THE STANDARD

Conservation of Mass in Reactions

Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.

DCI — DISCIPLINARY CORE IDEA

PS1.B · Chemical Reactions

> *Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. The total number of each type of atom is conserved, and thus the mass does not change.*

Atoms don't disappear. In a chemical reaction the atoms from the reactants regroup into new molecules, but every atom you started with is still there. Count hydrogen and oxygen on the reactant side, count them again on the product side. The numbers match. **That's why the mass before equals the mass after, as long as nothing escapes the system.**

SEP — SCIENCE & ENGINEERING PRACTICE

Developing and Using Models

> *Develop a model to describe unobservable mechanisms.*

Students aren't watching a reaction and calling it conservation. They're building a model that shows the same atoms on both sides, just regrouped. Before/after particle diagrams. Drag-and-drop atom sims. Gumdrops rearranged into new compounds. **If the model loses or invents an atom, the model is wrong, and that's the catch students have to find.**

CCC — CROSSCUTTING CONCEPT

Energy and Matter

> *Matter is conserved because atoms are conserved in physical and chemical processes.*

Matter is conserved because atoms are conserved. Students reason from something they can't see (atoms regrouping) to something they can measure (mass on a balance). When mass appears to change in an open container, the lens is: an atom went somewhere we didn't track. **The accounting works at the atomic scale, and the macroscopic measurement is the check.**