following pairs of compounds. In each case state what would be observed if the reagent is treated separately with each member of a pair
2.

 COCH2CH3 and COCH3

Reagent: (01 mark)

………………………………………………………………………………………………

………………………………………………………………………………………………

Observations (02 marks)

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

1. CH3CH2CH2CH2OH and (CH3)3COH

Reagent (01 mark)

………………………………………………………………………………………………

………………………………………………………………………………………………

Observations (02 marks)

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

NH2

1. CH3CH2CH2CH2NH2 and

Reagent; (01mark)

………………………………………………………………………………………………

………………………………………………………………………………………………

Observations (02 marks)

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

1. (a) (i) What is the chemical nature of soap (01mark)

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

(ii) A fat has a molecular formula C17H35COOR. Write an equation for the reaction leading to the formation of soap from the fat. (2 marks)

………………………………………………………………………………………………

………………………………………………………………………………………………

(b) (i) Explain why soapless detergents are better cleansing agents than soaps. (3 marks)

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

(ii) Starting from CH3(CH2)10 CH2OH show how a soapless detergent can be synthesized.

 (03 marks)

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

1. Explain the following observations
2. Hydrofluoric acid is a weaker acid than hydro bromic acid. (03 marks)

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

1. The PH of a solution of chromium (III) chloride is less than 7. (03 marks)

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

1. Ammonia is a weaker base than a ethyl amine. (03 marks)

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

