

# Chemistry



## Chapter 1

# Why Study Chemistry?

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- All the “stuff” in the universe is made from building blocks formed in stars.
- These building blocks and everything made from them are called *matter*.
- **Chemistry** is the study of matter and the changes it undergoes.
- A **substance**, also known as a chemical, is matter that has a definite composition

# Matter and its Characteristics

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- Matter has many different forms.
  - **Mass** is a measurement that reflects the amount of matter.
  - **Weight** is a measure of mass and the force of gravity on an object.
    - Weight can change from place to place, but mass is constant.

# Matter and its Characteristics

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- Much of matter and its behavior is **macroscopic**, meaning that it can be observed without a microscope
- The structure, composition, and behavior of all matter can be described on the **submicroscopic** (atomic) level.
- Chemistry explains events on the atomic level that cause macroscopic observations
- A **model** is a verbal, visual, or mathematical explanation of experimental data.

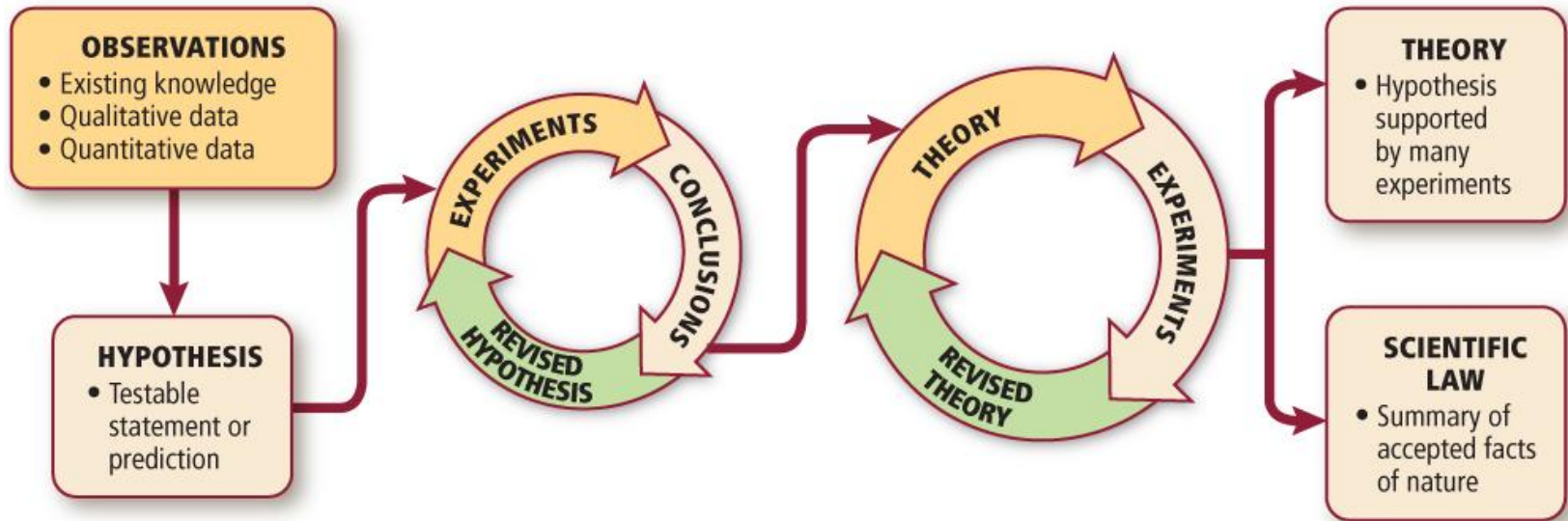
# A Systematic Approach

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- The **scientific method** is a systematic approach used in scientific study, whether it is chemistry, physics, biology, or another science.
  - It is an organized process used by scientists to do research, and provides methods for scientists to verify the work of others

# A Systematic Approach

- The steps in a scientific method are repeated until a hypothesis is supported or discarded.



# Observation

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- An observation is the act of gathering information.
- **Qualitative data** is obtained through observations that describe color, smell, shape, or some other physical characteristic that is related to the five senses.
- **Quantitative data** is obtained from numerical observations that describe how much, how little, how big or how fast.

# Qualitative vs. Quantitative

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## **Qualitative measurements**

- General, vague, descriptive measurements without units
  - Hot outside
  - He is tall
  - That table is heavy

## **Quantitative Measurements**

- Give numbers in a definite form, usually as numbers and units
  - The temperature is 98°F
  - He is 6' 6" tall
  - The table weighs 56 Kg



# Hypothesis

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- A **hypothesis** is a tentative explanation for what has been observed.

# Experiment

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- An **experiment** is a set of controlled observations that test the hypothesis
- A variable is a quantity or condition that can have more than one value.
  - An **independent variable** is the variable you plan to change.
  - The **dependent variable** is the variable that changes in value in response to a change in the independent variable.
- A **control** is a standard for comparison in the experiment.

# Experiments

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- A **conclusion** is a judgment based on the information obtained from the experiment.
  - A hypothesis is never proven, only supported or discarded.
  - A model can be used to make predictions

# Theory and Scientific Law

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- A **theory** is an explanation that has been repeatedly supported by many experiments.
  - A theory states a broad principle of nature that has been supported over time by repeated testing.
  - Theories are successful if they can be used to make predictions that are true.
- A **scientific law** is a relationship in nature that is supported by many experiments, and no exceptions to these relationships are found.

# Key Concepts

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- Scientific methods can be used in pure research or in applied research.
- ▣ Some scientific discoveries are accidental, and some are the result of diligent research in response to a need.
- ▣ Laboratory safety is the responsibility of everyone in the laboratory.
- ▣ Many of the conveniences we enjoy today are technological applications of chemistry.