

P525/1
CHEMISTRY
Paper 1
(Theory)
July/Aug. 2026
2 ¾ hours



GLORISO EXAMINATIONS BOARD (GEB) - KAMPALA
SECONDARY SCHOOLS JOINT MOCK ASSESSMENTS, 2026

Uganda Advanced Certificate of Education

CHEMISTRY

(Theory)

Paper 1

2 hours 45 minutes

INSTRUCTIONS TO CANDIDATES:

- ✓ This examination paper consists of **two** sections; **A** and **B**. It has **six** examination items.
- ✓ Section **A** has **two** compulsory items.
- ✓ Sections **B** has **two** parts; **I** and **II**. Each part consists of **two** items. Respond to only **one** item from each part.
- ✓ Respond to **four** items in all.
- ✓ Any additional item (s) responded to will **not** be scored.
- ✓ **All** responses must be written in the answer booklet (s) provided.
- ✓ Begin each item on a fresh page.

SECTION A*Respond to **all** the items in this section***Item 1.**

Copper (I) oxide and copper (II) oxide are widely used on boats and ships as paint to prevent attachment of algae and marine corrosion. However, their use on ships and boats depends on their stability which widely depends on **value of lattice energy**. The paint with high value of lattice energy is more stable and normally preferred to the other.

A group of learners in your school are planning to make paint as their project work but they are doubting on which raw material best suits the purpose between Copper (I) Oxide and Copper (II) Oxide. However, the learners contacted the chemistry teacher who provided them with the following thermochemical data about the two raw materials for paint making.

Enthalpy/Process	$\Delta_H(kJ/mol^{-1})$
Sublimation of copper	+339.3
First ionization energy of copper.	+750.0
Second ionization energy of copper.	+1958.0
Bond dissociation energy of oxygen.	+498.4
First electron affinity of oxygen.	-141.4
Second electron affinity of oxygen	+790.8
Enthalpy of formation of copper(I) oxide	-166.7
Enthalpy of formation of copper (II) oxide.	-155.9

They further wanted to understand how concentration of one of the raw materials affects production of paint. The teacher advised them that the manufacture of copper (I) oxide paint, another tricresyl phosphate (**R**) is used as reactant to increase on flexibility and durability of paint as show in the reaction below together with some kinetic data.



Exp No.	Initial $[Cu_2O]$ (mol/l)	Initial $[R]$ (mol/l)	Initial rate (mol $l^{-1}s^{-1}$)
1	0.10	0.10	0.0025
2	0.20	0.10	0.0100
3	0.10	0.20	0.0050
4	0.10	0.05	0.00125

The students in their discussions groups for projects found a challenge in selecting the most suitable raw material for making paint, how **ionic charge** and **ionic radius** affects the value of lattice for the two raw materials, knowing the rate constant for the reaction between copper (I) oxide and **R**, and any other application of the knowledge of lattice energies and have thought for your assistance confident enough you can help.

Task:

Help the students analyze the data to settle the debate including possible application and recommendation of the process.

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Item 2.

Fertilizer production heavily depends on ammonia, making it one of the most important raw materials in the agricultural sector.

A fertilizer company manufactures ammonia using the knowledge of harber process according to the equation; $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$

The production manager is interested in determining: How factors like pressure and catalyst can affect the yield of ammonia, Value of equilibrium constant K_p and whether the forward reaction is exothermic or endothermic. To address his issues, the laboratory analyst carried out the reaction above at 600°C and 750 °C and analyzed the equilibrium mixture and later advised them to obtain equilibrium constants K_p corresponding to the two temperatures. The equilibrium mixtures at 600 °C and 750 °C were found to contain 25% and 15% ammonia by volume respectively. Your school has been invited to item writing exercise by the company production manager and you have been selected to represent your school.

Task:

Present a write up addressing the production manager's concerns including associated applications and recommendation in the reaction.

SECTION B**PART I**

*Respond to any **one** item*

Item 3.

The chemistry of oxides is widely employed in glass manufacture.

A team of young chemist would like to start up a glass manufacturing firm in their area. They have identified Carbon dioxide, silicon (iv) oxide and lead (iv) oxide as possible oxides to use in the production process. However, the team has failed to

agree on the best compound to use based on the properties. When the team approached the nearby chemical Engineer, they were provided with the data below to analyze.

Oxides	CO ₂	SiO ₂	PbO ₂
Melting points	-56.6	1640	290

The team is wondering how: the data provided can help select the best material, the compound given behave in moisture, basic and acidic media including health implications of the selected material. The team through its marketing department, has invited schools for item writing exercise and you have been selected to represent your school.

Task:

Help the team address their concerns.

Item 4.

The chemistry of group II elements is employed in manufacture of drugs as active ingredients.

A group of senior five chemistry students under their science club visited an industrial plant specializing in manufacture of drugs. At the plant, they were given different products to observe. They realized some were made from Magnesium, some from calcium and some from other elements. They were told that the plant incorporates several periodic properties to determine the reactivity of elements. The properties included:

Element	Beryllium	Magnesium	Calcium	Strontium	Barium
Atomic radius	0.112	0.160	0.197	0.215	0.222
Ionization energy	890	738	590	550	503

The learners were told that among the reactions involved in the manufacturing process were; reaction with water, sodium hydroxide and dilute sulphuric acid. The tour guide didn't offer any explanation these reactions. The learners are wondering how: the periodic properties affect reactivity, the chemical reaction occur and if there are some health implications of the process. On their return from the tour, the learners engaged their teacher for an explanation who has instead referred them to you.

Task:

Help the learners address their concerns.

Part II

*Attempt any **one** item in this part*

Item 5.

The chemistry of organic compounds can be widely employed in manufacture of flavors and perfumes.

A school science club would like to produce a flavor that can be added to perfumes and a solvent that can be used to clean organic stains. In their discussion, one student proposed use of benzene and propan-2-ol as raw materials in the flavor and solvent manufacture respectively. However, concerns grew about the potential hazard of the unreacted raw materials. Another student proposed reacting the unreacted raw material in flavor and solvent manufacture with chlorine in the presences of the iron (iii) chloride solution and hot concentrated sulphuric respectively in a mitigation measure. The two raw materials are running out of stock and production may stop any time however, the laboratory attendant has advised them to use the available ethanol to obtain the two raw materials. The students are wondering how: the raw materials selected are suited for the role, the reactions for mitigation occurs, the production line can be maintained and if there are associated health implications of the processes. The learners have approached their teacher for advice and he has referred them to you.

Task:

Help the students address their concerns.

Item 6.

Manufacture of plastics and organic solvents require use of knowledge of organic chemistry.

A manufacturing company has received an order to produce and supply a plastic that serves as food container and a solvent that can clean grease. In a company meeting, one member suggested use of polypropene and phenylethane as the plastic and solvent respectively and that these two can be obtained respectively via synthetic pathways from ethanol and ethanoic acid as the raw materials.

One member got concerned about the potential hazard of the unreacted raw materials however, a member suggested reacting the unreacted raw material in solvent and plastic respectively with hot concentrated sulphuric acid and ethanol in presence of concentrated sulphuric acid in a mitigation measure but the company lacks knowledge

about the suggestions being made.

The company through its cooperate social responsibilities, has invited schools for item writing exercise and you have been selected to represent your school.

Task:

Help the company to:

- (a) Explain the suitability of the two suggested products for their role and how the reactions for mitigation occur
- (b) Explain how the selected products can be obtained from the suggested raw materials including possible health implications of the two processes.

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****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	35.4 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

THE END