

P525/1
CHEMISTRY
Paper 1
2026
2¼ hours



UGANDA TEACHERS' EDUCATION CONSULT (UTEC)

Uganda Advanced Certificate of Education

CHEMISTRY

(Theory)

Paper 1

2 hours 45 minutes

INSTRUCTIONS TO THE CANDIDATES

*This examination paper consists of two sections; **A** and **B**. It has **six** examination items.*

*Section **A** has two **compulsory** items.*

*Section **B** has two parts; **I** and **II**. 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 both items from this section.

Item 1

A group of S.5 chemistry students in their science club want to construct an electrochemical cell that generates electrical energy from spontaneous chemical reactions between Zinc and Copper electrodes. When they consulted their chemistry teacher, he gave them the following data after advising them that they needed the second ionisation energy of Copper.

Thermochemical data

$\Delta H_f \text{ CuCl}_2$	$= -220 \text{ kJ mol}^{-1}$
$\Delta H_a \text{ Cu(s)} \rightarrow \text{Cu(g)}$	$= +338 \text{ kJ mol}^{-1}$
$\Delta H_{\text{diss}} \text{ Cl}_2(\text{g}) \rightarrow 2\text{Cl}(\text{g})$	$= +121 \text{ kJ mol}^{-1}$
$\Delta H_{\text{IE}} \text{ Cu(g)} \rightarrow \text{Cu}^+(\text{g})$	$= +754 \text{ kJ mol}^{-1}$
$\Delta H_{\text{EA}} \text{ Cl(g)} \rightarrow \text{Cl}^-(\text{g})$	$= -364 \text{ kJ mol}^{-1}$
Lattice energy of CuCl_2	$= 2824 \text{ kJ mol}^{-1}$
$\text{Zn(g)} \rightarrow \text{Zn}^+(\text{g})$	$= 906 \text{ kJ mol}^{-1}$
$\text{Zn}^+(\text{g}) \rightarrow \text{Zn}^{2+}(\text{g})$	$= 1733 \text{ kJ mol}^{-1}$

Half Cell	E^0/V
$\text{Zn}^{2+}(\text{aq})/\text{Zn(s)}$	+0.76
$\text{Cu}^{2+}(\text{aq})/\text{Cu(s)}$	-0.34

Task:

As a chemistry student analyse and interpret the data provided for the S.5 chemistry students and make any recommendations if possible.

Item 2

Miscible liquids of alcohols and water are commonly being used for medical disinfection and surface cleaning. A manufacturing company intends to use substance Q labelled 52.14% C, 13.13% H and 34.73% oxygen. In the mass spectrum of Q the peak at the largest value of M/e occurs at 46. The vapour pressure of a solution containing 1 mole of Q and 4 moles of water is 0.76 atmospheres. The vapour pressures of pure Q and water are 0.675 and 0.454 atmospheres respectively at the same temperature.

The company's management wants to know; molecular of Q, how a mixture of Q and water deviates from ideal behaviour and an analysis of the applications of the mixture in real life. Your laboratory attendant was given this information but he is challenged.

Task:

As a student of Chemistry analyse and interpret the data to address the concerns of the company's management.

SECTION B

Part I

Respond to any one item in this part.

Item 3

A nuclear plant in Uganda is undertaking pilot studies for the use of various radioactive elements to generate clean and safe energy. In one of the studies the plant's technical team discovered that on storage

$^{226}_{88}\text{Ra}$ emits an α particle to form P.

$^{210}_{83}\text{Bi}$ emits a β particle to form Q.

$^{234}_{92}\text{U}$ emits five α particles to form R.

$^{231}_{91}\text{Pa}$ emits an α particle and a β particle to form S.

$^{226}_{88}\text{Ra}$ emits two α particles to form T.

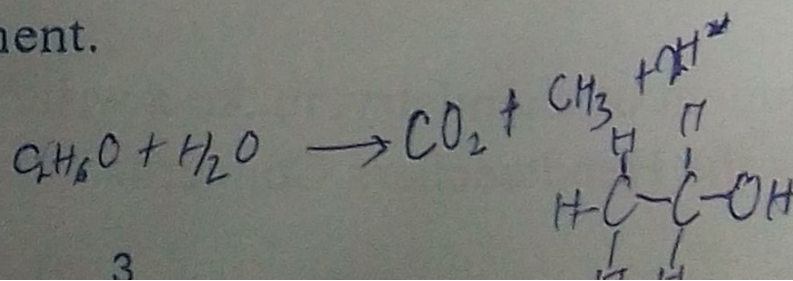
In another parallel study, the technical team obtained the following data for the two radioactive elements Y and Z.

Time (minutes)		0	10	20	30	50
Disintegrations (s^{-1})	Y	200	161	135	110	76
	Z	11.3	8.3	6.0	4.4	2.35

The plants management is interested in the identity of elements P, Q, R, S, T and the decay constants of Y and Z and the associated health implications of radioactivity. Your chemistry teacher was given this information.

Task:

As a student of Chemistry, analyse and interpret the data to address the concerns of the plant's management.



Item 4

A newly Constructed factory in town is Carrying out a feasibility study on using dioxides of group (IV) elements as raw materials for glass and Ceramics. The structural engineer advised that periodic trends, reactions of elements with water and halogens, reactions of the dioxides with alkalis play avital role in deciding the raw material and provided the following data;

Element	C	Si	Ge	Sn	Pb
Melting Point ($^{\circ}\text{C}$)	3800	1863	1211	505	601
Boiling point of dioxide ($^{\circ}\text{C}$)	-78	2590	1200	1900	Decomposes on heating

The Management of the factory is now interested in periodic trends, and the reactions of the elements and their Compounds and the possible environmental implication if any. Your laboratory attendant Came across this information.

Task:

As a student of chemistry analyse and interpret the data to address the raised Concerns by the Management of the factory.

Part II

*Respond to any **one** item in this part.*

Item 5

A school Science club has engaged its chemistry students to make phenol and ethanoyl chloride from benzene and propene respectively. The chairperson of the club suggested that as a mitigation Measure excess propene can be safely reacted with bromine water but excess benzene requires fuming sulphuric acid. The Headteacher of the School is interested in the Suitability of the products for their applications an analysis of mitigation reactions with equations evaluation of the Synthetic pathway routes and the possible environmental implications of their Products. Members of the School Science Club are challenged and have approached you for help.

Task:

As a student of chemistry, make a write up you would present to address the Headteachers Concerns.

Item 6

A chemical plant for dyes and solvents makes propanone hydrazone from propan-1-ol and n-ethyl-n-phenyl amine from benzene. As a mitigation Measure the excess propan-1-ol is reacted with hot concentrated Sulphuric acid and excess benzene with bromine in the Presence of Iron Catalyst. The Management of the Plant is interested in the Suitability of propanone hydrazone for its functions, an analysis of the mitigation reactions with equations, and evaluation of the Synthetic pathways for its operations and the possible health implications of its operations. Your teacher Came across the information.

Task:

As learner of Subject analyse the data to address Managements Issue.

END