

P525/1
CHEMISTRY
JULY 2026
2 hours

Uganda Advanced Certificate of Education
Senior SIX Term II Examinations 2026
CHEMISTRY

Pre mock set 2

2 hours and 45 minutes

INSTRUCTIONS TO CANDIDATES

This paper consists of two sections A and B. All items in section A are compulsory.

Attempt all items from section A and an two items from section B choosing one item from each part.

your responses on the answer sheets provided

Begin each item in section B on a fresh answer sheets

Nonprogrammable scientific electronic calculators may be used.

Use equations where necessary to illustrate your responses

Turn Over

SECTION A

Respond to all the items in this section

1. On 15th April 2026, Farmer Musa applied a liquid pesticide to control cutworms in his potato garden. The pesticide was 2-bromo-2-methylpropane, $(CH_3)_3C - Br$. Due to time, he poured the chemical in 3 concentrated spots rather than spraying evenly. The soil in the garden was tested to be alkaline with a PH of 9 since lie had been added the previous season.

3 days later, Farmer Mua noticed something strange. In each of the 3 spots where the pesticide was poured, the potatoes were soft and appeared to have been cooked and warm, the leaves had also wilted, however in the unsprayed regions, the potatoes were healthy and green.

The Agricultural officer suspects the pesticide reacted with the alkaline soil. Soil and plant samples were sent to the lab for analysis. The main reaction suggested by the lab chemists was identified as below;



The lab provided the Agricultural officer with the thermochemical data for the reaction show in table 1.

Species	$\Delta H_f^\circ (kJmol^{-1})$
$(CH_3)_3C - Br(l)$	-102.0
$NaOH(aq)$	-469.0
$(CH_3)_3C - OH(aq)$	-359.0
$NaBr(aq)$	-361.0

Knowing how fast the reaction occurs and molecules involved in the slowest step of reaction would help the Agricultural officer provided Farmer Musa with proper conclusions and recommendations regarding the use of the pesticides for better results. The lab technician went on ahead to provide him with the kinetics data as shown in the table 2 below.

Table 2: chemical kinetics data

Test	$[(CH_3)_3C - Br] / moldm^{-3}$	$[NaOH], moldm^{-3}$	Initial rate, $moldm^{-3}s^{-1}$
1	0.10	0.20	4.8×10^{-3}
2	0.20	0.20	9.6×10^{-3}
3	0.20	0.40	9.6×10^{-3}

Task

As a chemistry student,

Make a write up of a report you would use to show how the Agricultural officer would have analysed the date to help the Farmer.

2. During the cold month of June and July, the mountain roads in Kabale district often become very slippery due to ice formation overnight. This has led to several accidents and delays in transporting agricultural produce to Kampala markets. In an effort to improve road safety, the Kampala City Council in collaboration with the Ministry of works launched a pilot project. They decided to test the use of 42.16g of brine, NaCl as a de-icing agent which is known to dissolve in water to prevent ice from forming on the roads.

After spreading the salt for two weeks, the council received two types of feedback.

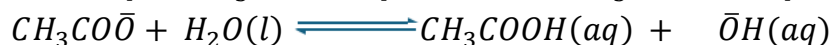
1. Drivers reported that the roads were less icy in the mornings even if the temperatures during those hours are -8°C .
2. Engineers from the bridge maintenance department reported an increase in rust and corrosion on the metal guards and bridge supports along the treated roads.

To investigate, the council laboratory collected two samples for analysis;

Sample A was taken immediately after spreading the salt and sample B collected from drainage channels 2 weeks after.

The data provided the following data for you to analyse and interpret;

1. Chemical analysis from sample B showed that NaCl had reacted with organic matter to form sodium ethanoate of concentration 0.5M.
2. Engineering standard safe PH for steel structures is 6.5 - 8.5 (rust and corrosion free), K_a for ethanoic acid is 1.8×10^{-5} and $K_w = 1.0 \times 10^{-14}$, $\text{Na} = 23$, $\text{Cl} = 35.5$.



Task

As a chemistry student

- a) Assess the feedback to the council by the drivers.
- b) Evaluate the application of calcium chloride in real life.

SECTION B

Part I

Respond to one item from this section

3. Learners from a high school in Kyotera district visited a cement and grinding - wheel factory in Tororo.

The factory manager explained that the factory uses materials made from period 3 elements.

He showed them samples of the elements and said,

"The physical properties of these elements and their chemical properties of their oxides, determine how we choose them for use here" the learners waited for more information because it seemed interesting.

The factory mainly uses aluminium oxide for making furnace linings and grinding wheels.

The manager presented to them some of the data for some of the period 3 elements as shown in table 3.

Element	Na	Mg	Al	Si	P
Atomic number	11	12	13	14	15
Melting point($^{\circ}\text{C}$)	98	650	660	1414	44
Electron affinity	-21	+67	-44	-135	-72

During the visit, the oxides of the above elements were exposed to study their interaction with water, dilute sulphuric acid and concentrated sodium hydroxide solution and they also discovered that most of the wires carrying electricity are made of aluminium

With a smile, the factory manager chose you as one of the visitors to guide your fellows about physical properties of the elements in the table, the chemical interactions of the oxides and evaluate the application of aluminium mentioned.

Task

Make a write up showing the information you would present.

4. A medical doctor from Mulago Hospital visited your school to talk about applications radioisotopes in medicine for example iodine which is one of the group 17 elements.

She told the students; "We use radioactive iodine-131 to treat thyroid cancer as the iodine nucleus undergoes a beta radioactive decay with lower half life of about 8.0days" one of the students asked in louder voice "why not chlorine yet they are all in same group and how do we know that half life please?".

She paused and didn't answer but added "we monitor it and give the next dose only when the amount left is 8.0g, this keeps the treatment effective but safe".

She gave students data in table 4 from the patient and asked them to find and decide when the next dose should be given.

She also mentioned that, its not only iodine used in medical field but also others.

Table 4: activity of iodine in blood of a patient.

Time/days	Mass of iodine-131 remaining/g
0	80.0
5	52
10	34
24	10.0
32	5.0
40	2.5

She informed them that iodine is also exposed to other substances like water, water, electropositive metals like magnesium and sodium hydroxide to detect how it may behave when in contact but when dealing with chemicals, care must be taken. however, she left the room with out answering the student's question, when to give next dose, interaction of iodine when exposed to mention substances and evaluation of application of radioisotopes.

Task

Make a report to show how she would respond.

PART II

Respond to only one item from this section

5. An explosion occurred in a chemical warehouse in Jinja. Investigators found a drum that did not explode.

Drum contained a colourless liquid with a fruity odor, used for making plastic softeners.

Lab tests revealed that both chemicals originated from 1 - bromobutane which was improperly stored.

The chief chemist stated;

"1-bromobutane is readily available. By changing reagents and number of steps, we can convert it to a primary alcohol(118oC), carboxylic acids(163oC) and then to amides or converted to methylbenzene an organic solvent. However, the reaction conditions determine whether we get substitution or elimination. The final products also differ greatly in physical properties and safety."

He handed you warehouse reaction log and asked you to explain why the intermediates have different boiling points as indicate, reconstruct the two possible synthetic routes, draw mechanisms for the first route of each path way and assess the application of the liquid in the drum to the environment.

Task

Make a report you would present to the chief chemist.

6. The national drug authority raided an illegal lab in Kampala making fake pesticides and perfumes. Three organic compounds were confiscated.

Gas A from petroleum cracking, decolourises bromine and forms an alcohol with two carbon atoms when reacted with water.

Liquid B with an almond like smell from petroleum reforming burns with a sooty flame and oxidized to white crystalline acidic compound with acidified potassium manganate (VII) solution under suitable conditions.

Solid B is white used as an ingredient in insecticides, is an amide from ethene.

Forensic analysis noted that;

1. Liquid B requires a catalyst to react with bromine unlike gas A.
2. Liquid can be obtained from gas A.
3. solid B can be converted to gas A.
4. each conversion in 2 and 3 have specific conditions
5. acceptable mechanisms do exist for reaction in 1. However, organic compounds are but care and caution needed to be taken.

Task

As a chemistry student;

- a) Assess the nature of reaction between compounds A and B.
- b) Evaluate points number 2 , 3 and 5 and hence the application of liquid B.

THE END

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	35.5 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