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Signature: ................................................ Index No.......................................

**CHEMISTRY**

**Paper 1**

July/August 2022

2¾ hours



WESTERN JOINT MOCK EXAMINATIONS

Uganda Advanced Certificate of Education

**CHEMISTRY**

**Paper 1**

2 Hours 45 Minutes

**INSTRUCTIONS TO CANDIDATES:**

*Attempt* ***all*** *questions in Section* ***A*** *and* ***only******six*** *in Section* ***B****.*

*All questions are to be answered in the spaces provided.*

*Illustrate your answers with equations where applicable.*

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

**SECTION A (46 MARKS)**

*Answer* ***all*** *questions from this section.*

1. Write an ionic equation for the reaction between sodium hydroxide solution and
2. Beryllium oxide. (*1½ marks*)

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1. Lead(IV) oxide. (*1½ marks*)

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1. Silicon hydride. (*1½ marks*)

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1. (a) Draw and name the structures of the following compounds.
2. (*01 mark*)

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1. (*01 mark*)

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(b) The bond angle in ammonia molecule is 107° while that in water molecule is 105°. Explain this difference in bond angles. (*03 marks*)

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1. (a) Explain what is meant by the term **thermosetting plastics**. (*01 mark*)

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(b) Give **one** example of thermosetting plastics. (*½ mark*)

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(c) The following are structures of some polymers.

O

(i)

CN

(ii)

Name the monomer(s) used in formation of each polymer.

Polymer (i)...........................................................................................................

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Polymer (ii)........................................................................................................

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1. State **one** use of polymer in (c)(ii) above. (*½ mark*)

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**R**

**Q**

Boiling point (°C)

100

**P**

**S**

85

100%

0

Composition of acid

The figure above shows boiling point-composition of hydrochloric acid and water system.

1. Identify each of the following. (*02 marks*)

**R**.......................................................................................................................

**Q**.......................................................................................................................

**P**.......................................................................................................................

**S**.......................................................................................................................

1. The vapour pressure of ethanol at 20°C is 43.6 mmHg and that of benzene is 75.2 mmHg. The mixture has 0.09 mole fraction of benzene. Calculate the mole fraction in the vapour phase. (*03 marks*)

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1. Complete the following equations and in each case, write the mechanism for the reaction.

Conc. H3PO4 / heat

OH



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HBr



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1. Iron(II) sulphate is normally used to standardize acidified solution of potassium manganite(VII) solution.
2. Write an equation that takes place during the reaction. (*1½ marks*)

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1. Explain why hydrochloric acid is **not** used to acidify the above reaction. (*2½ marks*)

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1. Describe what would be observed during the reaction in (a) above.

(*02 marks*)

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1. (a) Define the term **second ionization energy**. (*01 mark*)

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(b) The first three ionization energies of element **E** are 740, 1450 and 7750 kJmo-1.

(i) Which group in the Periodic Table does element **E** belong? (*½ mark*)

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(ii) Give a reason for your answer. (*01 mark*)

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(c) Explain why the third ionization energy is a bit high. (*1½ m.arks*)

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1. (a) Amino ethane was dissolved in water at 25°C. Write an expression for

its base dissociation constant (*01 mark*)

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(b) The pH of 0.002M solution of amino ethane is 9.6. Calculate its base dissociation constant, . (*3½ marks*)

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1. (a) Write the general equation for the manufacture of soap. (*1½ marks*)

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(b) Explain the cleaning action of soap. (*03 marks*)

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(c) Write an equation for the reaction between soap solution and hard water. (*1½ marks*)

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**SECTION B (54 MARKS)**

*Attempt* ***only six*** *questions from this section.*

1. (a) Write equations for the reactions of each of the following.
2. Calcium hydride and water. (*1½ marks*)

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1. Beryllium chloride and water. (*1½ marks*)

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1. Lead(IV) oxide and cold concentrated sulphuric acid. (*1½ marks*)

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(b) Explain the following observations: and write an equation of the reaction where possible.

1. Beryllium chloride is a covalent compound. (*2½ marks*)

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1. Aluminium sulphate solution and sodium carbonate form a white precipitate when mixed. (*02 marks*)

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1. (a) Calcium phosphate is sparingly soluble in water. Write an equation for

the solubility of calcium phosphate in water. (*1½ marks*)

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(b) Dilute hydrochloric acid was added to the product in (a). What will be the effect of the acid on the solubility of the calcium phosphate? (*02 marks*)

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(c) A saturated solution of calcium phosphate in water contains 1.4610-4 moles per dm3 at 25°C.

1. Calculate the solubility product of calcium phosphate at 25°C. (*02 marks*)

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1. Calcium phosphate was added to a solution of 0.1M calcium nitrate and mixture shaken to attain equilibrium – at 25°C. Calculate the solubility of calcium phosphate in gramdm-3. (Ca = 40; O = 16; P = 31). (*3½ marks*)

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1. Write a mechanism of the reaction for the formation of:
2. An alkene from 2-bromo-2-methyl propane. (*3½ marks*)

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1. Phenyl ethanoate from phenol. (*03 marks*)

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1. Propyne from 1, 2-dichloro propane. (*2½ marks*)

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13. The expression for the rate law of a certain reaction is given as:

1. Explain the meaning of each term used: (*1½ marks*)
2. ....................................................................................................
3. ...................................................................................................
4. ....................................................................................................
5. How would the rate of the above reaction change if;
6. concentration of is doubled while that of is kept constant.

(*01 mark*)

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1. concentration of is doubled while that of is kept constant.

(*01 mark*)

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1. The following kinetic data was obtained for the reaction below:

|  |  |  |  |
| --- | --- | --- | --- |
| **Concentration of reactants (moldm-3)** | | | **Rate of reaction (moldm-3)** |
|  |  |  |
| 0.01  0.01  0.02  0.02 | 0.01  0.03  0.03  0.03 | 0.10  0.10  0.10  0.20 | 1.7510-6  5.2510-6  1.0510-5  1.0510-5 |

Determine the order of the reaction with respect to; (*03 marks*)

1. Iodide ions

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1. Hydrogen ions

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1. Hydrogen peroxide

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1. Calculate the rate constant of the reaction. (*2½ marks*)

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1. (a) Define the term **buffer solution**. (*01 mark*)

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(b) A solution of 1 dm3 contains 0.12 M ethanoic acid and 0.146 M sodium ethanoate. To this solution was added 0.8 cm3 of 1M hydrochloric acid solution. Determine the pH of the solution.

(1.810-5 moldm-3) (*03 marks*)

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(c) Explain briefly how a solution containing ammonia and ammonium chloride works as buffer solution. (*05 marks*)

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1. The table below shows some elements of the Periodic Table and their melting points.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Element | Mg | A | Cr | Cu |
| Atomic number | 12 | 13 | 24 | 29 |
| Melting point (°C) | 650 | 661 | 1830 | 1083 |

1. Write down the electronic configuration of aluminium, chromium and copper. (*1½ marks*)

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1. Explain why chromium has a high melting point than magnesium.

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1. Write equation of the reaction between sodium hydroxide solution and the oxide of chromium. (*1½ marks*)

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1. Explain the lower value of copper than chromium. (*1½ marks*)

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1. Write equations to show how each of the following conversions can be effected and indicate the reagents and conditions.
2. C6H5CH2OH to benzene. (*2½ marks*)

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1. Methyl ethonoate from bromo ethane. (*03 marks*)

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1. CH3CH2OH to propene. (*3½ marks*)

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1. Using an equation in each case, explain what would be observed in each of the following reactions.
2. Concentrated hydrochloric acid is slowly added to a solution of cobalt(II) sulphate. (*03 marks*)

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1. Sodium thiosulphate solution for titrations should be freshly prepared.

(*03 marks*)

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1. Ammoniacal copper(I) chloride solution is slowly added to propyne in a test tube. (*03 marks*)

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**THE PERIODIC TABLE**

**END**