GREENHILL ACADEMY SECONDARY

S.5 CHEMISTRY HOLIDAY WORK

TERM 2 2026

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.

As a chemistry student help them to

i) Write the structural formulae and state the functional groups present in the organic compounds.

ii) Predict the reaction and write the mechanisms for the reaction of M with hydrogen bromide gas at room temperature.

iii) M with acidified water

iv) N with chlorine in presence of UV light

v) M with chlorine water

vi) Identify the reagent that can be used to distinguish between M and N and state what is observed when the reagent is treated with each of the compounds. Write the equation for the positive test

Item 2

The chemistry of group II chlorides is widely employed in food preservation to improve shelf life of some food products. The process involves use of solubility of salts to select the best salt to act as an alternative to common salt for food preservation. A group of senior five students at a certain school were debating why a magnesium chloride is commonly used as an alternative to common salt in food preservation and not calcium chloride. In their discussion, one student argued that the salt is highly soluble in water but other students did not seem to understand him. This prompted them to seek advise from their chemistry teacher who later gave them some thermochemical data below to analyze.

Atomization energy of Mg +148 kjmol^{-1}

First ionization energy of Mg +738 $kjmol^{-1}$

Second ionization energy of Mg +1450$kjmol^{-1}$

Atomization energy of chlorine +122$kjmol^{-1}$

First electron affinity of chlorine -349$kjmol^{-1}$

Enthalpy of formation of the salt -641$kjmol^{-1}$

Hydration energy of Mg^{2+} and Cl^{-} are -1920 and -363 $kjmol^{-1}$

Enthalpy of solution of Calcium chloride -82 $kjmol^{-1}$

The students have now approached their teacher for guidance and he has referred them to you.

Task

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