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P525/1

**CHEMISTRY**

**PAPER 1**

JULY/AUGUST 2016

2HOURS 45MINUTES

NTUNGAMO PRIVATE SECONDARY SCHOOLS

JOINT MOCK EXAMINATIONS

Uganda Advanced Certificate of Education

**CHEMISTRY**

**PAPER 1**

2HOURS 45MINUTES

**INSTRUCTIONS TO CANDIDATES:**

* Answer all questions in section **A** and **six** questions in section **B**.
* All questions must be answered in the spaces provided.
* The periodic table with relative automatic masses is attached at the end of the paper
* Mathematical tables or non-programmable scientific electronic calculators may be used
* ILLUSTRATE YOUR ANSWERS WITH EQUATIONS WHERE APPLICABLE

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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 | TOTAL |
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**SECTION A (46MARKS)**

**Answer all questions in this section**

1 (i) Name the three types of radiation emitted by a radioactive substance **1½mks**

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(ii) Identify the particles emitted in

(a)  + ………………………… **1mk**

(b) + ………………………… **1mk**

(iii) Complete the following nuclear reaction

+ ……………… + **1mk**

2 (a) 30g of organic compound Y depressed the freezing point of 50g of water by -6.20C. Calculate the relative molecular mass of Y. (freezing point depression constant for water = -1.860C/mole) **3mks**

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(b) When the experiment was repeated using benzene instead of water, a much higher value for molecular mass was obtained. Explain this observation **1½mks**

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3. Complete the following reactions and name the organic products

(a) CH3CH2CH2CH2COOH + PCl5  **1½mks**

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(b) CH3CH2CH2CH2COOH + CH3OH H+  **1½mks**

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(c) n(HOOC(CH2)3 COOH) + n(NH2(CH2)6 NH2) **2mks**

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4 (a) (i) What is the significance of a line spectrum? **1mk**

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(ii) Hydrogen has only one electron. The absorption spectrum for hydrogen consists of many clear lines. Briefly explain how the electron per atom can produce so many lines of absorption **1mk**

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(b) (i) Write the electronic configuration of cobalt. **1mk**

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(ii) Write balanced equations for the following reactions. **1mk each**

CoCl2.6H2O(S) + H2O(l) …………...................................................................

Co2+(aq) + excess NH3(aq) ...............................................................................

Co2+(aq) + NaOH(*aq)* …..................................................................................

5 (a) State Graham’s law  **1mk**

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1.0m

Cotton wool soaked in amine

White ring

Cotton wool soaked in HCl

0.52m

Two pieces of glass wool, one soaked in an amine and the other in concentrated hydrochloric acid were placed at the opposite ends of a glass tube as shown above in the diagram. After some time a white ring was observed 0.52m from the end containing the amine. Calculate the molecular mass of the amine.  **4mks**

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6 (a) What two structural features do the species CO, N2 and CN- have in common? **2mks**

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(b) Why is nitrogen gas so much less reactive than oxygen and fluorine gases? **1mk**

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(c) CO and CN- are very poisonous while N2 is not poisonous. Explain **2mks**

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7. To an aqueous solution of CuSO4.5H2O was added concentrated hydrochloric acid drop-wise until in excess

(a) Name the copper species present in the solution before hydrochloric acid was added **1mk**

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(b) Write the formula of the copper species in the solution containing excess hydrochloric acid **1mk**

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(c) The solution containing excess hydrochloric acid was diluted with water.

(i) State the colour changes that took place.  **1mk**

...................................................................................................................................................... (ii) Write an equation for the reaction that took place **2mks**

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8. 25.0cm3 of a saturated solution of lead (II) chloride required 17.8cm3 of 0.1M Silver nitrate for the complete removal of the chloride ions from the solution at 250C

(a) Calculate the molar concentration of Pb2+ ions in the solution. **3mks**

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(b).Calculate the solubility productof lead (II) chloride at 250C  **2mks**

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9 (a) Butan-2-ol reacts with concentrated Sulphuric acid to give but-2-ene. Write an equation and outline a mechanism for the reaction. **3mks**

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(b) Write equations to show how but-2-ene can be converted to but-2-yne  **3mks**

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**SECTION B (54MARKS)**

**Answer any six questions from this section**

10. When 10cm3 of a hydrocarbon C*x*Hy were exploded with excess oxygen, there was a contraction of 45cm3. On treating the product with sodium hydroxide solution, there was a further contraction of 30cm3. All volumes were measured at s.t.p.

(a) Determine the molecular formular of the hydrocarbon **4mks**

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(b) The hydrocarbon in (a) above was absorbed in concentrated Sulphuric acid at 200C and then hydrolyzed to form a product X

(i) Write equations leading to the formation of X **1½mks**

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………………………………………………………………………………........................................................ (ii) X was treated with acidified potassium dichromate to form a product Y.

Identify Y **1mk**

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(i) State what was observed **½mk**

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(ii) Suggest a mechanism for the reaction that took place **2mks**

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11 (a) Describe briefly how pure copper

(i) Can be obtained from blister copper **3½mks**

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(ii) Can react with mineral acids **3½mks**

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(b) When Copper (I) oxide was added to dilute Sulphuric acid a blue solution and reddish brown precipitate were formed. Explain this observation.  **2mks**

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12. Consider the reaction of Sulphur (IV) oxide with oxygen to produce Sulphur (VI) oxide at 7000C

(i) Write equation for the reaction and show whether reaction is exothermic or endothermic. **1mk**

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(ii) Write the expression for KC for the equation of reaction and give the units **1½mks**

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................................................................................................................................................... (iii) What happens to the [SO3]in the equilibrium mixture if

(a) the temperature is raised from 7000C to 8000C **1mk**

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(b) More oxygen is obtained  **1mk**

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(c) Nitrogen is added to the mixture. **1mk**

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(d) the volume of the reaction vessel is increased  **1mk**

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(iv) The equilibrium mixture of the above reaction at 7000C contain 0.40moles of SO2 0.030 moles of O2 and 1.00 moles of SO3 in 2.0 litre container. Calculate the value for Kc

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**13.** A and B are two different metals capable of forming an alloy of composition AB2. Below is a phase diagram for the mixtures of A and B.

R

673k

673k

573k

T

573k

8

5

3

P

473k

1

473k

2

S

7

Q

6

4

A=0 % composition of A=100

B=100 the mixture B=0

Using the diagram, answer the following questions.

(a) What is the

(i) melting point of A? **½mk**

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(ii) melting point of B?  **½mk**

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(iii) melting point of AB2? **1mk**

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(b) Regions 1 and 8 represent the liquid phase. Identify the regions 2 to 7 shown in the diagram, indicating clearly the composition of each region. **6mks**

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14. Explain clearly each of the following **3mks@**

(a) The aqueous solutions of chromium (II) Cr2+ and chromium (III) Cr3+ are coloured where as that of Copper (I) Cu + is not

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15. The elements contained in the third short period of the periodic table, given in the alphabetical order are Aluminium, Argon, Chlorine, Magnesium, Phosphorus, Silicon, Sodium and Sulphur.

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| Elements | Formula of hydride | Oxidation state of element in hydride | Type of bonding |
| Aluminium |  |  |  |
| Chlorine |  |  |  |
| Magnesium |  |  |  |
| Phosphorus |  |  |  |
| Silicon |  |  |  |

(a) In the table below, write the formulae of the hydrides formed by the elements listed. State the oxidation state of the elements in the hydrides and classify the bonding in hydride as ionic or covalent

(b) The hydrides formed by sodium and Sulphur were separately shaken with water.

(i) Write the equation to show the reaction which took place if any **3mks**

Sodium hydride..........................................................................................................

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Give reasons for your answer.

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16 (a) What is the basic raw materials in the production of soap? What is the chemistry involved in saponification? **3mks**

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...................................................................................................................................................... (b) Give an example of a synthetic detergent **1mk**

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(c) What is the function of

(i) Phosphates in commercial detergent **1mk**

.......................................................................................................................................... (ii) Perborates in commercial detergents **1mk**

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(d) Why is phosphate from detergent a pollution problem? **1mk**

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(e) Margarine is made from unsaturated oils and fats

(i) How is the oil or fat converted into margarine? **1mk**

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(ii) Explain briefly the chemistry involved in the conversion. **1mk**

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17 (a) Prop-1-ene and propanone are two substances that undergo addition reactions

(i) Give the structural formulae for prop-1-ene and propanone **1mk**

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(ii) Name one substance that forms an addition compound with prop-1-ene and one substance that forms an addition compound with propanone **2mks**

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................................................................................................................................................... (b) Benzene may be nitrated by using a mixture of concentrated nitric acid and sulphuric acid

(i) What is the role of concentrated sulphuric acid? **1mk**

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**1mk**

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