Name:……..…….. Centre/Index No: ……..…

Signature:……School: ……

P525/1
CHEMISTRY
Paper 1
2¼ hours

STANDARD HIGH SCHOOL ZZANA

Uganda Advanced Certificate of Education

CHEMISTRY

Paper 1

2 hours 15 minutes

INSTRUCTIONS TO CANDIDATES:

Answer **all** *questions in section* **A** *and* **six** *questions in section* **B**.

All *questions* **must** *be answered in the* **spaces** *provided.*

The periodic table with relative atomic masses is provided at the end of the paper.

Mathematical tables and non-programmable scientific electronic calculators may be used.

Illustrate your answers with equations where applicable.

Molar gas constant, R = 8.31 JK^{-1} mol^{-1}

Molar volume of gas at s.t.p is 22.4 litres.

For Examiner's use only																	
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	**Total**

Turn Over

SECTION A: (46 marks)

Answer **all** *questions from this section.*

1. (a) Define the term osmotic pressure. (02 marks)

……

……

……

(b) At 25^oC, a 1.24% solution of a polymer has an osmotic pressure of 3.1×10^{-3} atmospheres. Calculate the formula mass of the polymer. ($R = 0.0821 dm^3\ atm\ mol^{-1}K^{-1}$) (03 marks)

……

……

……

……

……

2. Name **one** reagent that can be used to distinguish between each of the following pairs of compounds and state what would be observed in each case if the reagent is reacted with the compound.

(a) C_6H_5CHO and $C_6H_5CH_2COCH_3$ (03 marks)

Reagent: ……

……

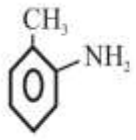
Observations:

……

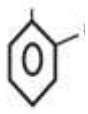
……

……

(b)



and



CH_2NH_2 (03 marks)

Reagent: ……

……

Observations:

……

……

……

3. Propanoic acid undergoes dissociation according to the following equation.

$$CH_3CH_2COOH\,(aq) \rightleftharpoons CH_3CH_2COO^-(aq) + H^+(aq)$$

(a) Write the expression for the acid dissociation constant, Ka. (01 mark)

……

……

(b) Given that the concentration of propanoic acid is $0.1M$ and it's degree of dissociation is 0.01133, calculate the;

(i) pH of propanoic acid, (3½ marks)

……

……

……

……

……

……

……

(ii) acid dissociation constant, Ka. (1½ marks)

……

……

……

4. Complete the following equations and state what is observed in each case when the substances react.

(a) $HC \equiv CH(g) + Cu(NH_3)_2OH(aq) \rightarrow$ …….. (01 mark)

Observation (½ mark)

……

Turn over

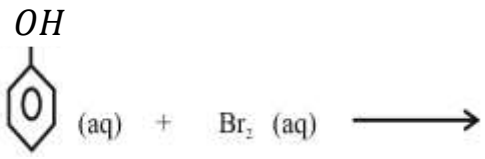
(b) $CH_3\,\underset{\underset{O}{||}}{C}\,CH_3(l) + NaHSO_3(aq) \rightarrow$ …….

(01 mark)

Observation (½ mark)

…….

(c) (01 mark)



Observation (½ mark)

…….

5. The ion MnO_4^{2-} undergoes disproportionation reaction in acidic medium.

(a) What is meant by the term dispropotionation? (02 marks)

…….

…….

…….

(b) State the oxidation state of manganese in MnO_4^{2-}. (½ mark)

…….

…….

(c) Write the equation for the behavior of MnO_4^{2-} in acid medium. (1½ marks)

…….

…….

6. The bond dissociation energies of H_2, Cl_2 and HCl are 435, 242 and 431 $KJmol^{-1}$ respectively.

Using a Born – Haber cyle, calculate the enthalpy of formation of HCl. (05 marks)

…….

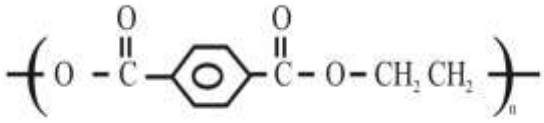
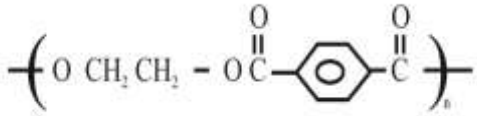
…….

…….

…….

…….

7. (a) For the polymers given below, write the formula and name of the monomers.. (04 marks)

Polymer	Formula of monomers	Name
		
		

(b) Distinguish between thermo-setting and thermo-softening plastics. (02 marks)

…….

…….

…….

…….

8. Haematite is one of the ores from which iron metal is extracted.

(a) Name **two** other substances that are added to the ore before the extraction process is carried out. (01 mark)

…….

…….

(b) Write equation(s) to show how iron metal is extracted from the above ore. (3½ marks)

…….

…….

…….

…….

…….

Turn over

(c) Write the equation for the reaction between calcium oxide and the impurity in the ore. (01 mark)

…….

…….

9. State what would be observed and write equation for the reaction that takes place when the following compounds are added together.

(a) Potassium dichromate(VI) solution in presence of an acid and hydrogen peroxide.

Observation: (½ mark)

…….

…….

Equation: (1½ marks)

…….

…….

(b) Acidified potassium permanganate solution and sodium oxalate solution.

Observation: (½ mark)

…….

…….

Equation: (1½ marks)

…….

…….

SECTION B: (54 marks)

Attempt only **six** *questions from this section.*

10. Name a reagent that can be used to distinguish between each of the following pairs of ions and state what is observed when the reagent is treated with the ions.

(a) Fe^{3+} and Cr^{3+}

Reagent (01 mark)

…….

Observations (02 marks)

……

……

……

……

(b) Al^{3+} and Zn^{2+}

Reagent (01 mark)

……

Observations (02 marks)

……

……

……

……

(c) CH_3COO^- and $C_2O_4{}^{2-}$

Reagent (01 mark)

……

Observations (02 marks)

……

……

……

……

11. Write equations to show how the following compounds can be synthesized. You should include reagents and conditions for the reactions.

(a) $CH_3CH_2CH_2COCl$ from $CH_3CH_2CH_2OH$ (3½ marks)

……

……

……

……

Turn over

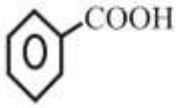
……

……

……

……

……

(b)  from $HC \equiv CH$ (2½ marks)

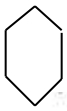
……

……

……

……

……

(c)  from 

(03 marks)

……

……

……

……

……

……

12. (a) Draw and name the shapes of the following species:

(i) PCl_3 (02 marks)

……

……

……

……

(ii) BCl_3 (02 marks)

……

……

……

……

(b) Briefly explain how the species adopt the shapes named in (a) (i) and (ii) above. (05 marks)

……

……

……

……

……

……

……

……

13. A compound ***W*** has a molecular formula $C_4H_{10}O$. When ***W*** is heated with acidified chromium(VI) oxide it gave another compound, which formed silver mirror with a solution of silver nitrate in excess ammonia.

(a) Write the structures and names of possible isomers of ***W***. (03 marks)

……

……

……

……

(b) When ***W*** was heated with concentrated sulphuric acid, compound ***X*** was formed. When ozonolysed and hydrated, ***X*** formed two products, which both gave a yellow precipitate when reacted with a solution of iodine and sodium hydroxide.

(i) Identify **W**. (01 mark)

……

……

(ii) Write a mechanism for the reaction leading to formation of ***X***.(03 marks)

……

……

……

……

(iii) Use mechanism to show how X can be converted to an alcohol. (02 marks)

……

……

……

……

14. (a) Define the term;

(i) solubility of a salt (01 mark)

……

……

(ii) solubility product (01 marks)

……

……

(b) State how the solubility of a sparingly soluble salt can be affected by adding a common salt. (01 mark)

……

……

(c) Magnesium hydroxide is sparingly soluble in water. Write

(i) an equation for the solubility of magnesium hydroxide. (1½ marks)

……

……

(ii) an expression for the solubility product, Ksp of magnesium hydroxide. (01 marks)

……

……

(d) A saturated solution of magnesium hydroxide in water contains $1.44 \times 10^4\ moldm^{-3}$ at 25^oC. Calculate it's solubility product at 25^oC. (3½ marks)

……

……

……

……

……

……

15. (a) Using equations, show how nitric acid is manufactured from ammonia gas. (4½ marks)

……

……

……

……

……

(b) Briefly describe how nitric acid reacts with copper metal. (4½ marks)

……

……

……

……

……

……

……

……

16. (a) Define the term colligative property. (01 mark)

……

……

Turn Over

(b) State **four** colligative properties of a solution. (04 marks)

……

……

……

……

(c) (i) Define the term mole fraction. (01 mark)

……

……

(ii) Calculate the mole fraction of potassium chloride in an aqueous solution containing $10g$ of potassium chloride per $100g$ of water.
$(K = 39, Cl = 35.5)$ (04 marks)

……

……

……

……

……

……

……

……

17. For each of the following equations suggest a possible mechanism for the reaction.

(a) $CH_3\overset{\overset{O}{||}}{C}CH_3 + H_2NOH \xrightarrow{H^+} CH_3\underset{\underset{NOH}{||}}{C}CH_3$ (05 marks)

……

……

……

……

……

……

……

……

……

……

……

……

(b)

$$C_6H_5C \equiv CH + 2HI \rightarrow C_6H_5\overset{\overset{I}{|}}{\underset{\underset{I}{|}}{C}}CH_3$$

(04 marks)

……

……

……

……

……

……

……

……

……

……

……

……

……

……

……

……

Turn Over

THE PERIODIC TABLE

1	2											3	4	5	6	7	8
1 H 1.0																1 H 1.0	2 He 4.0
3 Li 6.9	4 Be 9.0											5 B 10.8	6 C 12.0	7 N 14.0	8 O 16.0	9 F 19.0	10 Ne 20.2
11 Na 23.0	12 Mg 24.3											13 Al 27.0	14 Si 28.1	15 P 31.0	16 S 32.1	17 Cl 35.4	18 Ar 40.0
19 K 39.1	20 Ca 40.1	21 Sc 45.0	22 Ti 47.9	23 V 50.9	24 Cr 52.0	25 Mn 54.9	26 Fe 55.8	27 Co 58.9	28 Ni 58.7	29 Cu 63.5	30 Zu 65.7	31 Ga 69.7	32 Ge 72.6	33 As 74.9	34 Se 79.0	35 Br 79.9	36 Kr 83.8
37 Rb 35.5	38 Sr 87.6	39 Y 88.9	40 Zr 91.2	41 Nb 92.9	42 Mo 95.9	43 Tc 98.9	44 Ru 101	45 Rh 103	46 Pd 106	47 Ag 108	48 Cd 112	49 In 115	50 Sn 119	51 Sb 122	52 Te 128	53 I 127	54 Xe 131
55 Cs 133	56 Ba 137	57 La 139	72 Hf 178	73 Ta 181	74 W 184	75 Re 186	76 Os 190	77 Ir 192	78 Pt 195	79 Au 197	80 Hg 201	81 Ti 204	82 Pb 207	83 Bi 209	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 Ac (227)															

57 La 139	58 Ce 140	59 Pr 141	60 Nd 144	61 Pm (145)	62 Sm 152	63 Sm 150	64 Eu 152	65 Tb 159	66 Dy 162	67 Ho 165	68 Er 167	69 Tm 169	70 Yb 173	71 Lu 175
89 Ac (227)	90 Th 232	91 Pa 231	92 U 238	93 Np 237	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cr 251	99 Es (254)	100 Fm (257)	101 Mv (256)	102 No (254)	103 Lw

1. 1 H ← Indicates atomic number.

2. H 1.0 ← Indicates relative atomic mass.

END