

END OF TERM TWO ASSESSMENTS 2025

Uganda Advanced Certificate of Education

SENIOR FIVE CHEMISTRY

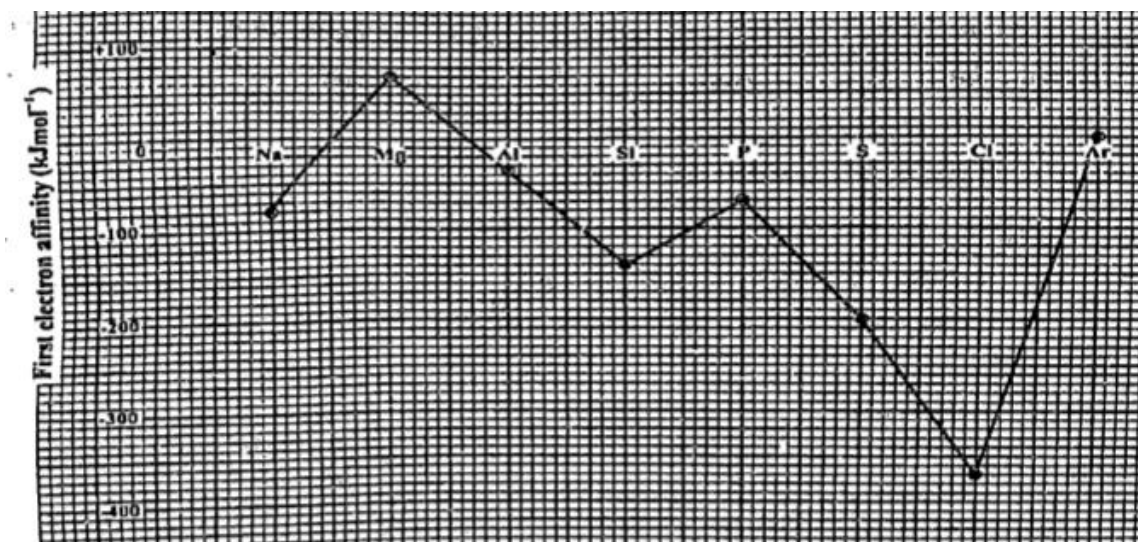
Paper 1

2 hours and 30 minutes

INSTRUCTIONS TO CANDIDATES

- ✓ *Answer **all the four** questions in this paper*
- ✓ *Begin each question *r* on a fresh sheet of paper.*
- ✓ *All necessary working **must** be shown clearly.*
- ✓ *Scientific calculators can be used where necessary.*

1. A new company in your village that deals in water purification and material synthesis is facing some challenges related to period 3 elements in their processes. During their research they came across the graphical data below about electron affinities



They are unaware of the explanation in the trend of the electron affinities of period three elements. They are aware that you have some knowledge about period three elements

Task;

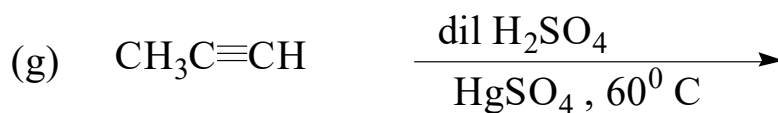
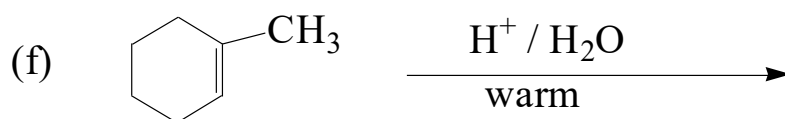
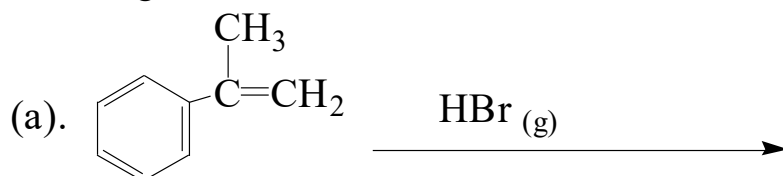
As a Senior five student of chemistry, help them to;

- (a) Explain why;
- there is a general increase in first electron affinity from sodium to argon.
 - The first electron affinity of magnesium is lower than that of aluminium
 - The first electron affinity of phosphorous is lower than that of sulphur
- (b) Predict the reactivity of;
- Period three elements with sodium hydroxide solution
 - Period three oxides with dilute sulphuric acid

2. In Uganda people often rely on simple organic compounds for every day needs, in construction, treatment and other useful needs. The science club in your school is investigating about reactivity of some organic substances with some reagents. In their investigation, they want to understand the products and mechanisms of the reactions. They well know that you study organic chemistry and they have come to you for advice

Task;

As a senior five chemistry student help them predict the products of the following reactions and write the mechanisms



3. A research team at Makerere University Uganda is investigating a newly discovered hydrocarbon isolated from a local plant species in Uganda. They have performed several experiments to characterize this compound. In the combustion analysis, when 5.60g sample of the unknown hydrocarbon completely burnt in oxygen yielding 17.60 g of carbon dioxide and 7.20g of water. Further experiments determined the molar mass of the hydrocarbon to be approximately 84g. your task as a skilled organic chemist is to characterize this compound

Task

As a s.5 chemistry student help them to:

- (i) Determine the empirical formula of the unknown hydrocarbon
- (ii) Determine the molecular formula of the hydro carbon
- (iii) Based on the molecular formula write structural formula and name all the possible structural isomers for the unknown hydrocarbon.

4. (a) A team of young innovative Ugandan chemists is researching potential new sustainable potential biofuels. One promising candidate is dimethylether, (CH_3OCH_3 (g)) which burns much cleaner than many fossil fuels. They need to thoroughly understand its thermodynamic properties especially its enthalpy of formation which is crucial for predicting energy yields. You are part of the research team. Given the following given the following experimental data.

Data

- Standard enthalpy of combustion of diethyl ether (CH_3OCH_3 (g)) = -1460.5 kJ/mol
- Standard enthalpy of formation of carbon dioxide, (CO_2) = -393.5 kJ/mol
- Standard enthalpy of formation of liquid water, ($\text{H}_2\text{O}_{(l)}$) = -285.8 kJ/mol

Task

- (i) Write the balanced chemical equation for the complete combustion of diethyl ether (CH_3OCH_3 (g))
- (ii) Calculate the standard enthalpy of formation for diethylether (CH_3OCH_3 (g))

(b) A group of s.5 students found data in the newspaper researched by a group of scientists who used a mass spectrometer to determine the relative atomic mass of chlorine. In their findings, chlorine had two isotopes , Cl-35 and Cl-37. The mass spectrum showed three significant peaks at 70, 72 and 74. Analysis shows that the relative atomic mass of chlorine is 35.5. one new student among the S.5 students wants to know information about the operation of the machine and how to use the data determine the molecular mass.

Task

Using your knowledge of chemistry help him to

- (i) Why only three peaks were observed
- (ii) Determine the percentage abundance of each isotope

END