

Candidate's Name:

Signature:

STREAM:							
---------	--	--	--	--	--	--	--

525/1
CHEMISTRY
 Paper 1
 October/November
 2025
 2 1/2 hours

MID OF TERM III ASSESSMENT
Uganda Advanced Certificate of Education
S.5 CHEMISTRY
Paper 1
(Set I)
2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

*This paper has **two** sections **A** and **B**.*

*Section **A** has two compulsory items while **B** has two parts **Part I** and **Part II***

*Each of part I and part II has two items, Answer only **one** from each.*

*Answers to Section **A** **must** be written in the spaces provided and Section **B** **must** be written in the answer booklet(s) provided*

Answer four in all.

Where necessary use,

$$\text{Molar gas volume at s.t.p} = 22.4\text{dm}^3$$

FOR EXAMINER'S USE ONLY																				
ITEM	1					2					3/4				5/6				T.T	
CODE																				
SCORE																				

(d) Evaluate whether the dissolution of the substance in water is thermodynamically feasible and spontaneous under standard conditions.

(i) State the properties that make the substance suitable to serve the above purpose

(ii) Suggest the possible impacts and mitigations of the substance to the environment.

SECTION B

Part I

Attempt **One** item in this section

Item 3

A manufacturing company in Mukono produces parts for high-temperature furnaces and electrical systems. The durability of each component depends on the melting point of the material, higher melting points ensure better heat resistance and mechanical strength. To guide selection, the research team compared melting points of selected Group II and Period 3 elements.. Following data was available

Group/period	Group II					Period 3							
Element	Be	Mg	Ca	Sr	Ba	Na	Mg	Al	Si	P	S	Cl	Ar
Atomic number	4	12	20	38	56	11	12	13	14	15	16	17	18
Melting point (°C)	1280	650	850	770	720	97.8	650	660.3	1414	44.2	115.2	-101.5	-189.4

The engineering department seeks a scientific analysis to select materials for different temperature ranges. The company is also considering an unknown element X, positioned between aluminium and silicon in the periodic table. *Plotting graphs* of melting point against atomic number for Group II and Period 3 (separately), *describing and explaining* trends and irregularities in melting points across Period 3 and down Group II, *evaluating, with reasons*, which elements are most suitable for furnace linings and electrical connectors and *predicting* the likely melting point range and industrial suitability of the unknown element X.

Task

As a chemistry student, make a write up you will use to help the company.

Item 4

A chemical company in Tororo manufactures halide compounds used in disinfectants. The first electron affinity (EA) of an element indicates how readily it gains an electron to form stable anions. Elements with more negative EA values are more reactive and suitable for halide formation, while those with low or positive EA are less effective.

The company is analysing Group VII and Period 3 elements to identify the most suitable for halide production and is also considering an unknown element X between aluminium and silicon.

Group/period	Group VII				Period 3							
Element	F	Cl	Br	I	Na	Mg	Al	Si	P	S	Cl	Ar
Atomic number	9	17	35	53	11	12	13	14	15	16	17	18
First EA (kJ/mol)	-354	-370	-348	-320	-21	+67	-44	-135	-72	-200	-364	0

The manager seeks to analysis the data to make informed decisions by *plotting* first electron affinity vs. atomic number for Group VII and Period 3 elements separately. Describe and explain *trends* and all *irregularities* in electron affinity across Period 3 and down Group VII. Evaluate which elements are(is) most suitable for industrial halide production, giving reasons. Predict the likely electron affinity of element X and comment on its potential suitability for forming halides.

Task

As a chemistry student, make a write up you will use to help the company.

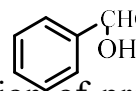
Part II

Attempt **One** item in this section

ITEM 5

A chemical manufacturing firm in Uganda produces a variety of organic-based materials used in plastics, solvents, fuels, and disinfectants. The firm has identified an inorganic compound containing 62.5% calcium and 37.5% carbon as a starting material. When this compound was reacted with water, it released a colourless flammable gas that burned with a sooty flame, which has numerous industrial applications in Uganda, including the production of alkenes, alkyl halides, and aromatic compounds.

The firm sought to convert it into valuable organic materials such as propanol, chloroethane, benzene, which can be further converted to 1-phenylethan-1-ol



and nitrobenzene. Key mechanisms involved include dehydration of propanol to propene, electrophilic substitution reactions on benzene ring.

The company seeks a comprehensive evaluation: *determine* the empirical formula of inorganic compound, confirm the identity of the gas evolved, *predict* the functional groups of resulting organic compounds, and illustrate stated *mechanisms*. Additionally, assess *synthetic* pathways in the formation of stated compounds, and evaluate *health* and *environmental* impacts of producing both aliphatic and aromatic compounds in an industry. You have contacted for assistance on this.

Task

As a student of Chemistry, prepare a presentation you will use upon invitation.

ITEM 6

A chemical research laboratory in Uganda is investigating a gaseous hydrocarbon X obtained from a petrochemical facility. Elemental analysis shows that X contains 11.11% hydrogen by mass, its vapour density is 27 and on treatment with Tollens' reagent gave positive test. Hydrogenation of X with 1 mole of hydrogen and 1 mole of X over a lindlar's catalyst produced a carbon-carbon double bond. When the resulting compound of *hydrogenation* is treated with concentrated sulphuric acid and water, it forms Y, which is further oxidized using hot acidified potassium dichromate to yield a compound Z. Z gives a negative test with Tollens' reagent. Multi-step synthesis from but-1-ene, propene, and ethene are explored to generate X and its derivatives, which are important for producing alcohols, carbonyl compounds, and polymer intermediates in Uganda's chemical industry, while safety considerations such as flammability and waste management are observed.

An analyst, wishes to know *molecular formula* X, all structural *isomers* of X with IUPAC names, *identity* of X, Y, and Z, *write equations* to be involved, *mechanisms* for formation of Y, propose multi-step *synthesis* of X from but-1-ene, propene, and ethene, and discuss the industrial applications, *environmental impact*, and mitigations of X, Y, and Z. You have been contacted for your help.

Task:

As a student of Chemistry, prepare a presentation you will use to help the firm.

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 68	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