Name ……..Centre/Index No…….

School ……...Signature……..

MOCK SET I EXAMINATIONS 2019

Uganda Advanced Certificate of Education

CHEMISTRY

P525/1

Time: 2 ¾ Hours

Instructions to Candidates

- *This paper consists of two **sections A and B***
- ***Section A** is compulsory*
- *Attempt only **six** questions from **Section B***
- *The periodic table has been attached at the end*

For Examiners Use Only																	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	TOTAL

SECTION A:

(All questions in this section are compulsory)

1. (a) Write the electronic configuration of element **Gallium** (Ga) (½ marks)

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(b) Natural gallium consists of isotopes ^{69}Ga and ^{71}Ga in atomic ratio 3**:**2. The relative isotopic masses of ^{69}Ga and ^{71}Ga are 68.9 and 70.9 respectively. Calculate the approximate relative atomic mass of Gallium. (1 ½ marks)

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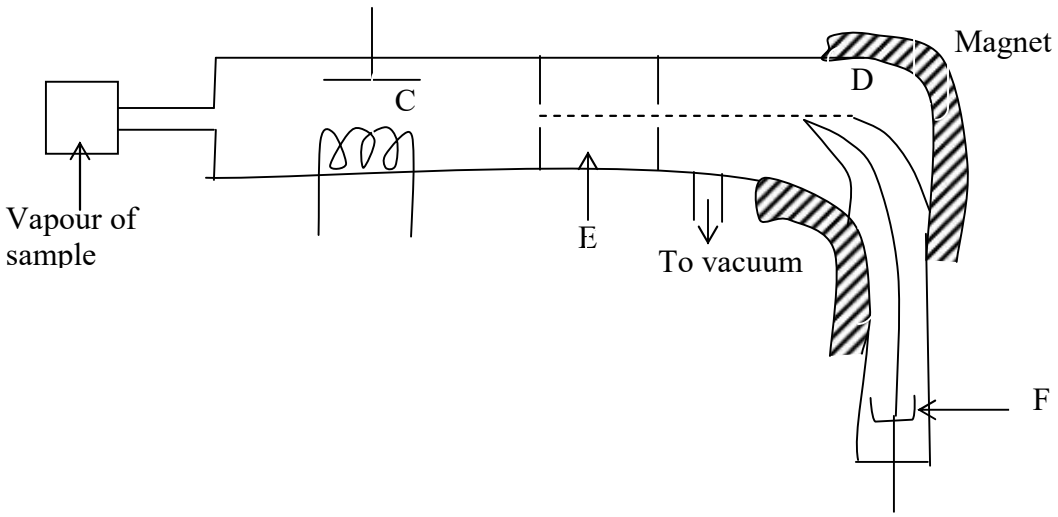
(c) The figure 1.0 below represents a mass spectrometer.



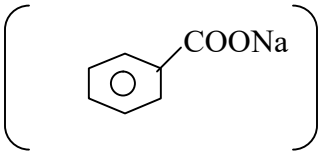
Name and state the function of parts

C ……

D …….

E ……....

F ……....

2. Sodium benzoate 

undergoes hydrolysis.

(a) Write

(i) equation for hydrolysis of sodium benzoate (1 ½ marks)

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(ii) the expression for the hydrolysis constant (Kh) for sodium benzoate

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(½ marks)

(b) The hydrolysis constant (Kh) of a 0.10M solution of sodium benzoate at 25^{o}C is 1.6×10^{-10} mol l^{-1} Calculate the pH of solution.

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3. (a) State three factors that affect first **ionization energy** (1 ½ marks)

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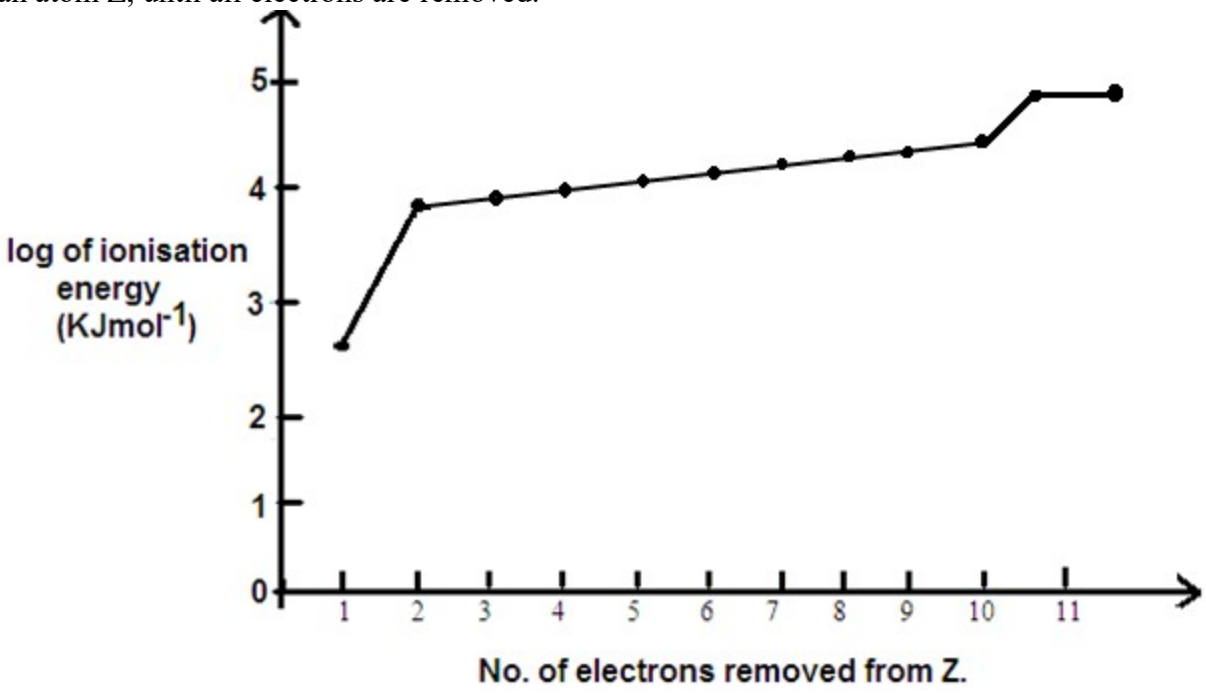
(b) The figure 1.1 below shows the energy required to remove successively each electron from an atom Z, until all electrons are removed.



Explain the shape of the graph (2 ½ marks)

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4. (a) (i) What is meant by the term **thermosetting plastic?** (01 marks)

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(ii) Name two thermosetting plastics (01 mark)

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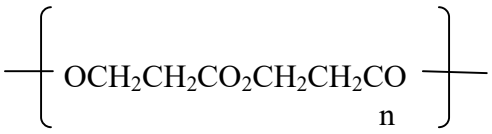
(b) A polymer has the structure



(i) Write the structure of the monomer (01 mark)

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(ii) State the type of polymerization reaction leading to the formation of polymer. (½ marks)

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(c) When 5 x 10^{-3} moles of this polymer was hydrolysed, 9.0g of monomer was obtained. Calculate value of n (2 marks)

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5. (a) What's meant by the term **ebullioscopic constant** (Kb)? (01 mark)

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(b) (i) 2.7g of ethanamide (CH_3CONH_2) was dissolved in 75g of ethanol . Calculate the boiling point of the resultant solution. (ebullioscopic constant, Kb of ethanol is $1.15^oCmol^{-1}kg^{-1}$ and the boiling point of ethanol is 78^oC) (3marks)

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(ii) State any two assumptions made in the calculation in b (i) above. (01 mark)

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6. Complete the following organic reactions and give the systematic (IUPAC) names of the main organic product in each case

(i) $(CH_3)_2C = CH_2 \xrightarrow{HCl}$

Name the product.

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(ii) $HOCH_3 + CH_3CH_2COOH \xrightarrow[\text{Warm}]{\text{Conc } H_2SO_4}$

Name of product:

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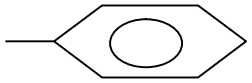
(iii) n $CH_2 = CH$  $\xrightarrow[\text{Heat, high pressure}]{\text{ROOR}}$

Name of product:

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(iv) $(CH_3)_3CCl$ $\xrightarrow[\text{Heat}]{\text{NaOH(aq)}}$

Name of product

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7. (a) State three characteristic properties of copper as a transition metal element. (1½ mark)

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(b) (i) Write the electronic configuration of copper.

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(ii) State the common oxidation states exhibited by copper in its compounds. (01 mark)

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(b) State what is observed and in each case write equation of reaction that takes place when the solution containing Cu^{2+} ions was added to

(i) $1cm^3$ of potassium hexacyanoferrate (II) solution (1 ½ marks)

Observation

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Equation

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(ii) Magnesium powder

Observation (1 ½ marks)

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Equation

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8. (a) What is meant by the term **eutectic mixture?**

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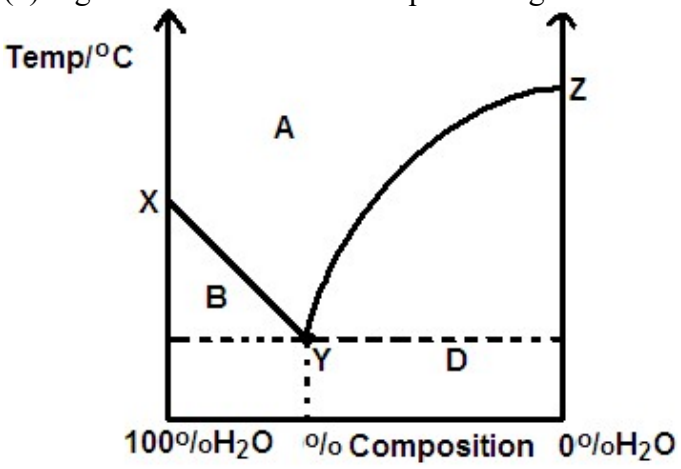
(b) Figure 1.2 below shows the phase diagram for sodium chloride – water system



(i) Name the point X, Y and Z (1 ½ marks)

X ……...

.Y ……..

Z …….....

(ii) Label phases A, B, C and D (2 marks)

A …….

B ……

C ……

D …….....

9. A cell was constructed as shown below
$Pt_{(s)}/Cr^{2+}(aq),Cr^{3+}(aq)$ // $MnO_4^-(aq)$, $Mn^{2+}(aq)$, $H^+(aq)/Pt_{(s)}$
(a)Write equations for the reactions that occur at the:
(i) Anode

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(ii) cathode

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(b) Using the equations in a(i) and a(ii), write the overall cell reaction. (1 ½ marks)

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(c) The electrode potentials for the systems Cr^{2+}/Cr^{3+} and Mn^{2+}/MnO_4^- are – O.4O2 and + 1.52 volts respectively. Calculate the cell voltage. (01 ½ marks)

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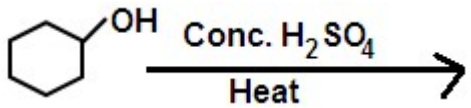
SECTION B:

Answer six questions from this section

10. Complete the following organic reactions and write the accepted mechanisms.
(3 marks @)

a) 

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(b) $(CH_3)_2CO \xrightarrow[H^+(aq)]{Na_2SO_3(aq)}$ (3marks)

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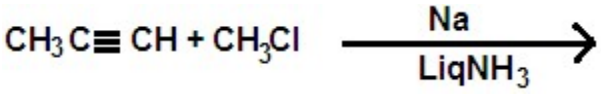
(c)  (3marks)

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11. (a) State factors that can affect melting points of elements or compounds. (2 marks)

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b) The melting points of elements in group IIA in the periodic table are given below

Element	Be	Mg	Ca	Sr	Ba	Ra
Mpt/^{o}c	1556	923	1123	1043	998	973

State the trend and explain the variation in trend of the melting points (05 marks)

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(c) Group (II) metals form few complexes. However, the tendency to form complexes decreases down the group. Explain this observation (02 marks)

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12. State what is observed when the following substance are mixed and in each case illustrate your answer with an equation.

(a) Aluminium powder is added to an aqueous solution of iron (III) chloride**.** (03 Mark)

Observation:

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Equation:

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(b) 2-3 drops of 2,4-dinitrophenylhydrazine are added to a dilute solution of propanone.

Observation;

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Equation:

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(c)Hydrogen sulphide gas is passed through a concentrated solution of nitric acid
Observation;

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Equation:

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13.(a) What is meant by the term**ligands** (01 Mark)

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(b)Explain why transition metals commonly act as catalysts in chemical reactions.

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(c) In each case write equation of reaction catalysed by the following ions/species(1½marks @)

(i) Vanadium pentoxide (V_2O_5) (1 ½ marks)

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(ii) Iron (Fe) (1 ½ marks)

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(iii) Manganese (II) ions (Mn^{2+}) (1 ½ marks)

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(d)Determine the Coordination number and Oxidation State of the central metal atom/ion in the following complexes. (2 Marks)

Complex	Coordination number	Oxidation state
$Fe_6(CN)^{2-}$		
$Cr(H_2O)_6Cl_3$		

14.(a) State conditions under which the **partition law**is valid (1 ½ Marks)

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(b)An aqueous solution of $500cm^3$ of A containing 5.00g of A was extracted by $100cm^3$ of ether and two successive portions of $50.0cm^3$ of ether. (The partition Coefficient of A between ether and water is 90)
Calculate the mass of A extracted by

(i) $100cm^3$ of ether (2 ½ Marks)

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(ii) Two successive portions of $50.0cm^3$ of ether (4 ½ Marks)

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(c) Comment on the results inb(i) and b(ii) (01 Mark)

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15. Name the reagent that can be used to distinguish between the following organic compounds in each state what is observed if each compound is separated treated with the reagent.

(a) $(CH_3)_2C=O$ and $CH_3CH_2\overset{\overset{O}{\|}}{C}-H$ (03 Marks)

Reagent(s)

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Observations

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(b) $(CH_3)_3COH$ and $(CH_3)_2CHOH$

Reagents

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Observations

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(C) HCOOH and HOOCCOOH

Reagent

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Observations

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16. Hydrogen iodide decomposes when heated according to the equation

$2HI\ (g) \rightleftharpoons H_2(g) + I_2(g) \qquad \triangle H = {}^{+}11.3KJmol^{-1}$

(a)Write the expression for the equilibrium constant, KC for the reaction. (1mark)

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(b)3.10g of hydrogen iodide was heated in $600cm^3$ bulb at 400 ^oC. When Equilibrium was attained the bulb was rapidly cooled to room temperature and broken under potassium iodide solution. The iodine formed from the decomposition required $13.40cm^3$ of 0.2M sodium thiosulphate solution for complete reaction.

(i)Why was the bulb rapidly cooled? (1 ½ Marks)

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(i) Calculate the value of the equilibrium constant (K_C) at 400^oC (05 Marks)

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(c)State what could happen to the value of K_C when

(i) Temperature is increased. (½ marks)

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(ii) Neon gas is added. (½ marks)

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(iii) Volume of buld is increased to $1000cm^3$. (½ marks)

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17. Draw the structure and name the shape adopted by the following molecules.

Molecule	Structure	shape
$BeC1_2$		
H_2S		

(b) Explain why the molecules adopt the shapes you have stated in (a) above. (2 ½ Marks)

(i) $BeCl_2$

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(ii) H_2S (2 ½ Marks)

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END