

Section 1

Development of the Atomic Theory



Bellringer

The following is a quote by Democritus (c. 460–c. 370 bce). Paraphrase this quote in your own words in your **science journal**.

“Color exists by convention, sweet by convention, bitter by convention; in reality nothing exists but atoms and the void.”

What do you know about Democritus? And why are his thoughts important?

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Objectives

- **Describe** some of the experiments that led to the current atomic theory.
- **Compare** the different models of the atom.
- **Explain** how the atomic theory has changed as scientists have discovered new information about the atom.

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The Beginning of the Atomic Theory

- **What Is an Atom?** Around 440 BCE, a Greek philosopher named Democritus thought that you would eventually end up with a particle that could not be cut. He called this particle an atom. (from the Greek “atomos”, meaning indivisible.
- **From Aristotle to Modern Science** Aristotle, another Greek philosopher, disagreed with Democritus’ s ideas. He believed that you would never end up with a particle that could not be cut. Democritus was right, though: Matter is made of particles, which we call atoms. An atom is the smallest particle into which an element can be divided and still be the same substance.

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Dalton's Atomic Theory Based on Experiments

- **Dalton's Theory** John Dalton published his atomic theory in 1803. His theory stated that all substances are made of atoms. Atoms are small particles that cannot be created, divided, or destroyed. Atoms of the same element are exactly alike, and atoms of different elements are different. Atoms join with other atoms to make new substances.
- **Not Quite Correct** The atomic theory was then changed to describe the atom more correctly.

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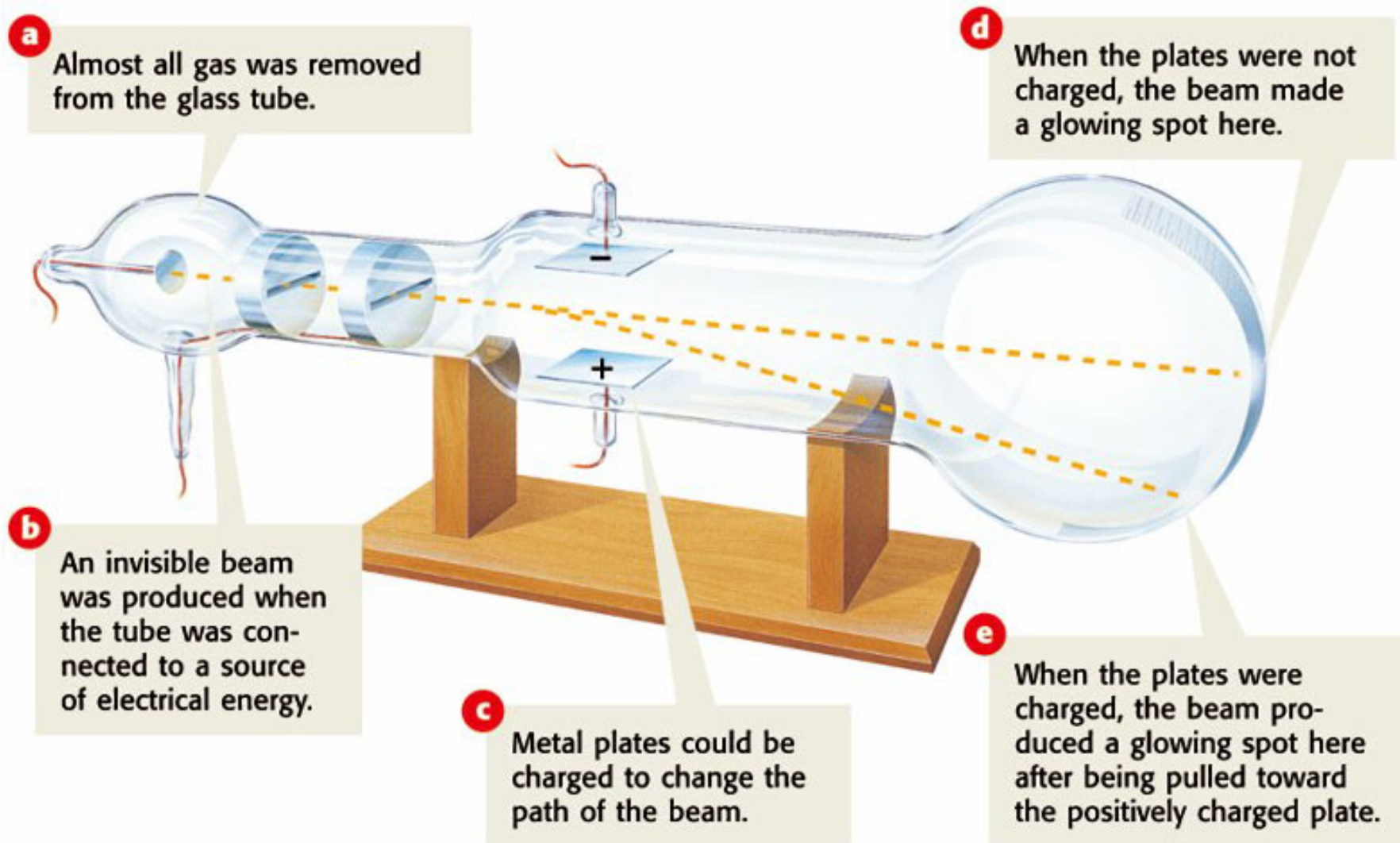
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Thomson's Discovery of Electrons

- **Negatively Charged Particles** Thomson experimented with a cathode-ray tube like the one shown on the next slide. He discovered negatively charged particles that are now known as electrons.
- **Like Plums in Pudding** After learning that atoms contain electrons, Thomson proposed a new model of the atom. Thomson thought that electrons were mixed throughout an atom, like plums in a pudding.

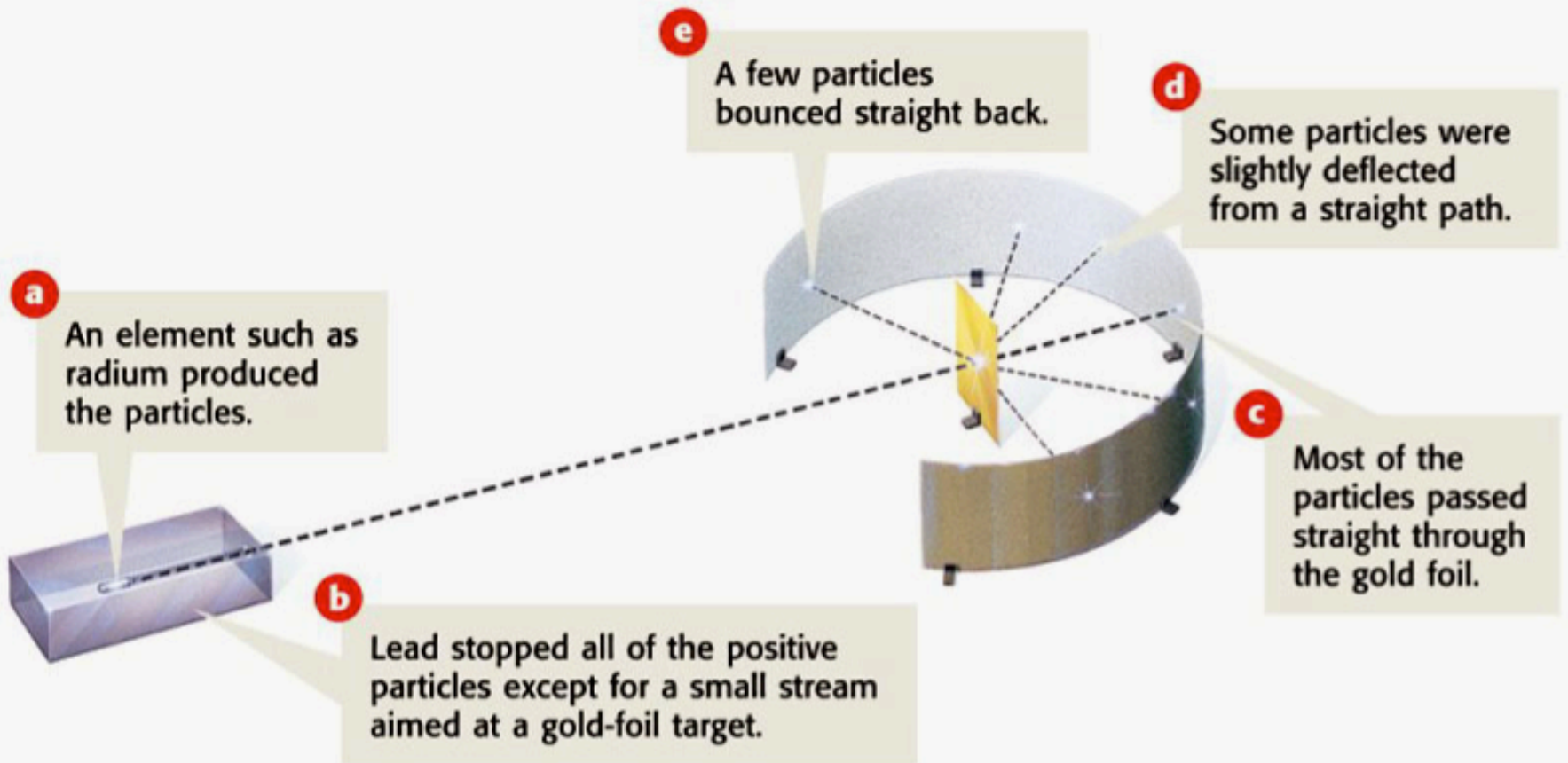
Section 1 Thompson's Cathode-Ray Tube Experiment



Rutherford's Atomic "Shooting Gallery"

- **Negatively Charged Particles** In 1909, Ernest Rutherford aimed a beam of small, positively charged particles at a thin sheet of gold foil. The next slide shows his experiment.
- **Surprising Results** Rutherford expected the particles to pass right through the gold in a straight line. To Rutherford's great surprise, some of the particles were deflected.

Section 1 Rutherford's Gold-Foil Experiment



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Where Are the Electrons?

- **Far from the Nucleus** Rutherford proposed that in the center of the atom is a tiny, positively charged part called the nucleus.
- **Bohr's Electron Levels** In 1913, Niels Bohr proposed that electrons move around the nucleus in certain paths, or energy levels.
- **The Modern Atomic Theory** According to the current theory, there are regions inside the atom where electrons are *likely* to found.