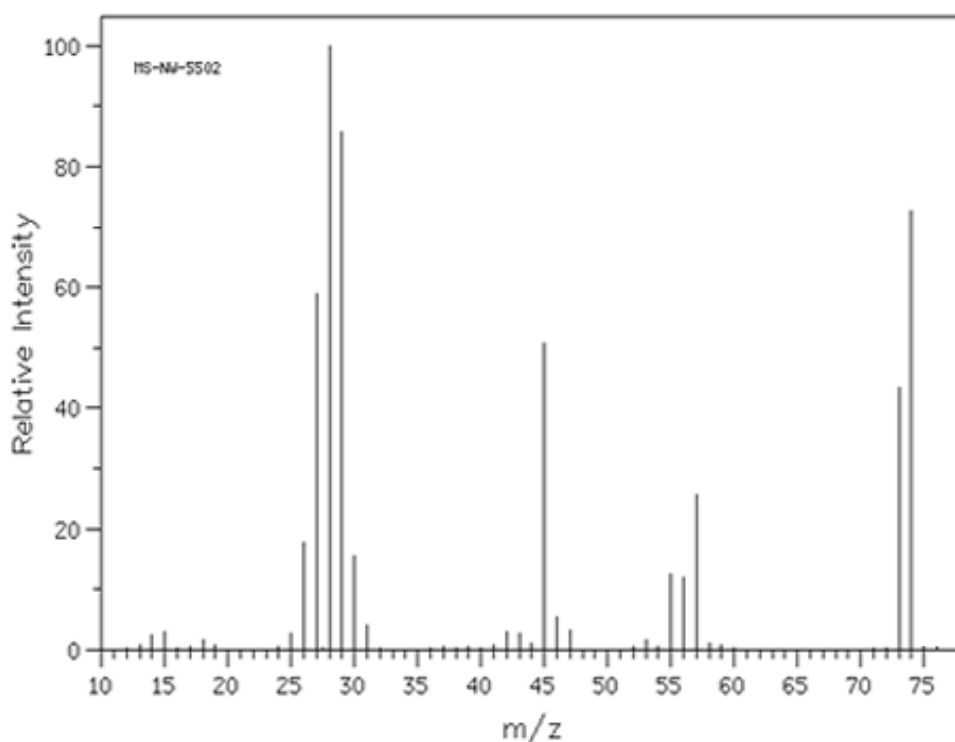


Friday Worksheet  
Mass spectroscopy 1

Name: .....

- 1) The most appropriate technique to determine the number of isotopes of Pb is
  - a) mass spectrometry.
  - b) infrared spectroscopy.
  - c) atomic absorption spectroscopy.
  - d) high-performance liquid chromatography.Explain why
- 2) The most appropriate technique to determine the concentration of  $\text{Hg}^{2+}$  ions in blood is
  - a) mass spectrometry.
  - b) infrared spectroscopy.
  - c) atomic absorption spectroscopy.
  - d) high-performance liquid chromatographyExplain why.
- 3) Consider the mass spectrum below of an organic acid with an empirical formula  $\text{C}_3\text{H}_6\text{O}_2$ .



- a) Define the following
  - i) m/z  
*mass / charge this number forms the x-axis of the mass spectrum*
  - ii) Base peak  
*Tallest peak in the spectrum assigned a relative intensity of 100*
  - iii) Parent ion peak  
*It is the peak formed by the parent ion, usually the right most peak and is used to determine the molar mass of a molecule.*
- b) Identify the organic molecule from the information given in the spectrum.  
*Propanoic acid*
- c) What fragment is represented by the peak at 45(m/z)  
 *$\text{COOH}^+$*

d) What is the most common fragment

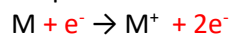


e) What is the molecular formula of the compound if its empirical formula is

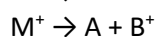
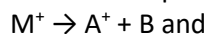


4) A sample of compound M is analysed in a mass spectrometer where it forms the molecular ion  $M^+$

a) Write an equation to represent the ionisation of M



Some of the parent ions fragment as follows.



b) If the molar mass of M is 29 and the molar mass of B is 14 the mass spectrum would show peaks at which  $m/z$  values?

$29, 15, 14$

c) Which of the following will not appear on the spectrum? Explain

M, A,  $A^+$ , B or  $B^+$

*All the neutral particles will not be deflected onto the detection plate and so will not be detected.*

5) 2-methylbutane is analysed using a mass spectrometer.

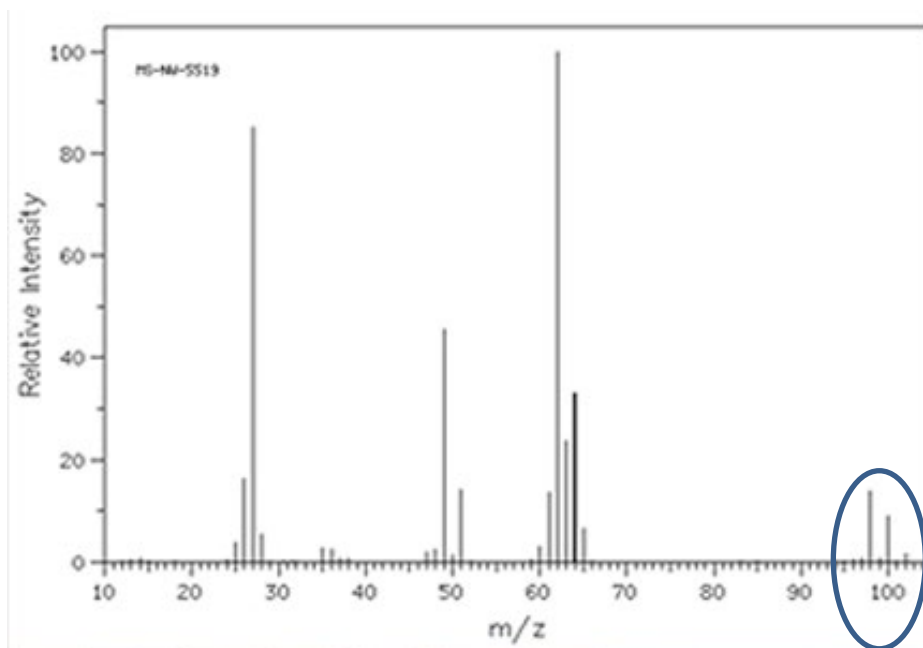
a) What is the highest  $m/z$  value that a peak could be expected?

*Parent ion peak at 72  $m/z$*

b) A peak at  $m/z$  57 is noticed. This is most likely caused by which fragment?



6) Below is a the MS of 1,2-dichloroethane.



a) What is the most common fragment?



b) Chlorine has two isotopes  $^{35}\text{Cl}$  and  $^{37}\text{Cl}$ . Looking at the spectrum what fragments formed the last three peaks on the right?

The three peaks in this area represent



and



and

