CANDIDATE'S NAME:……..

SIGNATURE: .....

RANDOM NUMBER							
PERSONAL NUMBER							

(Do not write your School/Centre Name or Number anywhere in this booklet.)

P525/1
CHEMISTRY
Paper 1
July/August, 2023
2 ¾ hours

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GLORISO EXAMINATIONS BOARD (GEB)-KAMPALA

SECONDARY SCHOOLS JOINT MOCK EXAMINATIONS, 2023

Uganda Advanced Certificate of Education

CHEMISTRY

Paper 1

2 HOURS 45 MINUTES

INSTRUCTIONS TO CANDIDATES:

- ✓ Attempt **all** questions in **section A** and **six** questions in **section B**.
- ✓ All questions are to be answered in the spaces provided.
- ✓ A Periodic Table, with relative atomic masses, is supplied/attached at the end of the paper.
- ✓ Mathematical tables (3-figures) and non-programmable silent scientific calculators may be used.
- ✓ Where necessary use: Molar gas constant, R = 8.31 J mol^{-1} K^{-1}

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

SECTION A: (46 marks)

*Answer **all** questions in this section*

Question 1:

(a) (i) Explain the term sparingly soluble salt. (½ mark)

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(ii) Write an equation for the reaction for solubility equilibrium of silver (I) Chromate. Deduce the expression for Ksp. (1½ marks)

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(b) Calculate the solubility of silver (I) chromate in potassium chromate (VI) solution of concentration 9.70 gdm^{-3}. (2 ½ marks)

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Question 2:

Name the following compounds.

(a) $(CH_4CH_2CH_2)_2$ N-N=0 (01 mark)

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(b) $CH_3CH_2CH_2CH = NOH$ (01 mark)

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(c) CH_3CHCH_3 with CH_3 branch (01 mark)

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(d) $(CH)_2CCH_3$ with Cl (01 mark)

3

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(e) $-(CH_2C=CHCH_2)_n-$ with CH_3 (01 mark)

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Question 3:

A mixture of aqueous ammonia and ammonium chloride acts a buffer solution.

(a) Define the term Buffer solution (1 mark)

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(b) Describe what happens to the mixture if small amount of the following is added:

(i) Sodium hydroxide solution (1½ marks)

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(ii) Sulphuric acid (1½ marks)

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(c) Calculate the composition of alkaline buffer solution of pH = 9.75 made by mixing aqueous ammonia and ammonium chloride of both same concentration. (Base dissociation constant of ammonia solution at 25°C is $1.78\times10^{-5}\,moldm^{-3}$)

(2½ marks)

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(d) State one biological application of buffer solution (½ mark)

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Question 4:

(a) Copper, like other transitional elements forms compounds in oxidation states +1 and +2. Write the electronic configuration of

(i) Copper (I) ions (½ mark)

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(ii) Copper (II) ions (½ mark)

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(b) The enthalpies of reduction of copper (I) and copper (II) ions to copper are -602 and -795 KJmol^{-1} respectively.

(i) Calculate the enthalpy of disproportionation of copper (I) ions to copper (II) ions and copper. (2 ½ marks)

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(ii) Comment on the stability of copper (I) ions with respect to copper (II) ions. Give a reason for your answer. (01 mark)

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(c) State any two properties that make copper a typical transition metal.

(01 mark)

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Question 5:

The vapour density of a mixture containing nitrogen dioxide and dinitrogen tetraoxide is 38.2 at 27^{o}C.

(a) Calculate the number of moles of nitrogen dioxide in 100g mixture.

(1½ marks)

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(b) (i) Explain the term mole fraction (½ mark)

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(ii) Show that the sum of mole fraction is one for the mixture in (a) (1½ marks)

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Question 6:

Carbon monoxide undergoes disproportionation reaction.

(a) (i) Explain the term disproportionation reaction (½ mark)

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(ii) Write the equation of reaction for disproportionation reaction of carbon monoxide (1½ marks)

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(b) Using equation(s) of reaction(s) only, show that germanium (II) oxide is:

(i) basic (1½ marks)

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(ii) acidic (1½ marks)

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Question 7:

(a) State what would be observed and write equation for the reaction that would take place when:

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(i) Ethanal is mixed with saturated solution of sodium hydrogen sulphite. (1½ marks)

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(ii) Methanol added to a mixture of benzoic acid and concentrated sulphuric acid and the mixture warmed. (1½ marks)

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(b) Write the mechanism for the reaction in (a) (ii) (2½ marks)

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Question 8:

State what would be observed and write the equation of the reaction that would take place if dilute sulphuric acid is reacted with:

(a) Lead (IV) Oxide.

(i) Observation (01 mark)

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(ii) Equation. (1 ½ marks)

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(b) Aqueous sodium chromate (VI)

(i) Observation (01 mark)

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(ii) Equation. (1 ½ marks)

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Question 9:

Name the reagent used to distinguish the following compounds and in each case, state what would be observed if each is treated with the reagent.

(a) $HCOOCH_2CH_3$ and $CH_3COOCH_2CH_3$. (2 ½ marks)

Reagent (s):

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Observation (s):

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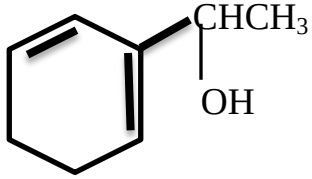
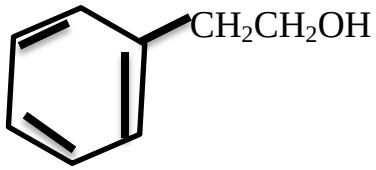
(b)  and  (2 ½ marks)

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Reagent (s):

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Observation (s):

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SECTION B (54 marks)

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

Question 10:

Use equations to show how the following conversions can be effected.

(a) 2, 2-dobromopropane to propan-1-ol (02 marks)

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(b) Ethanoic acid to 4-methyl pentan-2-one (02 marks)

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(c) Iodomethane to iodoethane. (02 marks)

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Question 11:

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(a) State any three chemical properties to show the anomalous behaviour of flourine. (1 ½ marks)

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(b) Describe the chemical reactions of chlorine and flourine with:-

(i) Hot concentrated potassium hydroxide solution. (02 marks)

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(ii) Carbon. (02 marks)

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(c) (i) State the conditions for the reaction between hydrochloric acid and potassium manganate (VII). (½ marks)

12

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(ii) Write the equation for the reaction. (01 mark)

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Question 12:

(a) State Raoult's vapour pressure law. (01 mark)

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(b) The vapour pressure of pure carbon disulphide at a certain temperature is 5333Pa. At the same temperature, a solution of 5g of sulphur is 63 cm^3 of carbon disulphide has a vapour pressure of 52230 Pa when the density of carbon disulphide is 1.27 gcm-3. Calculate the molecular mass of sulphur in carbon disulphide. (02 marks)

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(c) State any two assumptions made in your calculations in (b) above. (01 mark)

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Question 13:

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(a) Dimethylamine partially ionises in water to form alkaline solution. Write an equation for the ionization of dimethylamine in water. (01 mark)

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(b) The pH of OF 0.02M dimethylamine solution was found to be 11.52 at 20^{o}C.

(i) Calculate the molar concentration of the hydroxide ions in the solution . (The ionic product of water at the same temperature is 6.82 x 10 $^{-15}$ mol^{2} dm^{-6}). (1 ½ marks)

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(ii) Determine the ionization constant Ks of dimethylamine from your answer in b(i) above. (1 ½ marks)

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(c) Explain why the ionization constant for ammonia is lower than the value obtained in b(ii) above. (01 mark)

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(d) Calculate the mass of dimethylammonium chloride that should be added to dimethylamine to maintain the same pH. (1 ½ marks)

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(e) State one application of the mixture in (d) above. (½ mark)

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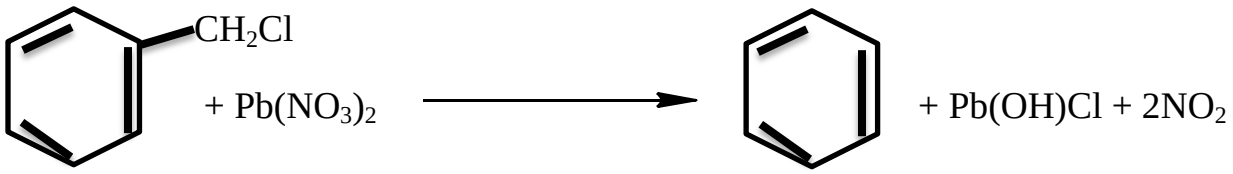
Question 14:

(a) Benzaldehyde can be prepared by hydrolysis of benzyl chloride on heating with lead (II) nitrate solution for about 3 hours according to the equation:



Benzaldehyde is obtained by steam distillation from the reaction mixture and extracted by ether from the distillate. State the reason(s) why:-

(i) Ether is used to extract benzalydehyde from the distillate. (01 mark)

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(ii) The basic chloride of lead is not found in the steam distillate. (01 mark)

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(b) Benzalydehyde is seperately treated with cold potassium hydroxide followed by dilute hydrochloric acid and hydroxylamine in acidic medium.

(i) Write an equation for the reaction between benzaldehyde and potassium hydroxide followed by dilute hydrochloric acid. (01 mark)

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(ii) Suggest a suitable mechanism for the reaction between benzalydehyde and hydroxylamine in acidic medium. (02 marks)

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Question 15:

With equations where necessary , explain each of the following observations:

(a) In conductrimetric titration of aluminium sulphate solution against potassium hydroxide solution, the electrolytic conductivity of the mixture decreases to a minimum value, then increases gradually and finally increases rapidly with excess base added. (02 marks)

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(b) Trimethylamine and aminopropane have almost the same molar mass, however, trimethylamine has a lower boiling point than aminopropane. (02 marks)

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(c) Tin (II) sulphate and iron (III) sulphate can not exist together in aqueous solution. (02 marks)

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Question 16:

Dilead (II) lead (IV) oxide is one of the mixed oxides of lead which can be prepared from lead (II) oxide.

(a) Write equation leading to the formation of dilead (II) lead (IV) oxide. (01 mark)

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(b) Write equation for the reaction between lead (II) lead (IV) oxide and;

(i) hot concentrated hydrochloric acid. (01 mark)

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(ii) hot aqueous sodium hydroxide solution (01 mark)

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(c) Explain why lead (II) oxide is almost insoluble in dilute hydrochloric acid but readily dissolves in concentrated hydrochloric acid. (02 marks)

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Question 17:

For each of the following experiments, state what would be observed and write an equation for each of the reaction that takes place.

(a) To 1cm^3 of barium nitrate solution, 2 spatula end-fulls of zinc powder followed by excess sodium hydroxide solution were added and the resultant mixture heated.

(i) Observation. (½ mark)

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(ii) Equation of reaction. (01 mark)

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(b)To 1cm^3 of silver nitrate solution, 3 drops of sodium hydroxide solution are added followed by excess ammonia solution, 2-methylpropanal is added to the resultant solution and the mixture heated.

(i) Observation (½ mark)

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(ii) Equation of reaction (01 mark)

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(c)To 1cm^3 of Iron (III) chloride solution, 2-3 drops of tin (II) chloride solution was added.

(i) Observation. (½ mark)

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(ii) Equation of reaction. (01 mark)

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(d) Methanol added to a mixture of benzoic acid and concentrated sulphuric acid and the mixture warmed.

(i) Observation. (½ mark)

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(ii) Equation of reaction. (01 mark)

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THE PERIODIC TABLE

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

		139 La 57	140 Ce 58	141 Pr 59	144 Nd 60	147 Pm 61	150 Sm 62	152 Eu 63	157 Gd 64	159 Tb 65	162 Dy 66	165 Ho 67	167 Er 68	169 Tm 69	173 Yb 70	175 Lu 71
		227 Ac 89	232 Th 90	231 Pa 91	238 U 92	237 Np 93	244 Pu 94	243 Am 95	247 Cm 96	247 Bk 97	251 Cf 98	254 Es 99	257 Fm 100	256 Md 101	254 No 102	260 Lw 103

THE END