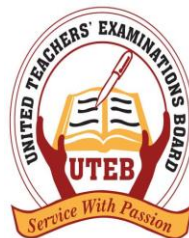


P530/2
CHEMISTRY
Paper 1
Jul./Aug. 2019
2¾ Hours

Name of School:.....

Name of Student:.....

Signature:.....Personal No.....



UTEB JOINT MOCK EXAMINATIONS, 2019
Uganda Advanced Certificate of Education
CHEMISTRY

Paper 1

2 hours 45 minutes

INSTRUCTIONS TO CANDIDATES

- Answer **all** questions in Section **A** and any **six** questions from Section **B**.
- All questions must be answered in the spaces provided.
- Molar gas constant $R = 8.31 \text{ JK}^{-1} \text{ mol}^{-1}$.
- Molar gas volume at s.t.p = 22.4 dm^3 .

SECTION A

Answer **all** questions from this section.

1. Potassium manganate (VII) is often used in volumetric analysis.

(a) Write equation for the reaction between potassium manganate (VII) and hydrogen peroxide in solution. (01 ½ marks)

.....
.....

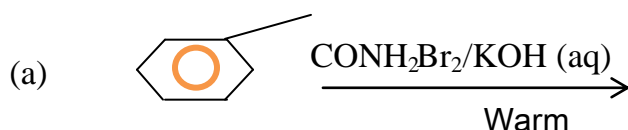
(b) Explain why potassium manganate (VII) is not used as a primary standard in volume in analysis. (02 marks)

.....
.....
.....

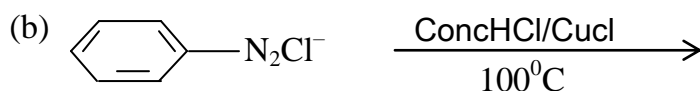
(c) Name one compound that is used to standardize potassium manganate (VII). (½ mark)

.....

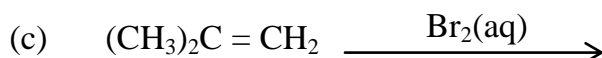
2. Complete the following equations and in each case name the main organic product (01 ½ marks each)



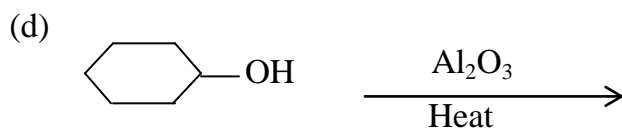
Name of product



Name of product



Name of product



Name of product

3. (a) Explain what is meant by the term solvent extraction. (01 mark)

.....

- (b) A crude sample of lead contained 2% of Silver by mass. Calculate the mass of silver left in 1 kg of lead if it was thoroughly agitates with 1 kg of zinc at 800°C . The solubility of silver in a given mass of zinc is 300 times its solubility in an equal mass of lead at 800°C . (03 marks)

.....

4. State what would be observed and write equation for the reaction that takes place when the following compounds are reacted.

- (a) Acidified potassium dichromate solution with tin (II) chloride solution.

(02 marks each)

Observation

.....

Equation

.....

.....

(b) Aqueous aluminium chloride with sodium sulphite crystals.

Observation

.....
.....

Equation

.....
.....

(c) Red lead oxide with dilute nitric acid.

Observation

.....
.....

Equation

.....
.....

5. (a) What is meant by the term rate constant? (01 ½ marks)

.....
.....

(b) The following results were obtained for two compounds A and B reacting to give product C.



Initial concentration (mol dm ⁻³)	Initial concentration [B] (mol dm ⁻³)	Initial rate [mol dm ⁻³ s ⁻¹]
0.2	0.24	2.0×10^{-4}
0.4	0.24	8.0×10^{-4}
0.6	0.48	3.63×10^{-2}

(i) Deduce the rate equation. (01 mark)

.....
.....

(ii) Calculate the rate constant and give units. (01 ½ marks)

.....

.....

.....

.....

6. In the extraction of aluminium from its ores, the ores is first roasted in air, crushed into a powder and mixed with concentrated sodium hydroxide solution and finally filtered.

(a) (i) Explain what is meant by the term ore. (01 mark)

.....

.....

(ii) Write the name and formula of one ore from which aluminium can be extracted. (01 mark)

.....

.....

(iii) State why the powdered ore is reacted with sodium hydroxide solution and filtered. (01 mark)

.....

.....

(b) Write equation for the reaction between the powdered ore and sodium hydroxide solution. (02 marks)

.....

.....

.....

7. 4.1 g of bromo alkane B was reacted with excess sodium hydroxide solution. The resulting solution was acidified with excess nitric acid and dilute to exactly 250 cm³ in a volumetric flask. 25.0 cm³ of this solution required 33.25 cm³ of 0.1 M silver nitrate solution for complete reaction.

(a) Determine the molecular formula of B. (03marks)

.....

.....

.....

.....

.....

.....

.....

(b) Write the structural formulae and names of the possible isomers of B.

(02 marks)

.....

.....

.....

8. Draw diagrams to show the approximate change in pH for each of the following and explain why the resulting solution is not neutral in both cases.

(a) 0.1 M sodium hydroxide solution is added in portions to 25 cm³ of
0.1 M ethanoic acid.

(03 marks)

.....

.....

.....

.....

.....

.....

.....

(b) 0.1 M hydrochloric acid is added in portions to 20 cm³ of 0.1 M ammonia solution

(03 marks)

.....

.....

.....

.....

.....

.....

9. Name a reagent that can be used to distinguish the following pairs of compounds. State what is observed when each member of the pair is separately treated with the reagent.

(a) Sodium ethanedioate solution and sodium ethanoate. (02 marks)

Reagent

.....
.....

Observation

.....
.....
.....

(b) Tin (II) solution and zinc chloride solution. (02 marks)

Reagent

.....
.....

Observation

.....
.....

SECTION B

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

10. (a) State three reasons as to why fluorine differs in properties from other elements in group VII of the periodic table. (01 ½ marks)

.....
.....
.....
.....
.....
.....

(b) Write equations for the reactions between

(i) Fluorine and cold dilute potassium hydroxide. (01 ½ marks)

.....
.....

(ii) Bromine and hot concentrated potassium hydroxide. (01 ½ marks)

.....
.....

(iii) Fluorine and water. (01 ½ marks)

.....
.....

(c) The values of the lattice energies of potassium halides are given in the table below.

Compound	KF	KCl	KI
Lattice energy KJmol^{-1}	-813	-710	-643

Explain the trend in these values for potassium halides. (03 marks)

.....
.....
.....
.....
.....
.....

11. (a) Liquid P (bp 92.5°C) and liquid Q (bp 90.8°C) form an azeotropic mixture of boiling point 73°C .

(i) What is meant by azeotropic mixture? (01 mark)

.....

.....

(ii) Draw a boiling point – composition diagram for the P – Q mixture. (04 marks)

.....

.....

.....

.....

.....

.....

.....

(b) A solution containing 60 g of RCOOH and 50 g of water was boiled.

(i) Calculate the boiling point of the solution. (03 marks)

($R = 43$, $H = 1$, $C = 12$, $O = 16$, K_b of water = $0.54 \text{ K mol}^{-1} \text{ kg}^{-1}$)

.....

.....

.....

.....

.....

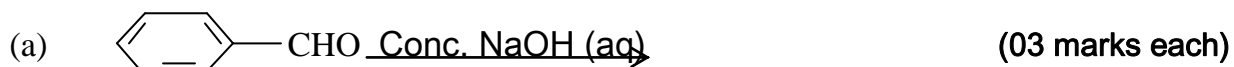
.....

(ii) State any assumption you made in the calculation.

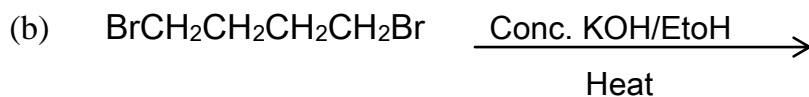
(01 mark)

.....
.....

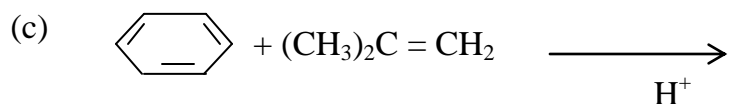
12. Complete the following equations and in each case write the accepted mechanism for the reaction.



.....
.....
.....
.....
.....
.....
.....



.....
.....
.....
.....
.....
.....
.....
.....



.....

.....

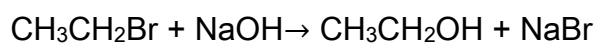
.....

.....

.....

.....

13. Ethyl bromide reacts with aqueous sodium hydroxide as in the equation.



(a) Name the reaction. (01 mark)

.....

.....

(b) (i) Write the rate equation for the reaction between the hydroxide and ethyl bromide. (01 mark)

.....

.....

(ii) Outline a mechanism for reaction involved. (02 marks)

.....

.....

.....

.....

(iii) Sketch a labelled diagram to show an energy profile for the reaction. (03 marks)

.....

.....

.....

.....

.....

.....

.....

(c) Write equation to show how $\text{CH}_3\text{CH}_2\text{Br}$ can be converted to $\text{HOCH}_2\text{CH}_2\text{Br}$.

(02 marks)

.....

.....

.....

.....

.....

14. (a) A compound K contains 63.7% lead, 14.8% carbon, 1.8% of hydrogen and the rest being oxygen. When vapourised, 0.225g of K occupies 15.5 cm^3 at 760 mmHg and 273k.

(i) Calculate the empirical formula of K. (02 marks)

.....

.....

.....
.....
.....
(ii) Deduce the molecular formula of K. (03 marks)

.....
.....
.....
.....
.....

(b) Compound K decomposed on heating forming yellow residue on cooling and a colourless vapour that turned limewater milky and formed yellow precipitate with 2, 4 – dinitrophenyl hydrazine in presence of sulphuric acid.

(i) Write the name and structural formula of compound K. (01 mark)

.....
.....
.....

(ii) Write equation leading to the formation of the yellow precipitate. (01 ½ marks)

.....
.....
.....
.....
.....

15. Water boiled at 100° at a pressure of 760 mmHg.

- (a) When atmospheric pressure is reduced to 660 mmHg, water boiled at 96°C . explain why the boiling point is reduced. (03 marks)

.....

.....

.....

.....

.....

- (b) When 0.746g of potassium chloride is dissolved in 100 g of water, the solution boiled at 100.11°C at a pressure of 760 mmHg.

- (i) Explain why the boiling point changes on adding potassium chloride.

(03 marks)

.....

.....

.....

- (ii) From the information given, calculate the boiling point constant, K_b . (03 marks)

.....

.....

.....

.....

.....

.....

.....

16. The table below shows the decomposition temperature of carbonates of elements of group (II) in the periodic table.

Carbonate	BeC ₃	MgCO ₃	CaCO ₃	BaCO ₃
Decomposition temperature (0 ⁰)	100	350	900	1350

- (a) (i) State how the thermal stability of carbonates of the element vary in the group. (01 mark)

.....

.....

- (ii) Explain your answer in (a) (i) above. (03 marks)

.....

.....

.....

.....

- (b) State three properties in which magnesium resembles lithium in group (I).

(03 marks)

.....

.....

.....

- (c) Name a reagent(s) can be used to distinguish between Ca²⁺ and Ba²⁺ and state what would be observed if each of the ions is treated with the reagents you have named.

Reagent(s)

.....

.....

Observation

.....

.....

.....

17. Write equations to show how the following compounds can be synthesized. In each case indicate the conditions and reagents for the reaction.



.....

.....

.....

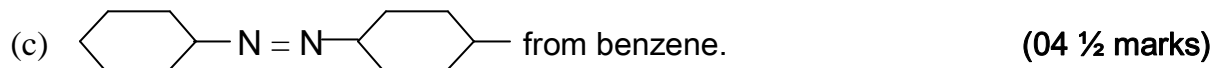
.....



.....

.....

.....



.....

.....

.....

End