Name of School:……

Candidate's Name:……

Centre No./Index No: ……. Signature:……

P525/1
CHEMISTRY
Paper 1
2 ¾ Hours

ELITE EXAMINATION BUREAU MOCK 2016

Uganda Advanced Certificate of Education

CHEMISTRY

Paper 1

2Hours 45 Minutes

INSTRUCTIONS TO CANDIDATES

- ✓ This paper consists of two sections A and B
- ✓ Section A is compulsory.
- ✓ Attempt only six questions in section B
- ✓ Answers must be written in the spaces provided only

For Examiner's Use Only

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

SECTION A (46 Marks)

Answer all questions from this section A

1. (a) Write:

(i) equation for ionization of methanoic acid in water. (1 ½ marks)

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(ii) the expression for the acid constant Ka, for methanoic acid. (½ marks)

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(b) The molar conductivity of 0.1M methanoic acid solution at 25^{o}C is 16.2 scm^{2} mol^{-1}. Calculate the:

(i) Degree of ionisation of methanoic acid at 25^{o}C (molar conductivity of methanoic acid at infinite dilution at 25^{o}C is 40 scm^{2} mol^{-1}) (1 ½ marks)

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(ii) Ionization constant, Ka for methanoic acid at 25°C. (1 ½ marks)

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2. Write equations for the reaction of the following oxides with sodium hydroxide.

(1 ½ marks @)

(a) Chromium (III) oxide.

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(b) Beryllium oxide

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(c) Lead (II) oxide

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3. Complete the following reaction equations and write the accepted mechanism.

a) $CH_3C \equiv CH \xrightarrow[Hg^{2+}, 60^{\circ}C]{H_2O/H^+}$

(3marks)

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b) $CH_3CH = CH_2 + HCl \longrightarrow$

(2marks)

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4. (a) State what is meant by the term **diagonal relationship?**. (1mark)

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(b) State three reasons why lithium and magnesium resemble. (1 ½ marks)

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(c) Mention three properties to show the diagonal relationship between lithium and magnesium. (3marks)

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5. $20cm^3$ of a gaseous hydrocarbon, X was exploded with $100cm^3$ of oxygen. After explosion, the volume and cooling of the residual gas was found to be $90cm^3$. On addition of concentrated potassium hydroxide, the volume reduced to $50cm^3$.

(a) Determine the molecular formula of X. (2marks)

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(b) X reacts with ammoniacal copper (I) chloride solution.

(i) State what is observed (1mark)

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(ii) Write equation for the reaction that takes place. (1mark)

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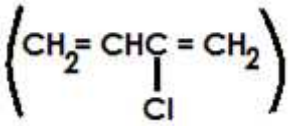
6. (a) Synthetic rubber (Z) was made from (n) monomers with structure.



(i) State the conditions for the reaction. (1marks)

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(ii) Write the equation leading the formation of Z (1marks)

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(iii) Name the type of reaction in a(ii) (½ marks)

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(b) A solution containing 5.0g of Z in 200cm^3 of benzene is found to have an osmotic pressure of 34KPa at 17^{o}C. Calculate

(i) the molar mass of Z (2 ½ marks)

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(ii) the number of monomers (n) (1 ½ marks)

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7. (a) State **Raoult's law** of relative lowering of vapour pressure. (1marks)

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(b)(i) Calculate the vapour pressure of a solution containing 18g of glucose ($C_6H_{12}O_6$) in 50g of water at 60^oC is 150mmHg. (2 ½ marks)

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(ii) State any three assumptions made in b(i) (1 ½ marks)

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8. Sodium propanoate undergoes hydrolysis when dissolved in water.

a) Write equation for the hydrolysis of sodium propanoate (1marks)

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b) Write the expression for the hydrogen constant, Kh (1mark)

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c) The hydrolysis constant, K_h for sodium propaonate is 5.9×10^{-10} moldm^{-3} at 25^oC. What is the concentration of hydrogen ions in solution at equilibrium for a 0.1M sodium propanoate? (2marks)

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9. (a) One of the properties of transition metals is complex ion formation

(i) Define the term **complex ion** (1marks)

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(ii) Explain why transition metals form may complexes (1 ½ marks)

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(b) Complete the table below. (2marks)

Complex ion	Oxidation state of metal ion	Name of complex ion
(i) $Fe(CN)_6^{4-}$		
(ii) $CuCl_4^{2-}$		

SECTION B (MARKS)

Answer six questions from this section

10. a) When red lead oxide, Pb_3O_4 was heated with dilute nitric acid, a solid was formed. Write equation for the reaction. (2marks)

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(b) The mixture from (a) was filtered and the residue warmed with concentrated hydrochloric acid.

(i) State what was observed. (1mark)

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(ii) Write equation for the reaction (1 ½ marks)

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(c) The filtrate from (b) was divided into two portions.

(i) To the first portion was added aqueous potassium iodide. State what was observed and write equation for the reaction. (2marks)

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(ii) The second portion evaporated to dryness and then heated strongly. State what was observed and write equation for the reaction. (2 ½ marks)

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11. Name reagent(s) that can be used to distinguish between the following pairs of compounds and in each case state what is observed. (3marks)

a)

Reagent

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Observations

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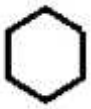
(b)

 and 

Reagent

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Observations.

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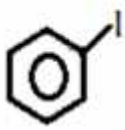
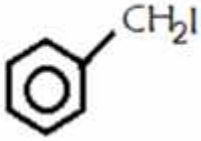
(c)

 and 

Reagent

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Observations.

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12. (a) State three properties in which manganese differs from magnesium.

(1 ½ marks)

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(b) Write equation to show the reduction of manganate (VII) ion in

(i) Acidic medium (1 ½ marks)

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(ii) Alkaline medium (1 ½ marks)

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c) State what is observed when drops of acidified potassium manganate (VII) solution are added to each of the following solutions.

(i) Hydrogen peroxide (2marks)

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(ii) Hot sodium oxalate solution. (2marks)

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(d) State one reason why potassium manganate (VII) is not a good primary standard in volumetric analysis (½ marks)

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13. (a) State three characteristics of a **chemical equilibrium.** (1 ½ marks)

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(b) Dinitrogen tetraoxide dissociates at $40^{o}C$ and 1 atm according to the following equation.

$N_2O_{4(g)} \rightleftharpoons 2NO_{2(g)}$ $\Delta H = +57\ KJmol^{-1}$

(i) Write an expression for the equilibrium constant, Kp (½ marks)

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(ii) Draw a labelled energy level diagram for the reaction in (b) (2marks)

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(c) The reaction mixture in (b) was found to contain 60% by volume of nitrogen dioxide. Calculate the equilibrium constant Kp at 60^{o}C for the reaction. (3marks)

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(e) Explain the effect of increasing pressure on the position of the above equilibrium. (2marks)

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14. Write equations to show how the following compounds can be synthesized and in each case indicate the conditions of reaction.

(a) $CH_2 = CH_2$ from CH_3CH_2COOH (3marks)

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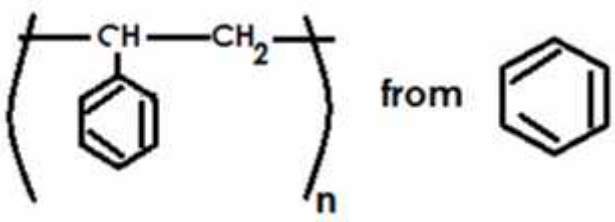
b) (3marks)



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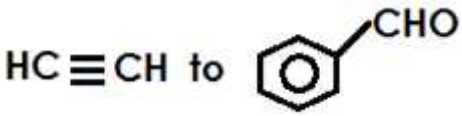
(c) (3marks)



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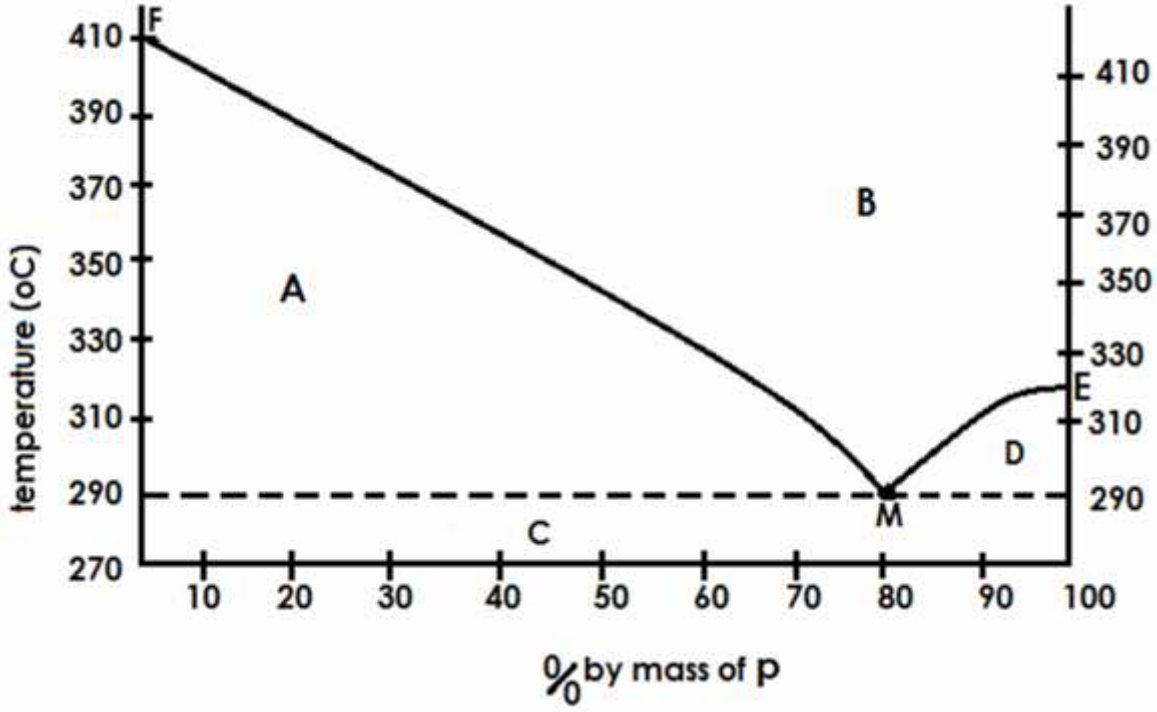
15. The phase diagram for a mixture of metals **P** and **Q** is shown below.



a) Identify the regions A, B, C and D (2marks)

(i) A ……

(ii) B ……

(iii) C ……

(iv) D ……

b) State what point M represents. (1mark)

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c) Using the diagram, estimate the melting point of; (1mark)

(i) P ……..

(ii) Q ……..

d) Describe what would happen if a mixture containing 50% by mass of P and Q is cooled from 410°C to 270°C. (3marks)

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e) State one difference and one similarity between the substance at point M and a pure compound

(i) difference

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(ii) similarity

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16. (a) Compound Y contains by mass 22.86% oxygen, 8.57% hydrogen and the rest carbon.

(i) Calculate the empirical formula of Y (2 ½ marks)

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(ii) When 0.30g of Y is vapourised at 80^{o}C and 700mmHg pressure, it occupied a volume of 134.77cm^{3}. Determine the molecular formula of Y. (3 ½ marks)

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(b) Y forms a yellow precipitate with 2,4-dinitrophenyl hydrazine and does not react with Tollen's reagent. Identify Y

Identify Y. (1mark)

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(c) Write equation for the formation of the yellow precipitate in (b) above. (2marks)

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17. Explain the following observations

(a) Ammonia is a weaker base than ethyl amine (3marks)

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(b) The PH of a 0.1M phenol is 6.5 while that of cyclohexanol is 7 (3marks)

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(c) Hydrofluoric acid is a weaker acid than hydrobromic acid. (3marks)

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END