Student's Name: ....

Signature:_ ----------------

Random No.						**Personal No.**		

(Do not write your School / Centre Name or Number anywhere on this Booklet)

P525
CHEMISTRY
Paper 1
Oct./Nov. 2025
2 hours

For Scorer's Use Only

Total weighted Score		
Initials		

S5 END OF TERM III EXAMINATIONS 2025
Uganda Advanced Certificate of Education

INNSTRUCTIONS TO STUDENTS:

The paper consists of **two** *Sections;* **A** *and* **B**.

It has **six** *examination items.*

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

Responses to section **A must** *be written in the spaces provided.*

Section **B** *has two* **Parts; I** *and* **II.** *Respond to only* **one** *item from* **each** *part.*

Responses to section **B must** *be written in the answer booklet(s) provided.*

Respond to **four** *items in all.*

Responses to each item in Section **B** *should start on a fresh page.*

Any additional item(s) responded to will **not** *be scored.*

For Scorer's Use Only

Item No.	Weighted Score	Scorer's Initials
1		
2		
___(3/4)		
___(5/6)		
Total weighted Score		

Turn Over

SECTION A

Respond to **all** *the items in this section in the spaces provided.*

ITEM 1

Students of Glory Land High school Ibanda district were investigating the nature of products produced when an organic compound Y is completely burnt in air. Their teacher gave a clue on the composition of organic compound Y. He clearly stated that; Compound **Y** is made up of carbon, hydrogen and oxygen only. When the students carried out the experiment, they found that on complete combustion of 5.52g of Y, it yielded 5.38dm^3 of carbon dioxide and 6.5g of water. However, the students found a challenge in analyzing its properties and they have contacted you to help.

Task:

As a learner who has studied organic chemistry at A'level, help them to;

(a) Determine the mass of carbon dioxide that was produced? **(04 scores)**

(1 mole of gas occupies 22400cm^3 at s.t.p.)

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(b) i) Determine the empirical formula of Y. **(03scores)**

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ii) Determine the molecular formula of Y if it has a vapour density of 32. **(03scores)**

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iii) Y is an alcohol. Write down the structural formula of Y. **(01 scores)**

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c) i) Write equation for the reaction between Y and concentrated sulphuric acid at 170^0C. **(02 scores)**

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(ii) The product formed can be identified using Bromine water in the laboratory. State what is observed? **(01 scores)**

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Write equation of reaction for your observation in c(ii) above? **(01 scores)**

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ITEM 2

A cosmetics manufacturer plans to establish a production facility for natural preservatives. Before construction, a land-quality assessment must be performed to ensure the soil does not contain harmful heavy metals—particularly lead (Pb)—which could contaminate plant-based ingredients used in preservatives. The analytical chemistry team responsible for determining whether the soil meets safety requirements has contacted you as a student of chemistry to help. A mass spectrometer is used to analyze trace levels of lead isotopes in a soil extract sample. The table below shows the information from a mass spectrum sample used to analyze a sample of lead.

Isotopes	**Detector Current /Am**
204	0.16
206	2.72
207	2.50
208	5.92

Task:

As a chemistry student guide them to;

a) Explain the meaning of the term Isotope **(01 scores)**

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b) Describe the main steps in the operation of a mass spectrometer used for this analysis. **(05 scores)**

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c) Calculate the relative abundance of each lead isotope in the sample.**(05sco)**

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Compute the relative atomic mass of lead in this soil sample. **(04 scores)**

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SECTION B
Part I

Answer only one item in this section

ITEM 3

A company that manufactures **high-strength electrical cables** is researching how different metals and nonmetals interact during production. They are evaluating **iron (Fe), copper (Cu), and lead (Pb)** as possible metal components, while **oxygen (O)** is considered because it can react with these metals during processing, forming oxides that affect conductivity and durability. To choose the best material, the team must analyze:

- Atomic radius
- Ionization energy
- Electronic configuration
- How these factors influence reactivity and bonding

Task

As a chemistry learner who has studied periodicity, help the company to;

a) Write the electronic configuration of the following elements and some ions.

(i) Oxygen (O = 8) **(01score)**

(ii) Copper (Cu = 29) **(01score)**

(iii) Copper (I) ions (Cu = 29) **(01score)**

(iii) Lead (Pb = 46) **(01score)**

(iv) Iron (III) ion (Fe = 26) **(01score)**

b) Explain to the company the term atomic radius **(01scoress)**

c) State two factors that affect the atomic radius of an element **(02 scores)**

d) State and explain the trend for atomic radius

(i) Down the group **(03scores)**

(ii) Across the period **(03scores)**

e) Explain what the following terms mean;

(i) Ionization energy **(01 scores)**

(ii) First Ionization energy **(01 scores)**

f) State two factors that affect Ionization energy? **(02 scores)**

g) Explain how the factors in (b) above affect Ionization energy **(03 scores)**

h) The table below shows the periodic variation for I.E$_1$ of elements in group I of the Periodic Table

Element	**Li**	**Na**	**K**	**Rb**	**Cs**	**Fr**
Atomic number	3	11	19	37	55	87
First Ionization Energy (KJmol^{-1})	520	500	420	400	380	280

(i) Plot a graph of first ionization energy against atomic number. **(05 scores)**

(ii) Explain to the company researchers the Shape of your graph in (a) above? **(04 scores)**

ITEM 4

Recently, in a high school chemistry lab, new shipment arrived, and the labels are partially removed. The only visible information is the atomic numbers of elements which are Element Q =19, R = 25, S = 20, and T= 29. Your teacher is responsible for ensuring that laboratory safety is a priority and chemicals are stored properly to prevent accidents.
The teacher has asked you to,

(i) Determine the electronic configurations of the elements Q, R, S and T and/or their ions,
(ii) Clarify on their position in the Periodic Table (Group, Period and Block).
(iii) Write chemical equations showing how each of the elements reacts with Chlorine of group VII.
(iv) Name the compound formed between S and Chlorine?
(v) Describe with diagrams how the compound in (iv) above is formed.
(v1 Explain the properties of the compound formed

Task;

Write a brief message to respond to the teacher's assignment. **(30scor)**

Part II

*Answer only **one** item in this section*

Item 5

During a chemistry lesson on gaseous reactions, learners were asked to investigate an unknown gaseous hydrocarbon X. Sharon conducted an experiment where she exploded 20 cm³ of hydrocarbon X with 100 cm³ of excess oxygen. After cooling, the total gas volume was 90 cm³, and after passing the mixture through aqueous potassium hydroxide, the volume reduced to 50 cm³.
Hydrocarbon X burns in oxygen according to the following equation:-

$$C_xH_{y(g)} + (x+\frac{y}{4})\ O_{2\ (g)} \longrightarrow x\ CO_{2\ (g)} + \frac{y}{2}\ H_2O_{\ (l)}$$

Sharon is unsure how to use these results to identify hydrocarbon X. She presents her findings to the class for interpretation.

TASKS:

As a chemistry student, Help Sharon to;

a) (i) Explain the term hydrocarbon and give the three classes **(04 scores)**
  (ii) Understand what caused the drop in volume after explosion**. (02scores)**
  (ii) Why the gas reduced further after treatment with potassium hydroxide?**(02)**
b). Calculate the volumes of carbon dioxide and oxygen that reacted **(07scores)**
c). Deduce;
  (i) The molecular formula of hydrocarbon X **(05scores)**
  (ii) The Molecular mass of hydrocarbon X. **(05scores)**
d) Help Sharon to understand the environmental impact(s) of the gaseous product produced when X burns in air and how it can be mitigated **(05scores)**

Item 6:

A group of forensic chemists are investigating organic substances they found at certain suspected illegal chemical dump. Analysis gave them the molecular formula of the two compounds as M(C_3H_6) and N (CH_4).
To gather more information about the compounds they also need to know the nature of the two compounds and their chemical reactivity. They are aware that you have some knowledge on organic chemistry and have come to you for advice.

Task:
As a chemistry student help them to

a) Write the structural formulae and state the functional groups present in the organic compounds N and M. **(04 scores)**

b) Predict the reaction and write the mechanisms for the reaction of;
  (i) M with hydrogen gas **(05 scores)**
  (ii) N with chlorine in presence of UV light **(05 scores)**
  (iii) N with concentrated nitric acid at (150-400) °C **(05 scores)**

c) Analyze the impacts of compound N to the environment. **(05 scores)**

d) (i) State a gaseous product formed when N is completely burnt in Air **(01sco)**
  (ii) Write equation of reaction **(01 scores)**
  (iii)Explain the impacts of the gaseous product formed and its mitigations **(02 scors)**
  (iv) Name one property of the gaseous product that makes it usefull in daily life **(02sco)**

ANSWER SHEET FOR SECTION B RESPONSES

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Graph for item 3

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