

CHEMISTRY

The study of **matter**

- its **properties**
- and **structure**
- and how **energy** affects it

Science

- **FACTS** about the universe
- The **ORGANIZATION** of the facts
- The **PROCESSES** that reveal the facts

Scientists have confidence that:

Questions and observations of the natural universe can be answered and explained.

Scientific Method

A logical approach to solving scientific problems

A way to sort the "truth" from lies/delusions

↓
Agrees with all known experimental evidence
May be modified or falsified

Observe: Use all of your senses

Question: What? How? Why? Can?

State the problem

Hypothesis

A **testable** prediction to explain observations

Needs to be specific, focused

Must be falsifiable

↙
There must be some experiment or possible discovery that could prove it wrong

Hypothesis

An initial:
 Prediction of a **pattern or event**
 or
 Explanation of a pattern or event

Design an Experiment

Must be repeatable, controlled
 The influence of bias must be minimized

Record Data

Qualitative – smooth, red, small
 Quantitative – 46.2g, 27°C
 Organized – usually in a table or graph

Analyze Results

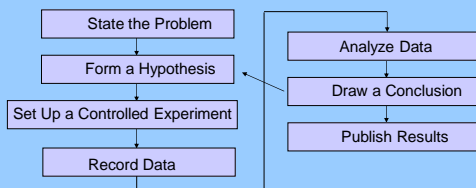
Make inferences
 Make models

Draw a Conclusion

Do the results strengthen or weaken the hypothesis?

Publish Results

Allows others to evaluate
 Allows others to check accuracy
 Allows others to test further



Scientific Theory/Scientific Law

These terms are *rarely* used properly.
 What do they mean in science???????

Scientific Law

A broad, sweeping statement summarizing a large number of related scientific facts
("What")

Scientific Theory

A set of statements to explain why a scientific phenomenon occurs
("Why" or "How")

Scientific Law vs. Scientific Theory

- | | |
|--|--|
| <ul style="list-style-type: none"> • From a large body of well-supported, related hypotheses • Accepted as "truth" • Not "higher" than theory • Was never a theory • What happens • Usually concise • Often a mathematical formula • Ex: Charles' Law | <ul style="list-style-type: none"> • From a large body of well-supported, related hypotheses • Accepted as "truth" • Not "lower" than law • Cannot be promoted to law • How or why it happens, an explanation • Usually several statements • Often explains several laws • Ex: Kinetic Molecular Theory |
|--|--|

LAW

Charles'
Boyle's
Gay-Lussac's
Law of Conservation of Mass
Law of Definite Proportions
Law of Multiple Proportions
Evolution
Gravity
1st law of thermodynamics
2nd "
3rd "

THEORY

Kinetic Molecular Theory
"
"
Atomic Theory
"
"
Natural Selection
?

Optical Illusions

<https://www.youtube.com/watch?v=Jtm0NDqKTb8>

https://www.youtube.com/watch?v=rmEgnjaw_08

<https://www.youtube.com/watch?v=dspHUApa8C0>