

Candidate's Name:Signature:

525/1
CHEMISTRY
Paper 1
2025
 $2\frac{1}{2}$ Hours

June/July, 2025

CHEMISTRY-CONNECT

UGANDA ADVANCED CERTIFICATE OF EDUCATION

S5 MID YEAR ASSESSMENT

CHEMISTRY

Paper 1

$2\frac{1}{2}$ Hours

INSTRUCTIONS TO LEARNERS:

*This paper consists of **two** sections: **A** and **B**. It has **five** examination items.*

*All Items are **compulsory**.*

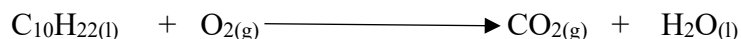
*Responses to section **A** **must** be written in the spaces provided while those of section **B** **must** be written on the answer sheet(s) provided.*

Consider: 1mole of a gas at r.t.p 24dm^3 , $C=12$, $H=1$, $O=16$.

SECTION A

(Items in this section are compulsory)

Item 1: A transport company is under pressure from environmental regulators to reduce its carbon emissions. The manager believes switching to high-octane petrol containing more Octane can improve fuel efficiency. However, they need scientific evidence on how much carbon-dioxide is produced per given mass of octane to assess environmental impact before making a decision. Octane burns in air according to the following equation:-



Task: As a chemistry student,

a) Identify the type of chemical reaction and its importance to vehicle performance. **(2scores)**

[illegible]

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Item 2: The development of periodic table started in early years, where Dmitri Mendeleev was the first to develop the periodic table.

His development of the periodic table stopped on the discovery of only 63 elements. His periodic table was not full and some empty spaces were left in for the future development by other scientists.

Mosley came in later and completed the work and developed what we have to date as the modern periodic table.

Task.

- a) On which basis did Dimitri arrange the elements in the periodic table. *(2scores)*

- b) On which basis did Mosley arrange the elements in the periodic table? *(2scores)*

- c) Why was it important to arrange the elements basing on the Mosley system? *(2scores)*

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- d) There is an element which was discovered with an atomic number 20, Using, hunds rule, paulis exclusion. Write its electronic configuration, In which group and period does it belong? (*4scores*)
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SECTION B

(Attempt all items in this section)

Item 3: A company specializing in manufacturing aviation fuel additives is researching a new compound with a molecular formula C_5H_{12} suitable for improving fuel efficiency. After conducting further studies, they discovered that the compound exists in different isomeric forms, all having similar chemical properties but differing in physical characteristics.

Since the ideal fuel additive should have the lowest boiling point to optimize combustion efficiency, the company seeks expert advice on which isomer would be most suitable for their formulation.

Task: As a chemistry student, (*10scores*)

- Discuss the meaning of isomers and different categories of isomerism.
- Enlightening the company on the different isomers and any similar chemical properties they exhibit.
- Advising and explaining which isomer would be best suited for their fuel additive formulation.

Item 4: A smart phone manufacturing company is looking for a new material to replace lithium in rechargeable batteries. The company wants a metal that is **lightweight, highly reactive**, capable of

easily **losing an electron** to supply electric current. You are a student working with a company's research team, and your task is;

- a) to propose and justify a suitable alternative element out of the three elements considered that is: sodium (**Na**), potassium (**K**), rubidium (**Rb**)

I. using their **atomic radii 1.57, 2.03, 2.16** respectively.

II. Metallic character **Na < K < Rb**

- b) Evaluate advantages and potential dangers of using highly reactive metals in consumer electronics. **(10scores)**

Item 5: A pharmaceutical company suspects that a shipment of chlorine gas used in disinfectant production contains a mixture of isotopes that might affect product formulation. The company sends the gas sample to a laboratory for analysis using a mass spectrometer, which separates and identifies isotopes based on their mass-to-charge ratio. The mass spectrum obtained for chlorine shows two peaks with the following information: (Relative abundances of the isotopes; $A^{35}\text{Cl} = 75\%$, $A^{37}\text{Cl} = 25\%$) The company requires your expertise to, interpret the mass spectrometer results and advise on the implications for their product formulations. **(10scores)**

Task: As a chemistry student,

- a) Describe the process the laboratory used to separate the isotopes.
- b) Using the data provided, calculate the accurate relative atomic mass of chlorine.
- c) How could variations in isotopic composition affect the quality of disinfectants? Suggest two ways the company can ensure their chlorine supply is consistent.

****END****

“Enjoy the Beauty of Chemistry”