TIME OF FLIGHT MASS SPECTROMETRY 2

1) a) Calculate the relative atomic mass of lead given the mass spectroscopy data below.

m/z	204	206	207	208
relative intensity	0.287	4.51	4.32	10.00

b) Identify the species responsible for the peak at *m/z* 208.

c) Which ion will have the shortest time of flight and reach the detector fastest?

2) The mass spectrum of butanone shows its main peak at m/z 72. It also has a small signal at m/z 73.

a) What is the relative formula mass of this compound?

b) Give two reasons for the peak at m/z 73.

c) There would also be tiny peaks at m/z 74, 75, etc. Explain why some ions with these m/z values may be formed but why their signals may be too small to be seen.

3) The mass spectrum of chloromethane (CH_3Cl) shows two main peaks at m/z 50 and m/z 52.

a) Explain why these two peaks are produced.

b) Predict the relative intensity of these two signals. Explain your answer.

4) a) Calculate the relative atomic mass of chromium given the mass spectroscopy data below.

m/z	50	52	53	54
relative abundance (%)	4.3	83.8	9.5	2.4

b) Identify the species responsible for the peak at *m/z* 52.

c) Which ion will have the shortest time of flight and reach the detector fastest?

d) All the particles have the same kinetic energy (= ½ mv^2, where m = mass of particle and v = velocity) and the velocity of the particles is given by v= d/t (where d = distance travelled and t = time taken). If the time of flight of a $^{54}Cr^+$ ion is 1.486×10^{-5} s, calculate the time of flight of a $^{50}Cr^+$ ion. Give your answer to the appropriate number of significant figures.

5) The element bromine is made of diatomic molecules. There are two isotopes of bromine, namely ^{79}Br and ^{81}Br of roughly equal abundance. Sketch what the time of flight mass spectrum of the element bromine will look like.

6) Calculate the relative atomic mass of krypton given the mass spectroscopy data below.

m/z	78	80	82	83	84	86
relative abundance (%)	0.3	2.3	11.6	11.5	56.9	17.4

7) Calculate the relative atomic mass of strontium given the mass spectroscopy data below.

m/z	84	86	87	88
relative intensity	0.00678	0.120	0.085	1.000