

## Chapter 1 The Chemical World



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## What Makes Soda Pop Soda Pop?

- Virtually everything around you is composed of chemicals

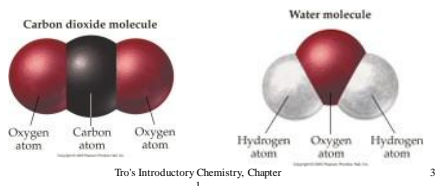


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## Structure Determines Properties

- Everything is made of tiny pieces called **atoms** and **molecules**



## What is Chemistry?

- What chemists try to do is discover the relationships between the particle structure of matter and the properties of matter we observe
- Chemistry is the science that seeks to understand what matter does by studying what atoms and molecules do.

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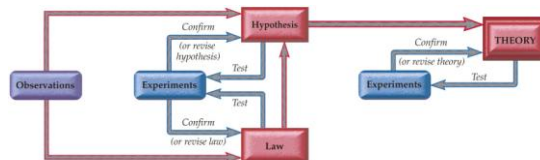
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## The Scientific Method

- A systematic process for trying to understand nature
- Key Characteristics of the Scientific Method include **Observation**, formulation of **Hypotheses**, **Experimentation** and formulation of **Laws and Theories**

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## Observation - A way of acquiring information about nature

- Some observations are simple descriptions about the characteristics or behavior of nature
  - ✓ “The soda pop is a liquid with a brown color and a sweet taste. Bubbles are seen floating up through it.”
- Some observations compare a characteristic to a standard numerical scale
  - ✓ “A 240 mL serving of soda pop contains 27 g of sugar.”



## Hypothesis

- A tentative interpretation or explanation of your observations
  - ✓ “the sweet taste of soda pop is due to the presence of sugar”
- A good hypothesis is one that can be tested to be proved wrong!
  - ✓ Falsifiable
  - ✓ One test may invalidate your hypothesis

## Experiments

- Tests of hypotheses, laws or theories
- Can you think of a way to test whether the sweet taste of soda pop is due to the presence of sugar?
- Results either Validate (confirm) or Invalidate (deny) your ideas
  - ✓ Invalidate = Discard or Modify
    - Many times experiments invalidate only parts of the hypothesis or theory, in which case the idea is modified
  - ✓ Validate ≠ Proof your idea will always hold

## Laws

- Summary of observations that combines all past observations into one general statement
  - ✓ **Law of Conservation of Mass** – “In a chemical reaction matter is neither created nor destroyed.”
- Allows you to predict future observations
  - ✓ So you can test the Law with experiments
- Unlike state laws, you cannot choose to violate a scientific law!



## Theories

- General explanation for the characteristics and behavior of nature
- Models of nature
  - ✓ Dalton's Atomic Theory
- Can be used to predict future observations
  - ✓ So they can be tested by experiments



## What's the Difference Between a Hypothesis and a Theory?

- A hypothesis is a tentative explanation of a single or small number of observations. It requires further testing.
- A theory is an explanation that extends beyond individual observations to an understanding of the underlying causes for the way nature is or behaves. A theory is supported by the data obtained from numerous experiments.

## What's the Difference Between a Law and a Theory?

- **Laws** answer the question *What* will happen.
- **Theories** answer the question *Why* does something happen.
  - ✓ Which will allow you to predict what will happen!

## The Best Approach to Learning Chemistry

- Learn the Vocabulary of Chemistry
  - ✓ Definitions of Terms
  - ✓ How Common Vocabulary is Applied to Chemistry
- Memorize Important Information
  - ✓ Names, Formulas and Charges of Polyatomic Ions
  - ✓ Solubility Rules
- Learn and Practice Processes
  - ✓ Systematic Names and Formulas
  - ✓ Dimensional Analysis
- Do the Questions and Exercises in the Chapter to Test your Understanding and help you learn the Patterns