# Isotopes and Atomic Mass

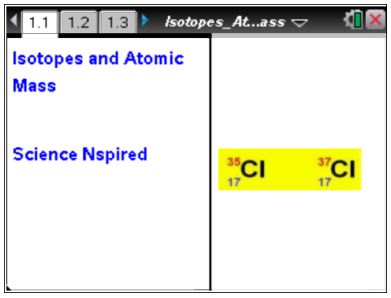
**Student Activity**

**Name** _____

**Class** _____

**Open the TI-Nspire document *Isotopes_Atomic_Mass.tns.***

Most elements have two or more stable isotopes (26 elements have a single stable isotope). The atomic mass given in the Periodic Table is an average atomic mass based on the masses and natural abundances of the stable isotopes. A mass spectrometer can be used to determine the masses and abundances of the isotopes. This data is used to determine the average atomic mass of an element.




**Move to pages 1.2 – 1.4. Answer the following questions here or in the .tns file.**

Q1. Most elements have two or more **isotopes**, like Cl-35 and Cl-37. _____. All of the isotopes of an element have the same number of _____. (More than one response may be correct.)

A. protons B. neutrons C. electrons

Q2. Isotopes of an element have a different number of _____. (More than one response may be correct.)

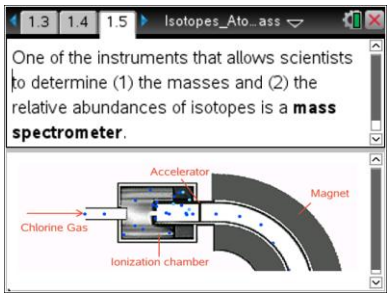
A. protons B. neutrons C. electrons

Q3. Isotopes of an element have the same mass.

A. True B. False

**Move to page 1.5.**

1. Examine the schematic diagram of a mass spectrometer.



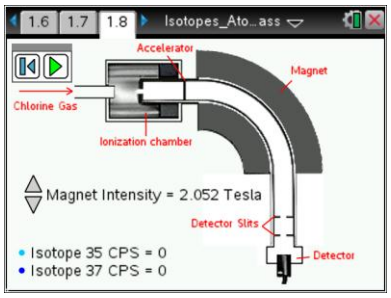

**Move to page 1.6. Answer the following question here or in the .tns file.**

Q4. In the first stage of the mass spectrometer the atoms in the vaporized gas (chlorine in this case) _____.

A. are ionized to become +1 ions B. pass through a magnetic field C. enter into the detector

**Move to pages 1.7 and 1.8.**

2. Read the instructions on page 1.7 for running the mass spectrometer simulation on page 1.8. After starting the simulation, you can use the up/down arrows to adjust the magnetic field. The counts per second (CPS) will provide data about the abundance of each isotope.



**Move to pages 1.9 – 1.21. Answer the following questions below or in the .tns file.**

Q5. Based on the data from the mass spectrometer, which Cl isotope has the greatest abundance?

A. Cl-35 B. Cl-37

Q6. To three significant figures, the percent of Cl-35 is _____%.

Q7. If chlorine were 50% Cl-35 and 50% Cl-37, the average atomic mass of Cl (to four significant figures) would be _____ amu.

Data: Cl-35 is 34.97 amu.
Cl-37 is 36.97 amu.
1 amu = $1.66054 \times 10^{-27}$ kg

Q8. The average atomic mass (four significant figures) for Cl is _____ amu.

Data: The abundance of Cl-35 (34.97 amu) is 75.78%.
The abundance of Cl-37 (36.97 amu) is 24.22%.

Q9. 10,000 carbon atoms have a mass of _____ amu.

Data: The abundance of C-12 (12.000 amu) is 98.93%.
The abundance of C-13 (13.003 amu) is 1.07%.

A. 12,000 C. 13,000
B. 12,010 D. 13,003

Q10. The average atomic mass of C is _____ amu.

A. 12.00 B. 12.01 C. 13.00

Q11. The average atomic mass (four significant figures) for Mg is _____ amu.

Data: The abundance of Mg-24 (23.985 amu) is 78.99%.
The abundance of Mg-25 (24.986 amu) is 10.00%.
The abundance of Mg-256 (25.983 amu) is 11.01%.

Q12. The percentage of Ga-69 found in nature is _____ % (three significant figures).

Data: Ga is 69.723 amu.
Ga-69 is 68.926 amu.
Ga-71 is 70.925 amu.