

## The Scientific Method

### key concepts:

- The scientific method involves making **hypotheses** about sets of observations and testing the hypotheses.
- **Scientific laws**, hypotheses, and **theories** are all parts of a way to organize observations about the real world.
- Using the scientific method, scientists came to realize that the world is composed of **atoms** whose chemical behavior could be explained.

<pre> graph TD     Theory((Theory)) --&gt; Observations[Observations and Experiments]     Observations --&gt; Laws[Find Patterns, Trends, and Laws]     Laws --&gt; Hypothesis[Formulate and Test Hypothesis]     Hypothesis --&gt; Theory     </pre>	<p>The scientific method involves making hypotheses about sets of observations and testing the hypotheses.</p> <p>When new observations conflict with a hypothesis, the hypothesis is revised or completely discarded for a new hypothesis.</p>
<pre> graph TD     Observations[Observations] --&gt; Law[Law]     Law --&gt; Hypothesis[Hypothesis]     Hypothesis --&gt; Theory[Theory]     Theory -- Revision of Hypothesis --&gt; Hypothesis     Hypothesis -- Experiments --&gt; Observations     </pre>	<p>Scientific laws, hypotheses, and theories are all parts of a way to organize observations about the real world.</p> <p>If a pattern emerges through several observations, a scientific law may be formulated. A scientific law is a concise statement that summarizes trends in a variety of observations.</p> <p>This set of observations may lead to a hypothesis. A hypothesis is a tentatively accepted explanation of facts. A hypothesis is an attempt to explain why the patterns of a scientific law are observed.</p> <p>If a hypothesis is able to predict the result of several experiments, it may develop into a theory. A theory is an encompassing idea that provides a full explanation for a natural phenomenon.</p>

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Lavoisier



Dalton

### atomic theory of matter

1. All matter is composed of indivisible atoms.
2. All atoms of a given element are identical in mass and all other properties.
3. Different elements have different atoms; for example, some atoms have different masses.
4. Atoms are indestructible and retain their identities in chemical reactions.

Antoine Lavoisier carried out a series of careful experiments which demonstrated the **law of conservation of mass**. The law of conservation of mass states that in every chemical change, an equal amount of **matter** exists before and after the change.

This scientific law led to a hypothesis that matter was composed of indestructible building blocks. This hypothesis was extensively tested.

This hypothesis led to John Dalton's **atomic theory of matter**. This theory was able to predict later observations.