Exercise 2.21– Mass spectrometer

Q221-01 Relative atomic and molar masses are determined with a mass spectrometer utilizing the fact that:

A. the velocity of the particles can be accurately determined.
B. a definite fraction of the particles is formed in a charged state.
C. all particles with the same charge to mass ratio follow the same curved path.
D. the force with which the accelerated particles strike a target can be measured.

Q221-02 What is the correct sequence for the processes occurring in a mass spectrometer?

A. vaporization, ionization, acceleration, deflection
B. vaporization, acceleration, ionization, deflection
C. ionization, vaporization, acceleration, deflection
D. ionization, vaporization, deflection, acceleration

Q221-03 Which ion would undergo the greatest deflection in a mass spectrometer?

A. $^{16}O^{+}$
B. $^{16}O^{2+}$
C. $^{18}O^{2+}$
D. $(^{16}O^{18}O)^{+}$

Q221-04 Why do peaks in mass spectra have different heights?

Q221-05 Why do small lines appear on the mass spectrum of neon at m/e 10 and 11, when the isotopes have masses of 20 and 22 atomic mass units?

Q221-06 Which of the following particles could be detected in a mass spectrometer?

A. H_2O^{+}
B. CO_2
C. Cl^{-}
D. CH_3

Q221-07 The species responsible for the line that appears in the spectrum at the highest m/e value is called which of the following:

A. The heaviest ion
B. The molecular ion
C. The atomic ion
D. The double ion

Q221-08 While carrying out a reaction, a chemist notices the evolution of a gas. A sample of this gas gave a mass spectrum in which the molecular ion (m/e = 44) was the largest ion peak. The only other significant peaks were observed at m/e = 28 and m/e = 16. Deduce the identity of the gas?

Q221-09 Chlorine consist of two common isotopes ^{35}Cl and ^{37}Cl with abundances of approximately 75% and 25%. How many lines will be seen on the mass spectrum of chlorine?

Exercise 2.21– Mass spectrometer

Q221-10 sulphur vapour is injected into a mass spectrometer for analysis. If the vapour consists of S_2 molecules and there are three isotopes of sulphur ^{32}S, ^{34}S and ^{36}S, determine the number and m/e values of the lines that appear on the mass spectrum.