Name:……..……
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P525/1
CHEMISTRY PAPER 1
MOCK 2024
AUGUST
TIME:2 HRS:45 MIN

MEBU EXAMINATIONS CONSULT

Uganda Advanced Certificate Of Education

MOCK EXAMINATIONS 2024

CHEMISTRY

PAPER 1

2 Hours 45 Minutes

INSTRUCTIONS TO CANDIDATES:

- Answer all questions in section A and six questions in section B.
- All questions must be answered in the space provided.
- Illustrate your answers with equation(s) where applicable.
  Where necessary, use the following:
  Molar gas constant, R = 8.31 $JK^{-1}mol^{-1}$
  Molar volume of a gas at s.t.p is 22.4 litres
  Standard temperature = 273K
  Standard pressure = $101325NM^{-2}$
- Periodic table and a graph paper are well attached at the end of the question paper.

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.

1. (a) Define the term partial pressure of a gas. (1 mark)

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(b) A 5.00dm^3 container holds a mixture of oxygen and nitrogen gases at a total pressure of 3.00atm and a temperature of 298K. the partial pressure of oxygen is 1.20atm. Calculate,

i) The partial pressure of nitrogen. (1 mark)

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i) The number of moles of each gas present in the mixture. (2 marks)

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c) State three major assumptions made in the above calculation. (1½ marks)

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2. Manganese is one of the transition element in the periodic table which forms stable compounds in oxidation states +2, +4 and +7.

(a) Define the term Oxidation State. (01 mark)

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(b) Write the formula of the Oxide of manganese in the oxidation states.
(½ mark each)

(i) +2: ……
(ii) +4:……
(iii) +7:……

(c) Write an equation for the reaction that took place between

(i) The oxide in +7 and dilute solution of potassium hydroxide.

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(ii) Hot concentrated solution of hydrochloric acid and the oxide in +4
(1½ marks)

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3. Briefly describe how each of the following factors affects the stability of a nuclide.

(a) Neutron- proton ratio. (1½ marks)

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b) Half -life (1½ marks)

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(c) Binding energy (1½ marks)

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4. 10.0g of a mixture containing Potassium chlorate (v), $KClO_3$ and Potassium chloride, KCl was strongly heated to a constant mass of 8.0g.

(a) Write an equation for the reaction that took place. (1½ marks)

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(b) Calculate the percentage of each of the salts in the mixture. (3½ marks)

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5. (a) Define the term colligative property. (1 mark)

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(b) Name the four colligative properties. (2 marks)

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(c) (i) The vapour pressure of pure water at 20^{o}c is 2.34×10^{4} Nm^{-2}. Calculate the vapour pressure of a solution containing 34.2g of sucrose ($C_{12}H_{22}O_{11}$) in 500g of water. (2 marks)

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(ii) State any two assumptions made to proceed with the calculations. (1 mark)

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6. (a) Define the term bond dissociation energy. (1 mark)

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(b) Describe the relationship between enthalpy change and Gibbs free energy and suggest the significancy of the relationship. (03 marks)

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7. A compound M contains 60% carbon, 13.3% hydrogen and the rest being oxygen. When 0.698g of M was dissolved in 100g of a solvent, there was a $0.19^{o}C$ depression in freezing point of a solvent.
(Kf of the solvent = $1.63^{o}CKg^{-1}mol^{-1}$).

(a) Calculate the simplest formula of M. (02marks)

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(b) Determine the molecular formula of M. (03mks)

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(c) Write the structural formula and the name of compound M. (01mark)

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8. Tin and Carbon belong to group IV of the periodic table.

(a)Write the,

(i) Formulae of stable chlorides of Tin and Carbon. (01 mark)

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(ii) Equation for the reaction of the chlorides in (a)(i) above with water.(2 marks)

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b) Excess acidified Tin (ii) sulphate was added to potassium dichromate solution.
i) State what was observed. (1 mark)

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ii) Write the equation for the reaction that took place. (1½ marks)

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9(a) State what would be observed if benzene was added to water (1 mark)
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(b) An organic compound R is soluble in both water and benzene. 0.5 moles of R was shaken with a mixture containing 45 cm^3 of water and 15 cm^3 of benzene and the mixture allowed to stand until equilibrium was attained.(KD for R between benzene and water at 25^oc is 5). Calculate the number of moles of R in benzene (3 marks)

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SECTION B (54 MARKS)

Answer **SIX** questions from this section

10. (a) State what is meant by each of the terms,
i) First electron affinity (1 mark)

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ii) Electronegativity (1 mark)
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(b)State one similarity and one difference between electron affinity and electronegativity
i).Similarity (1 mark)
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(ii) Difference (1 mark)
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c) State the correlation between the value of electron affinity and electronegativity. (1 mark)
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d) Explain how each of the following factors affect the value of the first electron affinity.
i)Nuclear charge (2 marks)
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(ii) Screening effect (2 marks)
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11. Name one functional group that can be identified using each of the following reagents. In each case state what would be observed and write equation for the reaction that would take place

(a) Bromine water:

Functional group. (01 mark)

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Observation. (01 mark)

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Equation. (01 mark)

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(b) 2, 4-dinitrophenyl hydrazine:

Functional group. (01 mark)

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Observation. (01 mark)

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Equation (01 mark)

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(c) Sodium carbonate:

Functional group. (01 mark)

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Observation. (01 mark)

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Equation. (01 mark)

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12(a) Explain the term partition coefficient. (02mks)

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(b) State two conditions under which partition coefficient is valid.(02 marks)

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(c) A solute Q is three times as soluble in ethoxyethane as in water. An aqueous Solution containing 4.5g of Q per litre of a solution was shaken by ethoxyethane in a separating funnel. Calculate the mass of Q that was extracted when the solution was shaken:

(i) With 100cm^3 of ethoxyethane. (02 marks)

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(ii) Twice with 50cm^3 of ethoxyethane. (03marks)

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13. Sodium, aluminium, silicon and phosphorous are the elements in period 3 of the Periodic Table.

(a) For each element, Write the formula and name the structure of the oxide

Element	Formula of the Oxide	Structure
Sodium		
Aluminium		
Silicon		

Phosphorus		

(4 marks)

(b) Write equation for the reaction between aluminium oxide and

(i) Dilute hydrochloric acid. (01½mks)

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(ii) Excess sodium hydroxide. (01½mks)

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(c) State the condition and write an equation of a reaction between the oxide of silicon and sodium hydroxide. (02 marks)

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14. State what is meant by the following (1 mark each)

(i) Radioactivity

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(ii) Half-life

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(iii) Law of alpha decay

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b) The table below shows data for the radioactive decay of element P.

Time(Hrs)	0.0	5.0	10.0	15.0	20.0	25.0	30.0
Activity (Counts/hr)	25.0	23.0	21.25	19.50	18.00	16.50	15.25

i) Plot a graph of activity against time. (03 marks)

ii) Determine the value of the half life of element P. (01 mark)

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(iv) Calculate the decay constant and state its units. (2 marks)

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15. 50cm^3 of solution G containing sodium hydroxide and sodium carbonate was diluted to 250cm^3 with distilled water. 25cm^3 of the diluted solution required 15cm^3 of 0.2M sulphric acid using phenolphthalein indicator, another 25cm^3 of the diluted solution of the mixture required 27.5 cm^3 of 0.2M sulphric acid using methyl orange indicator.

(a) Write the equations for the reactions taking place when using,

(i) Phenolphthalein indicator. (2 marks)

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(ii) Methyl orange indicator (3 marks)

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(b) Calculate the concentration in moles per litre of sodium carbonate in the solution of G. (4 marks)

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16. Write equations to show how the following conversion can be effected.

(a) 1,2-dichloropropane to propanone (02½ marks)

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(b) $(CH_3CH_2)_2O$ from Ethene. (02 marks)

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(c) Propanoic acid to ethylamine. (02 marks)

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(d) CH_3CH_2Br to CH_3CH_2CHO (2½ marks)

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17. (a) Draw the structure and name the shape of the species given in the table below. (06 marks)

Species	Structure	Shape
NO_2^-		
NO_3^-		
NO_2^+		

(a) Arrange the above given species in order of increasing bond angle.
(1 ½ marks)

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(b) (i) Name the reagent that can be used to distinguish between $NO2^-$ and $NO3^-$
(1 mark)

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(iii) State the observation made in each case (2 marks)

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END

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