P525/2

**CHEMISTRY**

**PAPER 2**

JULY/AUGUST 2016

2½hrs

WESTERN JOINT MOCK EXAMINATIONS

Uganda Advanced Certificate of Education

**CHEMISTRY**

**PAPER 2**

2HOURS 30MINUTES

**INSTRUCTIONS TO CANDIDATES:**

* Answer **FIVE** questions including **THREE** from section **A** and any **TWO** from section **B**
* Additional questions answered will **NOT BE MARKED**
* Write the answers in the answer sheets provided
* BEGIN EACH QUESTION ON A FRESH PAGE
* Mathematical tables and graph papers are provided.
* Non – programmable scientific electronic calculators may be used

(The Faraday F=96500, K=39.0, Mn = 55, O=16.0, H=1.0)

**SECTION A**

**Answer any three questions**

1 (a) State the law of mass action **2mks**

(b) Potassium Manganate (VI) reacts with water according to the following ionic equation 3MnO42-(aq) + 2H2O (*l*) 2MnO-4 (aq) +MnO2(s) + 4OH. 49.25g of potassium Manganate (VI) are shaken with 1.2moles of water in a 2 litre vessel until equilibrium is attained at 30oC. At equilibrium, 8.96g of potassium hydroxide is formed.

(i) Calculate the equilibrium constant Kc for the reaction at 300C and indicate units **7mks**

(ii) State and explain the effect on the equilibrium constant and equilibrium position if carbondioxide gas was bubbled through the mixture at equilibrium at 300C **4mks**

(c) Discus the effect on equilibrium reaction by

(i) Pressure  **5mks**

(ii) Catalyst **2mks**

2 (a) (i) Describe how group (IV) elements react with chlorine. **7mks**

(ii) Write equations for the reactions between sodium hydroxide solution and the products in a(i)above. **3mks**

(b) The melting points of group (IV) elements of the periodic table are shown in the table below

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Element | C | Si | Ge | Sn | Pb |
| Atomic number | 6 | 14 | 32 | 50 | 82 |
| Melting point/0C | 3550 | 1410 | 937 | 232 | 327 |

(i) Define the term melting point **1mk**

(ii) Plot a graph of melting point against atomic number **4mks**

(iii) Explain the shape of the shape of the graph **5mks**

3 (a) Give full structural formulae for the four compounds having the molecular formula C4H9Br. Give I. U. P. A.C name for each. **4mks**

(b) Three of these compounds A, B and C are described below. Identify these compounds and explain the chemistry involved.

(i) Hydrolysis of A with dilute aqueous sodium hydroxide gave a compound C4H10O. Oxidation of which gave a compound C4H8O, which on warming with iodine and aqueous Alkali formed a yellow precipitate. **7mks**

(ii) Hydrolysis of B gave a compound which was stable in alkaline potassium permanganate solution **4mks**

(iii) Elimination of hydrogen bromide from C by treatment with strong alkali gave a single hydrocarbon C4H8, which on vigorous oxidation gave a compound C3H6O2 **5mks**

4. Explain briefly each of the following

(a) Sodium chloride melts at 8000C whereas Aluminium chloride sublimes at 1800C **4mks**

(b) Nitrogen is gaseous at room temperature whereas phosphorus can exist in several solid forms at room temperature **4mks**

(c) Ethoxyethane boils at 340C and butan-1– o*l* at 1180C although both compounds have the same molecular mass **4mks**

(d) The boiling points of the tetrahalides of group (IV) elements increase from carbon to tin

**4mks**

(e) Graphite and copper are both conductors of electricity **4mks**

**SECTION B**

**Answer any two questions from this section.**

5 (a) Outline, giving all essential conditions, one method for

(i) Increasing the length of a carbon chain **2mks**

(ii) Decreasing the length of a carbon chain. **2mks**

(b) Write equations to show how the following conversions can be carried out. In each case indicate the reagents and conditions **4mks@**

(i) Cyclohexanol from benzene and fuming sulphuric acid.

O

(ii) Phenylethaneamide, NHC-CH3 from benzene- diazonium salt

(iii) CHCl3from propene

H H

(iv) C C from benzene and ethanochloride

H

n

6. Radium, , occurs in group (II) of the periodic table. From your knowledge of the elements of this group, make reasoned, predications of the reaction of radium with

(a) Dry air **3mks**

(b) Hydrogen **3mks**

(c) hydrochloric acid  **3mks**

(d) Sulphuric acid  **3mks**

(e) Choose one of these reactions to explain how you would expect the reactivity of radium to compare with that of the other members of its group. **4mks**

(f) The half-life of a radioactive isotope is 24hours. It is found that a sample of the isotope decays at rate of 4.0x1010 disintegrations per second. Calculate the time needed for the rate of decay to decrease to 2.5x106 disintegrations per second **4mks**

7. Complete the following reaction schemes by identifying all the compounds, giving conditions where required and giving their structural formulae

Hot ethanolic

(a) C2 H4 Br2  **A** HBr **B**  KOH (aq) **C**

KOH

warm

KOH(aq)

D

E

D gives a silver mirror with tollen’s reagent, whereas E does not **8mks**

(b) **F** conc. HNO3  **G** Sn **H** NaNO2 **I 4½mks**

J

Conc. H2SO4

dil.HCl, O0C

Conc.HCL

OH

N=N

(c) C3H7Cl **K** **?** **L** SOCl2  **M**

ethOH

KCN

CH3OH

KOH (aq)

N

**?**

P

P and N are isomers **7½mks**

8. Given the following electrode potentials

1. Mn (aq) + 8H+ (aq) + 5e Mn2+(aq) +4H2O() +1.52v

2. ½S2aq) + e S (aq) +2.01v

3. ½Cl2 (g) + e Cl-(g) +1.36v

(a) Draw a well labelled cell diagram for the cell formed by combining half-cells 1 and 2. **3mks**

(b) Write

(i) the overall cell reaction for the cell formed in (a) above **1½mk**

(ii) Cell notation for the cell formed in (a) above **1½mk**

(c) State what is observed at the anode for the cell formed in (a) above **1mk**

(d) Calculate

(i) the e.m.f of the cell formed in (a) above **2mks**

(ii) the standard free energy change for the cell in (a) above **2mks**

(e) Half –cells 1 and 3 are arranged

(i) State what is observed at each electrode and explain your answer **3mks**

(ii) Write the overall equation for the reaction **1mk**

(f) Describe briefly with aid of a diagram how the standard electrode potential of a chlorine half-cell can be determined **5mks**

**END**