**Name** ……………………………………………**Centre/Index No**………/……

**Signature** …………………………………

**P525/1**

**CHEMISTRY**

**Paper 1**

**August, 2019**

**hours.**

### JINJA JOINT EXAMINATIONS BOARD

#### **Uganda Advanced Certificate of Education**

##### MOCK EXAMINATIONS –AUGUST, 2019

**CHEMISTRY**

(Principal Subject)

Paper 1

2 hours 45 minutes.

**INSTRUCTIONS TO CANDIDATES:**

# Answer ALL questions in part A and Six questions from part B.

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

The Periodic Table with relative atomic masses is provided at the back.

## ***For Examiner’s Use Only***

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

##### PART A (46 MARKS)

**Attempt all questions in this section**

1. (a) Calculate the oxidation state of:

(i) Nitrogen in (1 mark)

(ii) Chromium in (1 mark)

(b) State what is observed and in each case write equation for the reaction that takes place when

(i) acidified potassium dichromate(VII) solution is added to an aqueous solution of sodium nitrite. (2 marks)

(ii) dilute hydrochloric acid is added to aqueous sodium chromate solution.(2 marks)

2. (a) Complete the following reactions and in each case name the main organic product.

(i)

(1½ marks)

**Br2 / H2O**

(ii) (1½ marks)

(CH3COO)2 Ca

**heat**

(b) Write the mechanism for the reaction in a(i) (3 marks)

3. A solution containing 0.368g of methanoic acid in 50g benzene freezes at 5.093oC

(a) Calculate the relative molecular mass of methanoic acid. (3marks)

[ The freezing point of pure benzene is 5.533oC and Kf = 5.5oC mol-1Kg-1]

(b) Comment on the value obtained in (a) (2 marks)

4. The table below shows the melting points of magnesium halides.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Formula of halide | Mg F2 | Mg Cl2 | Mg Br2 | Mg I2 |
| Mpt(oC) | 1263 | 714 | 711 | 634 |

(a) State how the melting point vary (1 mark)

(b) Explain your answer in (a) (3m arks)

5. Compare the reactions on carbon and silicon with

(i) Concentrated nitric(V) acid. (2½ marks)

(ii) Concentrated sodium hydroxide. (2½ marks)

6. (a) Write the electronic configuration of;

(i) copper(I) ion (½ mark)

(ii) copper(II) ion (½ mark)

(b) The standard electrode potentials for some reactions are given below. Eo(W)

(i) Cu+(aq) + e- Cu(s) + 0.52

(ii) Cu2+(aq) +e- Cu+(aq) + 0.16

Use the above data to calculate the e.m.f value for the reaction given below

(iii) 2Cu+(aq) Cu(s) + Cu2+(aq) (2 marks)

(c) Comment on the relative stabilities of the Copper(I) ion and Copper(II) ions.

(1½ marks)

7. (a) Write equation(s) to show how;

(i) Sulphur dioxide can be converted to Sulphuric acid. (3 marks)

(ii) Calcium Superphosphate fertilizer can be formed from Sulphuric acid.

(1½ marks)

(b) State one other use of Sulphuric acid. (½ mark)

8. The boiling point composition phase diagram for water-hydrochloric acid mixture at 760mmHg is given below;

(a) (i) label the phases;

P\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (½ mark)

Q\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (½ mark)

R\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (½ mark)

(ii) What do curves Y and Z represent?

Y\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1 mark)

Z\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1 mark)

(b) Calculate the percentage composition by mass of hydrochloric acid obtained when the liquid mixture of composition X was steam distilled at 108.5oC and 760mmHg

(Vapor pressure of water at this temperature is 675mmHg) (2 marks)

9. Write equations to show how the following conversions can be effected.

(a) (3 marks)

**Cl**

**to**

(b) (2 marks)

CH3C CH to

CH3COCH3

**SECTION B: 54 MARKS**

**Answer any six questions from the section.**

10. The elements contained in the third short period of the periodic table, given in order of increasing atomic number are sodium, magnesium Aluminium, silicon, phosphorus, Sulphur and chlorine.

(a) Give one example of an element from the above list which forms the class of oxide given below and write the type of bonding in the given oxide.

(i) An acidic oxide (1 mark)

* Element

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Type of bonding in the oxide

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(ii) Amphoteric oxide (1 mark)

* Element

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Type of bonding in the oxide

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(iii) A basic oxide (1 mark)

* Element

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Type of bonding in the oxide

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(b) Classify the elements according to the type of crystal structures below.

(i) Covalent structure (1 mark)

(ii) Molecular structure (1 mark)

(iii) Metallic structure (1 mark)

(c) Write equations for the reaction between

(i) Silicon(IV)oxide and hydrofluoric acid (1 ½ marks)

(ii) Phosphorus and hot aqueous sodium hydroxide solution. (1 ½ marks)

11. Complete the following organic reactions and outline the accepted mechanism.

(a) (3 ½ marks)

**NH2**

+ (CH3 C)2O

O

(b) (5 ½ marks)

o

+ NH2NH2

H+

12. (a) Define the term electrolytic conductivity (1 mark)

(b) The table below shows the conductivity of a solution when a small volume of sodium hydroxide were added to 50cm3 of hydrochloric acid.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Volume of NaOH(cm3) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| K(-2-1cm-1) | 3.90 | 3.35 | 2.80 | 2.27 | 1.72 | 1.11 | 0.62 | 0.76 | 1.19 | 1.62 | 2.0 |

(i) Plot a graph of conductivity against volume of sodium hydroxide (3 marks)

(ii) Use the graph to determine the volume of sodium hydroxide used to neutralize hydrochloric acid. (1 mark)

(iii) Calculate the molarity of sodium hydroxide (1 ½ marks)

(c) Explain the shape of the graph drawn in b(i) (3 marks)

(d) State one other application of conductivity measurements. ( ½ marks)

13. Name the reagent(s) that can be used to distinguish between the following pairs of compounds. In each case state what is observed when each member of the pair is separately treated with the reagent and write equation for the reaction that takes place if any.

(a) Phenylethanol and 2-phenyl propan-2-ol (3 marks)

Reagent:

Observations:

Equation:

(b) 2- aminopropane and dimethylamine (3 marks)

Reagent:

Observations:

Equation:

(c) Phenol and benzoic acid (3 marks)

Reagent:

Observations:

Equation:

14. (a) Differentiate between soap and soap-less detergents (2 marks)

(b) Write equations to show how a soap-less detergent can be prepared from dodecanol

(CH3(CH2)10CH2-OH) (2 marks)

(c) Explain the cleansing action of soap (3 marks)

(d) State the advantage and disadvantage of using a soapless detergent instead of soap in washing.

(i) advantage (1 mark)

(ii) Disadvantage (1 mark)

15. (a)(i) What’s meant by the term solvent extraction. (1 mark)

(ii) State three limitations of solvent extraction (1 ½ marks)

(b) A solute Q is three times as soluble in ethoxyethane as in water.

An aqueous solution containing 4.5g of Q per litre of solution was shaken with ethoxyethane in a separating funnel. Calculate the mass of Q that is extracted by

(i) 50cm3 of ethoxyethane (2 marks)

(ii) two successive 25.0cm3 portions of ethoxyethane (3 ½ marks)

(c) State which of the extractions in (b) is more preferable.

Give a reason for your answer (1 mark)

16. Explain each of the following observations

(a) The bond angles of the hydrides of nitrogen (NH3) and phosphorus (PH3) are 107o and 94o respectively yet the two elements are in the same groupV (3 marks)

(b) The bonds in carbontetrachloride are polar yet the carbon tetrachloride molecule is not polar.

(c) Lead(IV)chloride is covalent whereas lead(II)chloride is predominantly ionic.

(3 marks)

17. (a) What is meant by the term complex ion (1 mark)

(b) Write the formulae and name of the complex ion formed between

(i) Iron(III) ion and cyanide ions (1 marks)

(ii) Aluminium ion and fluoride ions (1 mark)

(iii) Cobalt(III)ion and nitride ions (1 mark)

(c) The molecular formula of a salt is

Cu(NH4) x Cly. ZH2O. (Rmm = 277.5)

(i) A solution containing 1.3888g of the salt gave 2.87g silver chloride when reacted with 𝝀. Calculate the number of moles of chloride ions in the salt. Silver nitrate solution (1 ½ marks)

(ii) When a solution containing 1.388g of the salt was heated with aqueous sodium hydroxide, ammonia liberated neutralized 10cm3 of 1.0M hydrochloric acid.

Calculate the number of ammonium ions in the salt. (1 mark)

(iii) Determine the number of moles of water of crystallization in the salt. (1 ½ marks)

(iv) Write down the molecular formula of salt. (1 mark)