

Atomic Theory—Inside the Invisible

KEY IDEAS

- Matter is made of atoms.
- The atomic theory of matter has changed with new discoveries.
- Elements can be classified according to their properties.
- Atoms have a structure that determines their chemical and physical properties.





Chapter Preview

The astronomer Carl Sagan once referred to matter as “the stuff of the universe.” But what is this “stuff” made of? In the way that a large building is an assembly of boards, nails, bricks, and mortar, all matter is composed of a few types of “building blocks.” Scientists and philosophers have long been intrigued by the nature of matter. In 500 BCE, the Greek philosopher Democritus proposed that all matter was made up of tiny particles, which were too small to be seen, and that these particles were different sizes and shapes. In other words, the particles that made up wood were different from the particles that made up water. He called these small particles “atomos” or “indivisibles.” As you will learn, Democritus came remarkably close to our modern atomic theory.

In this chapter, you will learn about the development of some theories and models of the structure of atoms. As new techniques and technologies developed and new information became available, the models and theories changed and adapted.

TRY THIS: *Modelling a Theory*

Skills Focus: creating models, predicting, observing

Scientists often use physical models to help explain or demonstrate theories. Experimenting with models allows scientists to verify parts of a theory, or to revise or replace a theory. In this activity, you will create a model, then use your model to test a prediction based on a theory.

Materials: (per group) small 10 cm aluminum pie plate; about 40 plastic beads in two different sizes (20 of each size), 20 popcorn kernels, 20 steel ball bearings (same size as one size of plastic bead)

The Theory: A collection of particles, when vibrated, should sort out according to size and density.

1. Fill a pie plate half full with the beads, kernels, and ball bearings.
2. Based on the theory, predict what will happen when the plate is vibrated.
3. Test your prediction. Use small, rapid vibrations and try not to spill the contents.
 - A. How did the contents sort out? Describe the arrangement in detail.
 - B. Based on your observations, evaluate your prediction.
 - C. Revise the theory. This may involve adding more detail or changing the theory entirely.
 - D. Describe how your new theory better fits your observations.