

Name:COMBN.....

Signature:

P525/1
Chemistry
Paper 1
MARCH 2023
2 hours

Uganda Advanced Certificate of Education
S.5 CHEMISTRY
Paper 1
2 hours

INSTRUCTIONS TO CANDIDATES:

- Answer **all** questions in section A and **any three** questions in section B
- All questions must be answered in the spaces provided
- The Periodic Table, with relative atomic masses, is supplied.
- Mathematical tables(3 - figure tables) are adequate or non-programmable scientific electronic calculators may be used
- Illustrate your answers with equations where applicable.

Where necessary, use the following:

- Molar gas constant $R = 8.31 \text{ JK}^{-1} \text{ mol}^{-1}$
- Molar volume of a gas at s.t.p is 22.4 litres.
- Standard temperature = 273 K
- Standard pressure = 101325 N m^{-2}

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

1. (a) State Graham's law of diffusion. (01 mark)

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(b) A certain volume of oxygen diffused through a porous membrane in 120s. Under the same conditions, the same volume of a gas X diffused in 112s. Calculate the formula mass of X (04 marks)

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2. When 4.90g of an organic compound Q, containing carbon and hydrogen only was burnt in oxygen, **15.78g** of carbon dioxide and **5.38g** of water were formed. Calculate the empirical formula of Q.

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3. (a) What is meant by **first ionisation energy**? (01 mark)

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(b) Write an equation for first ionisation energy of magnesium. (01 mark)

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(C). the table below shows the variation in first ionisation energies of elements in group (VII) of the periodic table

Element	F	Cl	Br	I
First ionisation energy(KJmol ⁻¹)	1681	1255	1142	1007

(i) State the trend in first ionisation energy of the elements. (01 mk)

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(ii) Explain your trend in (c)(i) above. (04 marks)

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4. The combustion of a hydrocarbon **P** gave 8.8g of carbon dioxide and 4.5g of water, if the molecular mass of **P** is 58. Determine the

(a) Empirical formula of **P**

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(b) Molecular formula of **P**

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4. State two examples of an s-block element and write their respective electronic configurations.

Elements..... and (01 mark)

Respective electronic configuration. (02 marks)

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6. (a) The diagram below shows the isothermals of a gas.

(i) What is the critical temperature of the gas. (01 mark)

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(ii) Which isothermal almost represents an ideal gas. (01 mark)

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(iii) What does the region ABC represent. (01 mark)

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(b) State two conditions for liquefying a gas. (01 mark)

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7. A compound **P** contains 52.2% carbon and 13.0% hydrogen and the rest being oxygen.

(a) Determine the empirical formula of **P** (02 marks)

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(b) When vaporized, **0.1g** of **P** occupied **78.8cm³** at **157 °C** and **740mmHg**. Determine the

(i) Formula mass of **P** (02marks)

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(ii) Molecular formula of **P** (01 mark)

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c) Write the structural formulae of all the possible isomers of P (1mk)

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8. (a) State what is meant by the terms

(i) Radioactivity.

(01 mark)

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(ii) Half life.

(01 mark)

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(b). In an experiment, the rate of radioactive decay of bromine decreased by 25% in 96 minutes. Calculate the half-life of bromine. (03 marks)

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9. (a) What is meant by the following terms

(i) A d-block element

(01 mark)

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(ii) An orbital

(01 mark)

b) Write the electronic configuration of the following

(i) Magnesium

(01 mark)

(ii) Phosphorous

(01 mark)

(iii) Calcium

(01 mark)

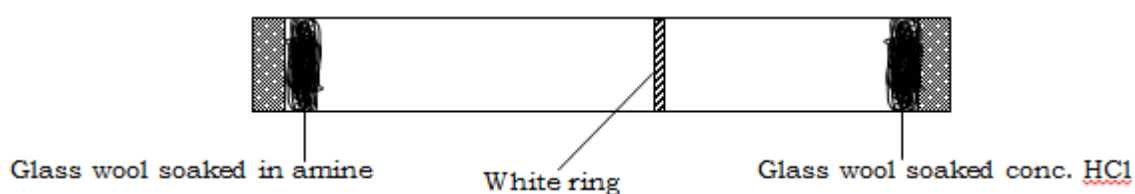
(iv) Manganese

(01 mark)

(v) Zinc ion (Zn^{2+})

(01 mark)

10. A sample of concentrated ammonia solution was placed at one end 'A' of a 0.8m glass tube held horizontally. At the other end 'B' was placed a sample of concentrated hydrochloric acid and both ends of the tube sealed. When the tube was left for some time, a white ring was formed inside the tube.



(a) Write equation for the formation of the white ring

(b) Calculate the distance between B and the white ring

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SECTION B

Attempt any three questions from this section.

11 (a) The table below shows the times (t) taken for gases of different molecular mass (M_r) to diffuse through a narrow opening under similar conditions.

$t(s)$	25.00	34.23	41.67	47.62
$M_r (g)$	16	30	44	58

Plot a graph of rate of diffusion, $1/t$ against $1/M_r$ (04 marks)

(b) Using your graph in (a) above, find the molecular mass of a gas. (3mks)

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(iii) Determine the mass that takes 38.42 seconds to diffuse (02mark)

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12. (a) State what is meant by an **ideal gas** (01 mark)

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(b) Explain how liquefaction of a gas can be affected by
(i) Pressure. (02 marks)

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(ii) Temperature (02 marks)

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(c) The curves below show deviations of some gases from the ideal behaviour

(i) State why hydrogen shows a small deviation from the ideal behaviour compared to other gases. (01 mark)

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(ii) Compare the deviations of oxygen and carbon dioxide from the ideal behaviour. (03 marks)

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13 (a) Define the term Relative Atomic Mass. (01 mark)

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(i) State two methods that they may be used to produce positive ions in a mass Spectrometer. (01 mark)

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(ii) What property of the ions does the mass spectrometer measure? (01 mark)

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(b) The mass spectrum of an element **A** contained 4 lines at **mass: charge ratio** of **54, 56, 57 and 58** with relative abundance of **5.84, 91.68, 2.17 and 0.31** respectively

(i) Explain what the term relative abundance means. (01 mark)

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(ii) Calculate the relative atomic mass of **A**. (04 marks)

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(e) Explain why the values of R.A.M have no units.

(01 mark)

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14. (a) What is meant by the term atomic radius.

(01mark)

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(b) Describe how atomic radius varies

(i) Down a group.

(04 marks)

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(i) Across a given period.

(04 marks)

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WELCOME TO S5 CHEMISTRY CLASS 2023.

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