



Atom Builder

Companion worksheet — use the Atom Builder tool to complete each row.

Name: _____ **Date:** _____

Part A — Build these atoms

For rows with a target given, use the builder to figure out the missing particle counts. For rows with counts given, use the builder to identify what you've built.

Target	Protons	Neutrons	Electrons	Mass #	Charge
Neutral Carbon-12					
Neutral Oxygen-16					
An isotope of Oxygen (mass 18)					
Sodium ion (Na^+)					
? (p=17, n=18, e=18)					
? (p=6, n=8, e=6)					

For the last two rows, use the builder's results panel to name the element, then write what you built (e.g. "Chloride ion, Cl^- ") in the Target column.

Quick reference

Mass number	protons + neutrons
Charge	protons – electrons
Isotope	same protons, different neutrons than the standard count
Ion	protons $\neq$ electrons (a charge exists)



Part B — Challenges

Use the builder to construct each atom described below, then record exactly what you built.

1. Build an atom with a $2+$ charge that is also an isotope (not the standard neutron count).

What I built: protons ____ neutrons ____ electrons ____ → element/ion: _____

2. Build an anion with a mass number of 35.

What I built: protons ____ neutrons ____ electrons ____ → element/ion: _____

3. Build the most common isotope of Nitrogen, then turn it into an ion with a $3-$ charge.

What I built: protons ____ neutrons ____ electrons ____ → element/ion: _____

4. Build any atom you like, then swap two protons for two more neutrons instead. Is it still the same element? What changed?

What I built: protons ____ neutrons ____ electrons ____ → element/ion: _____

Part C — Reflection

What is the difference between an isotope and an ion? Can a single atom be both at the same time? Explain.

**TEACHER ANSWER KEY — remove or skip this page before printing for students****Part A**

Target	Protons	Neutrons	Electrons	Mass #	Charge
Neutral Carbon-12	6	6	6	12	Neutral
Neutral Oxygen-16	8	8	8	16	Neutral
Oxygen-18 (isotope)	8	10	8	18	Neutral
Sodium ion (Na^+)	11	12	10	23	1+
Chloride ion (Cl^-)	17	18	18	35	1-
Carbon-14 (isotope)	6	8	6	14	Neutral

Part C — Sample answer

An isotope is defined by neutron count — atoms of the same element (same protons) with a different number of neutrons. An ion is defined by electron count — an atom that has gained or lost electrons, giving it a nonzero charge. Yes, an atom can be both at once: e.g. Carbon-14 that has also lost electrons would be both a carbon isotope and a cation.

Teaching notes

- This builder caps protons at 36 (Krypton) to match the diagram tool's dataset — sufficient for standard high school chemistry scope.
- The "standard neutron count" used to flag isotopes is derived from each element's standard atomic weight, rounded — a common simplification, not a rigorous per-isotope lookup.
- Part B, challenge 3 has multiple valid answers depending on which nitrogen isotope students start from — accept any internally consistent answer.