





Chapter 1: Introduction to Chemistry

- **Chemistry** is the study of matter and the changes that it undergoes. (...the science that studies the composition of matter and its properties.)
- **Matter** is anything that has mass and occupies space.
 - Matter is the “stuff” that things are made of.



Early Ideas of Matter:

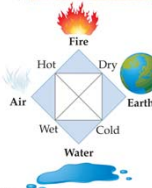


Empedocles (Greek) – All things made from combination of four “elements”; Earth, Water, Fire and Air (450 BC)

Aristotle (Greek) – Added “ether” (filled all of space). Adopted continuous view of matter. (350 BC)

Democritus (Greek) – Fundamental particle (uncuttable) “Atomos”



Alchemists – (8th century, Arabic) Trying to change base metals into precious metals (e.g. lead into gold). They were reacting substances at the electron level so they were not successful.



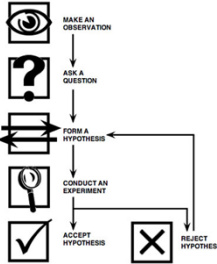

The Development of Chemistry

1661 - **Robert Boyle** (Irish, 1627-1691) published *The Sceptical Chymist* – Stressed the importance of experimentation.

Latter 1700's - **Antoine Lavoisier** (French, 1734-1794) published *Elements of Chemistry* – Proposed first systematic and uniform chemical language and analytical techniques. Considered to be the father of modern chemistry. Disproved the *phlogiston theory*.

The Scientific Method

When our hypothesis successfully predicts what will happen, we designate it as a **scientific law** – a (usually) mathematical description of “here’s what will happen.”

A **theory** is the *explanation* for a law.

Science Evolves:

Science is not a “static” endeavor.

Theories are continually re-tested and refined or abandoned in light of better theories. (e.g. Atomic theory)

Values and constants (such as the speed of light and atomic masses) increase in their precision as better methods of measuring become available.

There are very few (if any) “absolutes”.

There is a saying that goes: “No amount of experimentation can prove a theory absolutely true, but a single experiment can prove it false.”

Science must be “testable”.

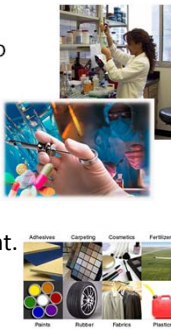
Why is it important to learn something about chemistry?

Chemistry is sometimes referred to as the “central science”.

Applications in biology, physics, geology, medicine, etc.

Environmental Chemistry: Safer chemicals, smaller quantities, less harmful impact on the environment.

Medicine; Agriculture; Manufacturing; Petrochemicals



Example: The Law of Gravity

Equation given by:

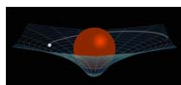
$$F = G \frac{m_1 m_2}{r^2}$$

Where F is the force in Newtons, G is the universal gravitational constant ($6.673 \times 10^{-11} \text{ m}^3/\text{kg s}^2$), m_1 and m_2 are the interacting masses and r is the distance between their centers.

Explained by **Newton** as a “force” between two bodies containing mass.

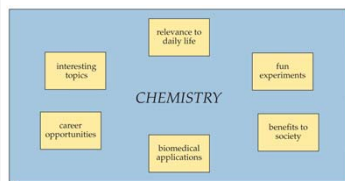


Explained by **Einstein** as a “warping” of space-time around a massive body.



Perceptions About Chemistry

Book uses optical illusions and puzzles as a way of introducing the concept of “underlying attitudes regarding a particular perception.” And that “...we should not confine our concept of chemistry to a preconceived attitude that learning chemistry will be difficult.”



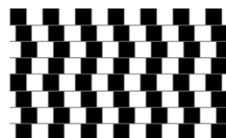
Positive associations of chemistry.

Perceptions About Chemistry

Also reveals information regarding critical thinking, preconceived notions and perceptions as they relate to experimental evidence and the world around us.

Common examples from physics are the concepts of “centrifugal forces” and “suction”. How do you explain these phenomenon?

Other Illusions:



Are the horizontal lines parallel or do they slope?

