Chapter One:

CHEMICAL FOUNDATIONS
Chapter 1 covers the following topics:

1.1 Chemistry: An Overview
Science: A Process for Understanding Nature and Its Changes

1.2 The Scientific Method
Scientific Models

1.3 Units of Measurement

1.4 Uncertainty in Measurement
Precision and Accuracy

1.5 Significant Figures and Calculations

1.6 Dimensional Analysis

1.7 Temperature

1.8 Density

1.9 Classification of Matter
Student should be able to

1. understand the basic concept of scientific methods.
2. describe laboratory methods of measuring volume, mass and temperature and explain the principles upon which they are based.
3. use the conversion factor approach to change from one set of units to another.
4. express the uncertainty in a measurement or in a calculation based upon measurements, applying the rules governing significant figures.
5. identify pure substances and mixtures.
6. understand the physical and chemical changes of the matter.
1.1 Chemistry: An Overview
Atoms vs. Molecules

- Oxygen atom
- Hydrogen atom
- Water molecule
Oxygen and Hydrogen Molecules

oxygen molecule \[ \text{written } \text{O}_2 \]

hydrogen molecule \[ \text{written } \text{H}_2 \]
A Chemical Reaction

two water molecules written $2\text{H}_2\text{O}$

electric current

one oxygen molecule written $\text{O}_2$
two hydrogen molecules written $2\text{H}_2$
A Chemical Reaction

\[ \text{O}_2 \quad \rightarrow \quad \text{spark} \quad \rightarrow \quad 2\text{H}_2\text{O} \]

\[ 2\text{H}_2 \]
1.2 The Scientific Method
The Various Parts of the Scientific Method

Observation → Laws → Hypotheses → Theory
Key Info

• The scientific method is a way to ask and answer scientific questions by making observations, experimentation, and the formulation of laws, hypotheses, and theories.

• The steps of the scientific method are to:
  
  **Ask a Question**
  **Do Background Research**
  **Construct a Hypothesis**
  **Test Your Hypothesis by Doing an Experiment**
  **Analyze Your Data and Draw a Conclusion**
  **Communicate Your Results**

• It is important for your experiment to be a fair test. A "fair test" occurs when you change only one factor (variable) and keep all other conditions the same.
Law vs. Theory

- A **law** is a general statement that can be used to summarize observations of natural phenomena.
- An **experiment** is then done to test the law.
- A **hypotheses** is an attempt to explain why it happens.
- A **theory (model)** is a set of tested hypotheses that gives an overall explanation of some natural phenomenon.
Figure 1


*Rates are age-adjusted to the 2000 US standard population.

Information is included for all states except Connecticut, Louisiana, Maine, Maryland, Minnesota, New Hampshire, Oklahoma, Virginia, and Vermont.

Question

• A concise statement or summary of observations of natural phenomena is called
A. a law
B. a theory
C. a hypothesis
D. an experiment
E. a citation
Question

• A concise statement or summary of observations of natural phenomena is called

A. a law
B. a theory
C. a hypothesis
D. an experiment
E. a citation
A tentative explanation of an observation of natural phenomena is called a (an)

A. law
B. hypothesis
C. theory
D. experiment
E. citation
Answer

• A tentative explanation of an observation of natural phenomena is called a (an)
  A. law
  B. hypothesis
  C. theory
  D. experiment
  E. citation
Question

• A tested explanation overall of basic natural phenomena is a (an)
  A. law
  B. hypothesis
  C. theory
  D. experiment
  E. citation
A tested explanation overall of basic natural phenomena is a (an)

A. law
B. hypothesis
C. theory
D. experiment
E. citation