Average Atomic Mass

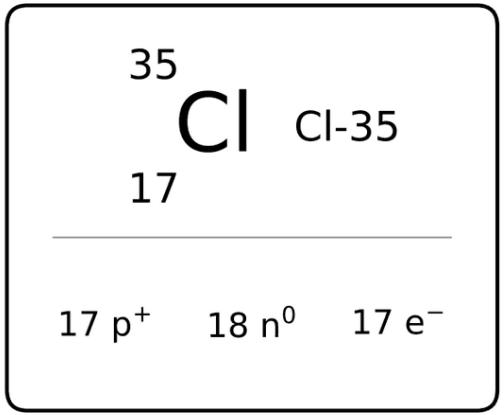
Essential Question

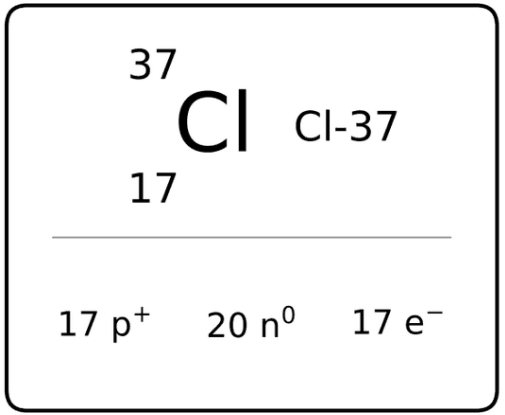
Why isn't atomic mass a whole number?

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Isotopes

- Isotopes: same element, different numbers of neutrons
- Hyphen notation: chlorine-35 or Cl-35
- Nuclide symbol: mass number top left, atomic number bottom left





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Nuclear Stability

- A stable nucleus does not change
- An unstable nucleus breaks apart: it is radioactive
- Carbon-12 and carbon-13 are stable; carbon-14 is radioactive
- Change the protons → a new element

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The Atomic Mass Unit

- 1 amu = 1/12 the mass of a carbon-12 atom
- Protons and neutrons are each about 1 amu

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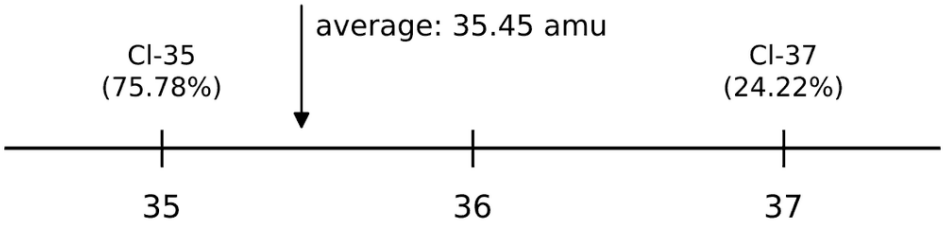
Percent Abundance

- How common each isotope is in nature
- All abundances add up to 100%

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What Is Average Atomic Mass?

- Weighted average of all of an element's isotopes
- The atomic mass on the periodic table
- Closest to the most common isotope



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Calculating Average Atomic Mass

- $(\text{mass}_1 \times \text{abundance}_1) + (\text{mass}_2 \times \text{abundance}_2) + \ldots$
- Use abundance as a decimal: 75.78% → 0.7578
- One term per isotope

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Average Atomic Mass

Steps to Solve

- Convert each percent to a decimal
- Multiply each mass by its decimal
- Add the products
- Round at the end with significant figures
- Check: between the masses, near the most common

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Example: Two Isotopes

Use the data to calculate the average atomic mass of chlorine.

Isotope	Mass (amu)	Abundance
Cl-35	34.969	75.78%
Cl-37	36.966	24.22%

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Example: Three Isotopes

Use the data to calculate the average atomic mass of magnesium.

Isotope	Mass (amu)	Abundance
Mg-24	23.985	78.99%
Mg-25	24.986	10.00%
Mg-26	25.983	11.01%

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Example: Which Is More Common?

Copper has two isotopes, copper-63 and copper-65. Its average atomic mass is 63.55 amu. Which isotope is more abundant? Explain.

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Example: Finding Abundance

Boron has two isotopes: boron-10 (10.013 amu) and boron-11 (11.009 amu). Its average atomic mass is 10.81 amu. Find the percent abundance of each isotope.

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Average Atomic Mass

Big Ideas

- Isotopes of an element have different numbers of neutrons
- Write isotopes as Cl-35 or as a nuclide symbol
- Atomic mass is a weighted average
- It is closest to the most common isotope

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