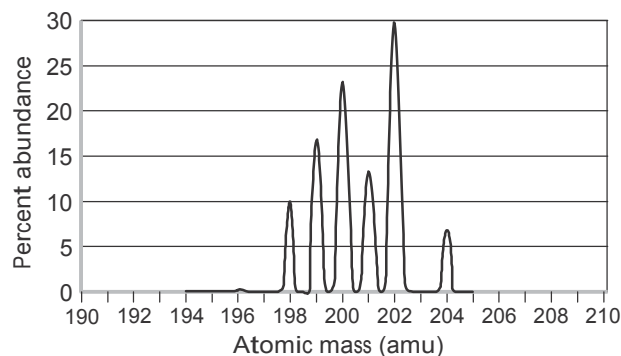


Isotopes of an Element

Use with Chapter 4,
Section 4.3

A mass spectrometer is a device for separating atoms and molecules according to their mass. A substance is first heated in a vacuum and then ionized. The ions produced are accelerated through a magnetic field that separates ions of different masses. The graph below was produced when a certain element (element X) was analyzed in a mass spectrometer. Use the graph to answer the questions below.



- How many isotopes of element X exist? _____
- What is the mass of the most abundant isotope? _____
- What is the mass of the least abundant isotope? _____
- What is the mass of the heaviest isotope? _____
- What is the mass of the lightest isotope? _____
- Estimate the percent abundance of each isotope shown on the graph.

- Without performing any calculations, predict the approximate atomic mass for element X. Explain the basis for your prediction.

- Using the data given by the graph, calculate the weighted average atomic mass of element X. Identify the unknown element.

Use the equation for average atomic mass to answer the following questions. Show all work and correct units to receive full credit.

- 9) Copper is made of two isotopes. Copper-63 is 69.17% abundant and it has a mass of 62.9296 amu. Copper-65 is 30.83% abundant and it has a mass of 64.9278 amu. What is the average atomic mass of copper?
- 10) Calculate the average atomic mass of lead. The four lead isotopes have atomic masses and relative abundances of 203.973 amu (1.4%), 205.974 amu (24.1%), 206.976 amu (22.1%) and 207.977 amu (52.4%).
- 11) Gallium has two naturally occurring isotopes. The atomic mass of gallium-69 is 68.9256 amu and it is 60.108% abundant. Using the average atomic mass of gallium, what is the actual atomic mass of the second isotope, gallium-71?
- 12) **CHALLENGE:** Antimony has two naturally occurring isotopes. The mass of antimony-121 is 120.904 amu and the mass of antimony-123 is 122.904 amu. Using the average atomic mass of antimony, find the percent abundance of *each* isotope.