Name ……**Centre/Index No**……/……

Signature ……

KIIRA COLLEGE BUTIKI

Uganda Advanced Certificate of Education

CHEMISTRY

(Principal Subject)

Paper 1

LOCK DOWN REVISION QUESTIONS

PART A

Attempt all questions in this section

1. (a) The enthalpies of some reactions are given below.

		$\Delta H^{\theta}(KJmol^{-1})$
(i)	$H_{2(g)} \longrightarrow 2H_{(g)}$	+432
(ii)	$H_{(g)} + e^{-} \longrightarrow H^{-}_{(g)}$	-72
(iii)	$Na_{(s)} \longrightarrow Na_{(g)}$	+107
(iv)	$Na_{(g)} \longrightarrow (Na^{+}_{(g)} + e^{-}$	-494
(v)	$Na_{(s)} + {}^{1}/_{2}H_{2(g)} \longrightarrow NaH_{(s)}$	-57

Calculate the lattice energy of sodium hydraide (3 marks)

(b)(i) From your answer in (a); state whether sodium hydride is a stable compound or not. (½ mark)

(ii)Give a reason for you answer in b(i) (1 mark)

2. Complete the following equations and write the IUPAC names of the main organic product in each case.

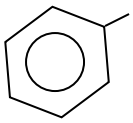
(a) $CH_3Br \xrightarrow{CH_3COO\text{-}Ag^+}$ (1 mark)

Name of product (½ mark)

(b) $(CH_3)_3COH \xrightarrow[\text{Heat}]{\text{Conc } H_3PO4}$

(1 mark)

Name of product (½ mark)

(c)  $\xrightarrow[\text{reflux}]{NaOH / CH_3CH_2Cl}$ (1 mark)

Name of product (½ mark)

3. State the conditions and write equation for the reaction between nitric acid and

(i) Sulphur (2 ½ marks)

(ii) Tin (2 ½ marks)

4. The electrode potentials of $S_2O_8^{2-}{}_{(aq)} / SO_4^{2-}{}_{(aq)}$ and $I_{2(aq)} / I_{(aq)}$ are + 2.01v and +0.54v respectively

(a) Write the;

(i) cell notation of the cell formed when the half cells are combined (1 mark)

(ii) overall cell reaction (1 ½ marks)

(b)(i) Calculate Gibbs free energy for the cell in (a)
(Faraday's constant = 95600c) (2 marks)

(ii) State whether the cell reaction is feasible or not. Give a reason for your answer. (1 mark)

5. State what would be observed and write equation for the reaction that takes place when;

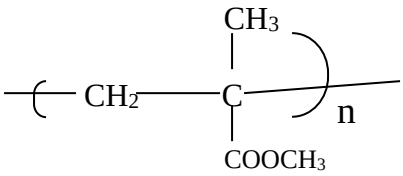
(i) benzene is warmed with a mixture of concentrated nitric acid and concentrated sulphuric acid (2 marks)

(ii) dilute sulphuric acid was added to copper(I)oxide (2 ½ marks)

(iii) aluminium powder was added to aqueous solution of iron(III)chloride

(2 marks)

6. Perspex is a polymer of structure:



(a) Name the reaction leading to the formation of Perspex (½ mark)

(b) Write the structure and give the IUPAC name of the monomer used to manufacture Perspex (2 marks)

(c) A solution containing 5.5g of Perspex in 1dm3 of benzene has an osmotic pressure of 6.796×10^{-2} atmospheres at 25°c
Calculate the
(i) molecular mass of Perspex (2 marks)

(ii) value of n (1 mark)

(d) state one application of perspex (½ mark)

7. The melting points of some of the chlorides of group II elements of the periodic table are given in the table below.

Formula of chloride	$MgCl_2$	$CaCl_2$	$SrCl_2$	$BaCl_2$
Melting point (^oc)	708	772	878	967

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

(b) Explain your answer in(a) (3 marks)

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

(a) propan-1-ol from propyne (3 marks)

(b) Bromocyclohexane from hydroxybenzene (2 ½ marks)

9. The conductivity of a 0.0634 $moldm^{-3}$ solution of 2-hydroxy propanoic acid was found to be 1.138×10^{-3} Scm^{-1} and the molar conductivity at infinite dilution at 25°c is 388.5 $5cm^3mol^{-1}$

Calculate the,

(i) pH of solution (2 marks)

(ii) acid dissociation constant, Ka at 25°c. (2 ½ marks)

SECRTION B (54 MARKS)

(Attempt only six questions from this section)

Addition questions answered will not be marked.

10. An organic compound (R) contains 58.8% carbon, 9.8% hydrogen and the rest oxygen.

(a) Calculate the empirical formula of R. (2 ½ marks)

(b) Determine the molecular formula of R
(RFM of Y = 102) (1 ½ marks)

(c)(i) R reacts with aqueous sodium hydroxide under reflux to produce propan-1-ol as one of the products. Identify R (1 mark)

(ii) Write an equation to show how R can be synthesized from propan-1-ol and indicate a mechanism for the reaction. (4 marks)

11. Sulphur dioxide and oxygen react to form sulphur trioxide according to the equation ;

$$2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}; \quad \Delta H = -ve$$

(a) (i) Write the expression for the equilibrium costant, Kp for the reaction (1 mark)

(ii) When 3 moles of sulphur dioxide were made to react 2 moles of oxygen at 450^{o}c in a 1dm3 vessel, the equilibrium mixture was found to contain 20% sulphur dioxide at 50atm.
Calculate the equilibrium constant Kp for the reaction. (4 marks)

(b) State giving reasons, how the concentration of sulphur trioxide at equilibrium would be affected when;
(i) Pressure is increased (1 ½ marks)

(ii) temperature is increased (1 mark)

(iii) Helium is added at constant pressure (1 ½ marks)

12. (a)(i) Write the general electronic configuration of group IV elements of the periodic table. (1 mark)

(ii) State the common oxidation states exhibited by group IV elements. (1 mark)

(b)(i) Give three properties in which carbon shows a different behavior from other group IV elements. (3 marks)

(ii) Explain your answer in b(i) (1 ½ marks)

(c) Lead(IV) oxide was added to aqueous manganese(II) nitrate followed by concentrated nitric acid and the mixture heated.

(i) State what was observed (1 mark)

(ii) Write equation for the reaction that took place. (1 ½ marks)

13. (a) The data showing the pH changes during the titration of 0.1Moldm^{-3} solution of sodium hydroxide against 10cm^3 of aqueous ethanoic (acetic) acid is given in the table below.

Volume of NaOH (cm^3)	0.0	2.0	4.0	6.0	8.0	10.0	14.0
pH	2.9	4.3	4.7	5.2	6.4	12.0	12.4

Plot a graph of pH against the volume of sodium hydroxide. (3 marks)

(b) Use your graph to determine the pH at equivalence point and volume of sodium hydroxide used to neutralize the acid.

(i) pH at equivalence point (1 mark)

(ii) volume of sodium hydroxide used to neutralize the acid. (1 mark)

(c) Calculate the molarity of ethanoic (acetri) acid. (2 ½ marks)

(d) The pH range for some indicators are given in the table below.

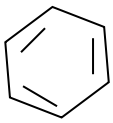
Indicator	pH range
Methyl orange	3.2 – 4.4
Phenolphthalein	8.3 – 10.0
Cresol red	7.2 – 8.8

Which of the indicators is suitable for this titration?

Give a reason for your answer. (1 ½ marks)

14. Complete the following equation(s) and write the mechanism(s) for the reaction(s) leading to the formation of major organic products.

(a) $CH_3CHO \xrightarrow{NH_2NH_2}$ (3 marks)

(b)  $\xrightarrow{CH_3COBr / FeCl_3}$ (3 marks)

(c) $(CH_3)_3CCl \xrightarrow{CH_3CH_2OH / NaoH}$ (3 marks)

15. (a) Describe the reactions of group II elements with water (5 marks)

(b) Potassium chromate solution was added to aqueous barium chloride solution followed by dilute nitric acid drop-wise until in excess.

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

(ii) Write equation(s) for the reaction(s) that took place. (3 marks)

16. (a) Compound F, contains 56.4% phosphorus the rest being oxygen.

(i) Determine the molecular formula of F (F=220 (3 marks)

(ii) Write equations for the reaction between F and water (1 ½ marks)

(b) Write equation(s) for the reaction(s) of excess aqueous sodium hydroxide solution with

(i) Phosphorus (1 ½ marks)

(ii) Chromium (1 ½ marks)

(iii) Silicon (1 ½ marks)

17. (a) Calculate the oxidation state of Bromine in the following ions

(i) BrO^-_3 (1 mark)

(ii) BrO^- (1 mark)

(b) State what would be observed and write equation for the reaction that takes place when potassium bromated(V) solution was added to acidified potassium iodide.

Observation; (2 ½ marks)

Equation;

(c) Sodium hydroxide and chlorine are manufactured by electrolysis of brine in a mercury cell.

(i) Name the anode and cathode

Anode; (2 marks)

Cathode

(ii) Write equation(s) for the reactions that take place at;

Anode; (2 ½ marks)

Cathode;