Explore elements: a self-paced mini-course

Four text-based modules, approximately 55 minutes in total. Read, investigate and self-check at your own pace.

Module 1 - Read the table (10 minutes)

Goal: identify a symbol, atomic number, period and group. Read an element tile; atomic number counts protons. A period is a row and a group is a column. The detached f series belong inside periods 6 and 7.

Do: compare oxygen, sodium and chlorine. Record each symbol, Z, period and group.

Self-check: does gaining an electron change an element? Answer: no; changing the proton number changes the element. A changed electron count creates an ion.

Module 2 - Compare patterns (15 minutes)

Goal: use a pattern without treating it as a guarantee. Main-group columns often share useful outer-shell patterns; families can span columns. Hydrogen is in group 1 but is not an alkali metal.

Do: compare Li, Na and K. Sketch their shell populations and explain what repeats.

Self-check: do all group-18 elements have eight outer electrons? Answer: helium has two, filling its first shell; the other familiar noble gases have an outer-shell octet.

Module 3 - Test with data (15 minutes)

Goal: support a claim with numbers, units and exceptions. A graph displays a selected set of reported values. Unknown is not zero; a line between points does not add measurements.

Do: open Trend lab, period 3, first ionization energy. Run the increase test and locate both decreases.

Self-check: does Pearson r prove that X causes Y? Answer: no. It summarizes linear association for the complete pairs in the selection.

Module 4 - Investigate nuclei (15 minutes)

Goal: distinguish isotopes and explain random decay. Isotopes share Z but differ in N; A=Z+N. After each half-life, the expected surviving fraction halves.

Do: compare C-12, C-13 and C-14. In Decay Lab, record five samples at three half-lives and compare their mean with 32 of 256.

Self-check: must each sample have exactly 32 survivors? Answer: no; individual decays are random. The expectation describes an average over repeated trials.

Completion task

Choose one classroom investigation and write a claim, two pieces of evidence, a scientific explanation and one limitation. Use the 16-point rubric to review your work. This is a free, text-based self-paced course; it has no enrollment, credential or certificate.

Suggested levels are starting points, not formal curriculum alignment. Use the site or printed data; no physical element samples are needed. Source data and limitations: elementexplore.com/sources.html. These original Element Explore materials may be copied and adapted for classroom use.