THE STANDARD

Molecules & Extended Structures

Develop models to describe the atomic composition of simple molecules and extended structures.

DCI — DISCIPLINARY CORE IDEA

PS1.A · Structure and Properties of Matter

> *Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals).*

Everything is built from atoms. About a hundred different types exist, and they combine in characteristic ways. Sometimes they make small discrete molecules (water is 3 atoms, methanol is 6). Sometimes they make giant repeating structures that go on for billions of atoms (table salt, diamond). **The structure determines what the substance actually is.**

SEP — SCIENCE & ENGINEERING PRACTICE

Developing and Using Models

> *Develop a model to predict and/or describe phenomena.*

Students aren't memorizing what a water molecule looks like. They're building models that show how atoms connect, then using those models to describe a substance. The model is a thinking tool. If it can't predict or describe, it's just art. **If it can, the student is doing science.**

CCC — CROSSCUTTING CONCEPT

Scale, Proportion, and Quantity

> *Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.*

Atoms are too small to see, even under a microscope. The whole standard hinges on students reasoning about something they can't directly observe. **They scale up: a ball-and-stick model of one molecule represents the trillions of identical molecules in the cup of water in front of them.**