Additional Background Information for Teachers

- To fill in isotopes table, it is important to emphasize the equations: mass = protons + neutrons; charge = protons – electrons. Since all of these are neutral, proton number (Z) = electron number and gives rise to element name. The isotope name or symbol also has mass in it, so may be used to find the hidden pieces. If it hasn’t been emphasized before, the teacher should note that Hydrogen-1 has no neutron. It is a stable nucleus.

- When teaching about average atomic mass, teacher may wish to discuss how isotopes actual mass (not mass number) is NOT a whole number. Therefore some of the average atomic masses (such as the one for strontium) do NOT match what is on the periodic table. If you wish to address this, the actual masses and percentages of strontium are: 83.9134 (.56%), 85.9094 (9.86%), 86.9089 (7%) and 87.9056 (82.58%). The mass then comes out to 87.62. The following examples can ignore this difference and still approximate the periodic table mass.

- Please note that different isotope maps represent the data in different manners. The explanation for these delta (δ) calculations are found in the USGS Isotopes Tracer page (https://wwwrcamnl.wr.usgs.gov/isoig/res/funda.html) Briefly, stable isotope abundance is referred to with the term “per mill”. The calculation is (in %) δ = (R_{sample}/R_{standard} - 1)1000 where R is the ratio of the heavy isotope to the lighter isotope. There is a standard or accepted ratio that is the average in nature (R_{standard}). The sample from a geographic area (R_{sample}) is compared to this standard value.

- The map values show the delta or divergence from that average or standard. A positive delta means that there is more of the heavy isotope than in the standard; a negative delta value means there is more of the lighter isotope.

References:


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Thanks to:
Dow Chemistry Teacher Summit