Name of School:...

Candidate's Name:..

Centre No./Index No: .... Signature:...........................

P525/1
CHEMISTRY
Paper1
2 ¼ Hours
July/ August 2023

KAMSSA JOINT MOCK EXAMINATION
Uganda Advanced Certificate of Education
CHEMISTRY
Paper1
2 Hours 45 Minutes

INSTRUCTIONS TO CANDIDATES

- ✓ This paper consists of two sections A and B
- ✓ Section **A** is compulsory and attempt **only six** questions in section **B**
- ✓ Answers must be written in the spaces provided only
- ✓ The periodic table is provided at the end of the paper.
- ✓ mathematical calculators (3 figure tables or non programmable electronic calculators may be used)
- ✓ Illustrate your answers with equations where aplicable.
- ✓ Where necessary use:
- ✓ **Gas constant R=8.314J/mol/k, sturndard pressure =101325N/m²=760mmHg, 1mole of a gas occupies a volume of 22.4dm³**

For Examiner's Use Only

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

Turn Over

(Attempt all questions)

1(a). What is meant by the term standard enthalpy of neutralization? (01marks)

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(b). Explain why the value for heat of neutralization of a strong acid by a strong base is not the same as that of the formation of water. (01mark)

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(c). 250cm³ of **0.40M** sodium hydroxide solutions were added to 250cm³ of **0.40M** hydrochloric acid in a calorimeter of 500g and specific heat capacity of 400jkg⁻¹k⁻¹. All the three were initially at 17.05°c and the temperature rose to 19.55°c. (Assuming that the specific heat capacity of the two solutions is 4200jkg⁻¹k⁻¹). Calculate the standard enthalpy of neutralization. (03marks)

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2.Propanone can be prepared from propan-1-ol according the scheme below.

$$CH_3CH_2CH_2OH \xrightarrow{A} CH_3CH=CH_2$$

$$CH_3CH=CH_2 \xrightarrow{B} CH_3\overset{Cl}{C}HCH_3$$

$$CH_3\overset{Cl}{C}HCH_3 \xrightarrow{C} CH_3\overset{OH}{C}HCH_3$$

$$CH_3COCH_3 \xleftarrow{D} CH_3\overset{OH}{C}HCH_3$$
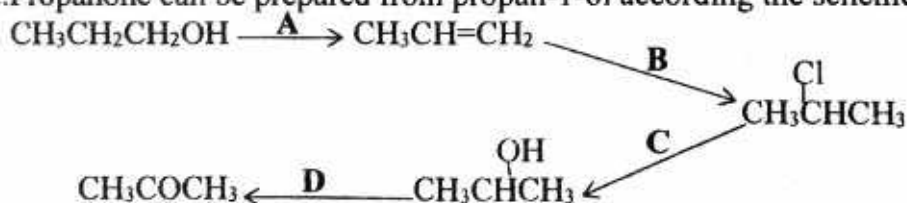
Identify the reagent A, B, C and D and state the condition(s) for the reaction in each case. (06marks)

	Reagent	Condition(s)
A		
B		
C		
D		

3. An iron chloride contains **34.5%** iron and **65.5%** chlorine. When **0.6** of the chloride of iron were strongly heated in a sealed tube of volume $200cm^3$ to a temperature of 600k, the pressure exerted was found to be $4.6 \times 10^4 pa$.

a) Calculate the molecular formula of the iron chloride. (03marks)

b) Draw the structure of the chloride in a gaseous phase. (01mark)

c) Sodium carbonate solution was added to the aqueous solution of the iron chloride
i)   State what was observed. (0½mark)

ii)   Write the equation for the reaction that took place. (01½marks)

4. Write equations to show how the following conversions can be affected
a) Ethene to ethanamide. (02 ½ marks)

b) CH_3CH_2Cl to $H_2C_2O_4$ (02 ½ marks)

5a) State the oxidation state of the central atom in each of the following complex ions and in each case, give the name of the complex ion. (03marks)

Complex ion	Oxidation state of the central atom	Name of the complex ion
$[CuBr_4(H_2O)_2]^{2-}$		
$[Al(OH)_4(H_2O)_2]^{1-}$		
$[Co(NH_3)_4Cl]^{+}$		

b) State 2 reasons why zinc is a d-block element but not a transition element.   (01marks)

6a) State any two colligative properties.   (01marks)

b) A solution of 0.4% polyvinyl chloride, $\text{-[CH}_2\text{-CH]}_n$ in dioxin has an osmotic pressure

$$\begin{array}{c} | \\ Cl \end{array}$$

of 65pa at 20^0c

i)   Calculate the relative formula mass of the polyvinyl chloride.   (02marks)

ii)   Determine the number of monomer units in the polyvinyl chloride.   (02marks)

7. Beryllium exhibits different properties from the rest of the group II elements.
a) Explain what is meant by the term anomalous behavior.   (01mark)

b) What 2 anomalies does beryllium show from group II elements?   (01marks)

c) Give any one property to show that beryllium is anomalous from the group II elements.   (01marks)

8a) Concentrated nitric acid reacts with to form a yellow oily liquid. State the condition(s) under which the reaction occurs and give the IUPAC name of the yellow oily liquid.

(01mark)

Condition(s):

....

IUPAC name:

....

b) Outline the mechanism for the reaction between nitric acid and benzene in presence of the condition(s) given. (02marks)

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c) Show how that yellow oily liquid can be converted to phenol. (02marks)

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9a) State Le Chatelier's principle. (01mark)

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b) Hydrogen and iodine react according to the following equation.

$H_2(g) + I_2(g) \longleftrightarrow 2HI(g)$
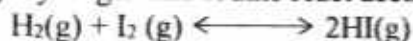
State what would happen to the position of equilibrium when;

i) temperature is lowered. (½marks)

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ii) pressure is increased.

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c) When molar quantities of hydrogen and iodine are reacted in a sealed vessel at 500°c and 10 atmospheres. The equilibrium mixture was found to contain 1.6 moles of hydrogen iodide. Calculate the equilibrium constant Kp for the reaction at 500°c. (03 marks)

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10. Name **one reagent** that can be used to distinguish between each of the following pairs of compounds. In each case, state what is observer if each member of the pair is treated with the reagent?

(a).

and $CH_3CH_2CH_2Cl$ (03 marks)

Reagent:

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Observation:

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(b).

 and   (03 marks)

Reagent:

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Observation:

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(c). $CH_3COCH_2CH_2CH_3$ and $CH_3CH_2COCH_2CH_3$ (03 marks)
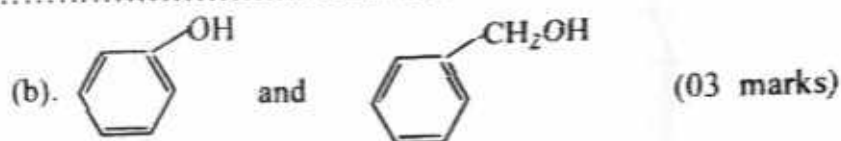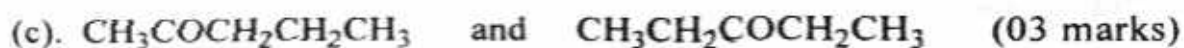
Reagent:

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Observation:

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11a) Write an equation for the reaction between acidified potassium dichromate(vi) solution and potassium iodide solution.

(01½marks)

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b) 1.015g of potassium dichromate (vi) were dissolved in 100cm³ and the solution made up to the mark in a 250cm³ volumetric flask with distilled water. A 25cm³ portion of the solution was added to excess 10% potassium iodide solution followed by 1.5M sulphuric acid and the iodine liberated required 19.2cm³ of sodium thiosulphate solution in presence starch indicator.

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Calculate;

(i)   The number of moles of iodine liberated in 25 cm^3 (03marks)

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(ii)   The concentration in moldm^{-3} of sodium thiosulphate.   (04½marks)

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12. Identify one compound that can be tested using the following reagents. In each case state what is observed and write equation for the reaction that takes place when the compound named is treated with the following reagents.   (03marks each)

a) Baeyer's reagent

Compound:

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Observation:

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Equation

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b) Tollen's reagent

Compound:

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Observation:

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Equation

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c) Phosphorous (v) chloride
   Compound:

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Observation:

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Equation

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13. A compound R contains 40% carbon and 6.67% hydrogen, the rest being oxygen.
    a) Calculate the empirical formula of R.   (01½marks)

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b) A solution containing 28.145g of R in 250g of water froze at -3.490°C.
   (The freezing point constant Kf of water 1.86°C/mol/1000g)
i)   Determine the molecular formula of R.   (02marks)

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ii)   Write the structural formula and I.U.P.A.C names of all the possible isomers of R.
                                                                               (02marks)

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c) R reacted with sodium carbonate with effervescence of a colourless gas.

i) Identify R. (01 mark)

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ii) Write equations to show how R can be synthesized from ethene. (01½ marks)

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14. Silver chloride dissolves in water according to the following equations.

$$AgCl_{(s)} + (aq) \leftrightarrow Ag^+_{(aq)} + \overline{Cl}_{(aq)}$$
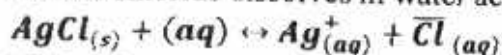
a) Write the expression for the solubility product Ksp of silver chloride. (01 marks)

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b) The electrolytic conductivity of a saturated solution of silver chloride in water at 25°C is $3.41 \times 10^{-6} \Omega^{-1} cm^{-1}$ and that of pure water is $1.60 \times 10^{-6} \Omega^{-1} cm^2 mol^{-1}$. The molar conductivities at infinite dilution of silver nitrate, potassium nitrate and potassium chloride is 133.4, 145.0 and $149.9 \Omega^{-1} cm^2 mol^{-1}$ respectively ate 25°C. Calculate the solubility product of a saturated solution of silver chloride at 25°C. (04½ marks)

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c) Ammonia solution was added to a solution containing silver chloride.

i) State how the solubility of silver chloride was affected. (01 mark)

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ii) Explain your answer in (c)(i) above. (02½ marks)

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15a) State the essential conditions and give the IUPAC name for the product formed when chlorine; (0 ½ marks each)

i) Is added to benzene

Conditions;

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Name of the product

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ii)   Substitutes a hydrogen atom of benzene
      Conditions;

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      Name of the product

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iii)   Reacts with cyclohexene
      Conditions;

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      Name of the product

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b) Outline the mechanism for the reaction in.   (03marks)
(i) a) ii) above

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(ii) a) iii) above

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16. During the extraction of copper from copper pyrites, copper pyrites is crushed and
    agitated with water/oil mixture. Compressed air is bubbled through the mixture which is
    then filtered, roasted and finally impure molten copper is obtained.
a) State the role of:

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ii) compressed air.

....   (01 mark)

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b) Write equation for the reaction that occurs when copper pyrites is roasted. (01$^1/_2$ marks)

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c) Explain briefly how impure copper can be refined. (04 marks)

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d) Explain why it is advantageous to have a sulphuric acid manufacturing plant near a copper extraction plant.

(01½ marks)

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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

END