ANSWER KEY

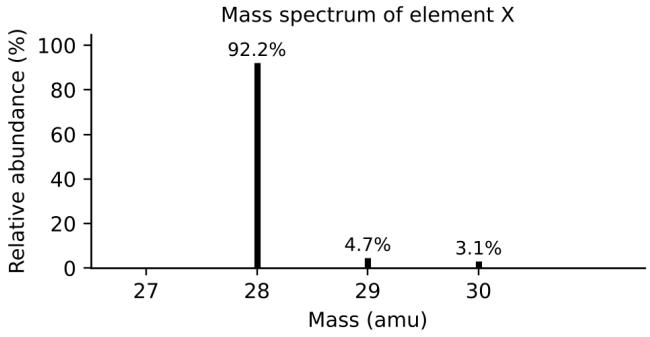
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1.2 Mass Spectra of Elements

AP Chemistry | ANSWER KEY

Use a periodic table. Show your work for every calculation.

1. The mass spectrum of element X is shown. (a) Calculate the average atomic mass of X. (b) Identify X and explain your choice.



(a) 28(0.922) + 29(0.047) + 30(0.031) = 28.11 amu
(b) Silicon (28.09 amu). The average is closest to the tallest peak at 28, and silicon's average atomic mass matches.

2. Bromine has two isotopes: Br-79 (78.92 amu, 50.69%) and Br-81 (80.92 amu, 49.31%). Calculate the average atomic mass of bromine.

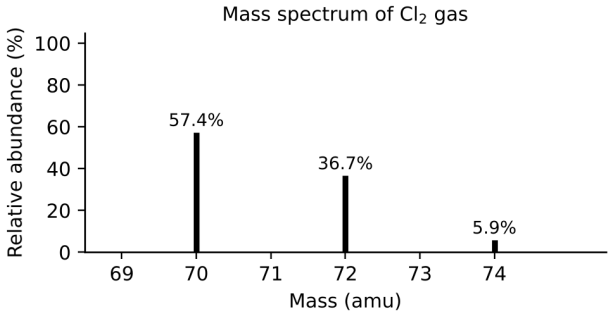
78.92(0.5069) + 80.92(0.4931) = 79.91 amu

3. Lithium has two isotopes, Li-6 (6.015 amu) and Li-7 (7.016 amu). The average atomic mass of lithium is 6.941 amu. Calculate the percent abundance of Li-6.

6.015x + 7.016(1 − x) = 6.941 so 1.001x = 0.075, x = 0.0749
Li-6 is 7.49% (and Li-7 is 92.51%)

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4. Chlorine is 75.78% Cl-35 and 24.22% Cl-37. The mass spectrum of Cl_2 gas is shown. Explain why there are three peaks and why the peak at 70 is the tallest.

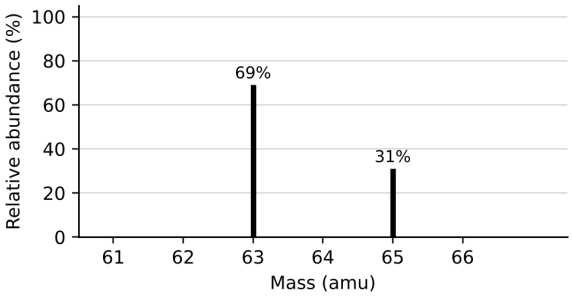


Each Cl_2 molecule holds two Cl atoms, which can be 35 + 35 = 70, 35 + 37 = 72, or 37 + 37 = 74 amu. Cl-35 is the most common isotope, so the molecule made of two Cl-35 atoms is the most likely, giving the tallest peak at 70.

5. A student says, “The average atomic mass of boron is 10.81 amu, so most boron atoms have a mass of 10.81 amu.” Explain what is wrong with this claim.

No boron atom has a mass of 10.81 amu. Boron atoms are either B-10 (about 10 amu) or B-11 (about 11 amu). 10.81 is a weighted average, closer to 11 because B-11 is more common.

6. Copper is 69% Cu-63 and 31% Cu-65. Sketch the mass spectrum of copper on the axes.



Two lines: one at 63 reaching 69% and a shorter one at 65 reaching 31%.

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