

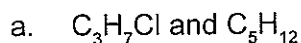


Isotope Questions

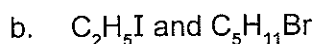
1. Explain why there is always a small peak one mass unit above the molecular ion for all organic molecules analysed.

Organic molecules contain carbon atoms and a small percentage (1.1%) of carbon atoms are ^{13}C rather than ^{12}C . This means a small number of the molecules have one mass unit more than the rest and this produces the small peak one mass unit above the molecular ion.

2. Describe the feature/s of a mass spectrum would readily differentiate the following pairs of molecules.

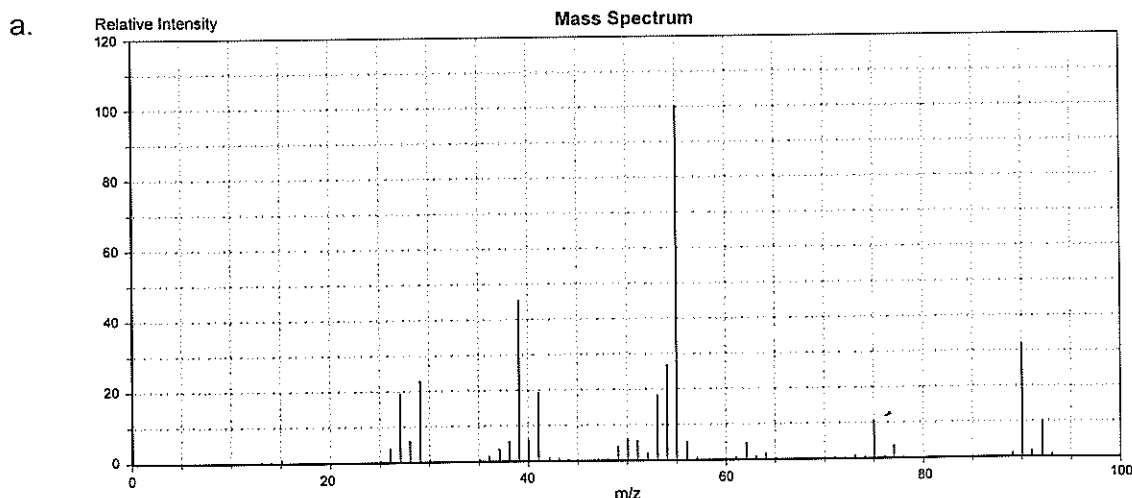


$\text{C}_3\text{H}_7\text{Cl}$ will have a molecular ion of $3 \times 12 + 7 + 35 = 78$ whereas C_5H_{12} will have a molecular ion of $5 \times 12 + 12 = 72$. Most notably, $\text{C}_3\text{H}_7\text{Cl}$ will have a $M+2$ peak ($m/z = 80$) one third the size of the molecular ion whereas C_5H_{12} will not.



$\text{C}_2\text{H}_5\text{I}$ will have a molecular ion of $2 \times 12 + 5 + 127 = 156$ whereas $\text{C}_5\text{H}_{11}\text{Br}$ will have a molecular ion of $5 \times 12 + 11 + 79 = 150$. Most notably, $\text{C}_5\text{H}_{11}\text{Br}$ will have two peaks of similar height 2 mass units apart the molecular ion 150 and $M+2$ at 152. On the other hand $\text{C}_2\text{H}_5\text{I}$ will have no such extra peak.

3. For each of the following spectra, identify whether it has a halogen present and if so, which one.



Chlorine. The molecular ion M is present with $M+2$ in a 3:1 ratio.