Here are a list of steps to follow when interpreting a mass spectrum. This simplified list will help you to interpret many spectra, however there are other mechanisms of fragmentation which cannot be covered in this brief tutorial.

Steps to interpret a mass spectrum

1. Look for the molecular ion peak.
   - This peak (if it appears) will be the highest mass peak in the spectrum, except for isotope peaks.
   - Nominal MW (meaning=rounded off) will be an even number for compounds containing only C, H, O, S, Si.
   - Nominal MW will be an odd number if the compound also contains an odd number of N (1,3,...).

2. Try to calculate the molecular formula:
   - The isotope peaks can be very useful, and are best explained with an example.
     - Carbon 12 has an isotope, carbon 13. Their abundances are $^{12}\text{C}=100\%$, $^{13}\text{C}=1.1\%$. This means that for every 100 $^{12}\text{C}$ atoms there are 1.1 $^{13}\text{C}$ atoms.
     - If a compound contains 6 carbons, then each atom has a 1.1% abundance of $^{13}\text{C}$.
     - Therefore, if the molecular ion peak is 100%, then the isotope peak (1 mass unit higher) would be 6x1.1%=6.6%.
     - If the molecular ion peak is not 100% then you can calculate the relative abundance of the isotope peak to the ion peak. For example, if the molecular ion peak were 34% and the isotope peak 2.3%: $(2.3/34)\times100 = 6.8\%$. 6.8% is the relative abundance of the isotope peak to the ion peak. Next, divide the relative abundance by the isotope abundance: $6.8/1.1=6$ carbons.
   - Follow this order when looking for information provided by isotopes: (A simplified table of isotopes is provided in the introduction, more detailed tables can be found in chemistry texts.)
     - Look for A+2 elements: O, Si, S, Cl, Br
     - Look for A+1 elements: C, N
     - "A" elements: H, F, P, I

3. Calculate the total number of rings plus double bonds:
   - For the molecular formula: $\text{C}_x\text{H}_y\text{N}_z\text{O}_n$
     - rings + double bonds = $x - (1/2)y + (1/2)z + 1$

4. Postulate the molecular structure consistent with abundance and m/z of fragments.
   - More information on specific fragmentation can be found in the quiz for each functional group.

Contributors