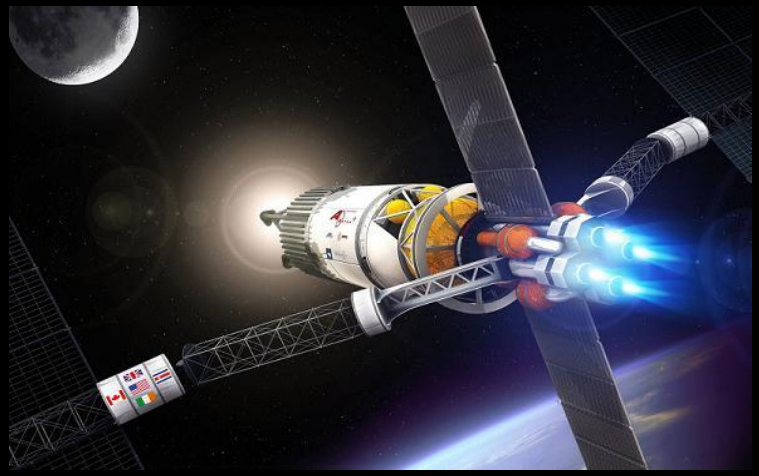
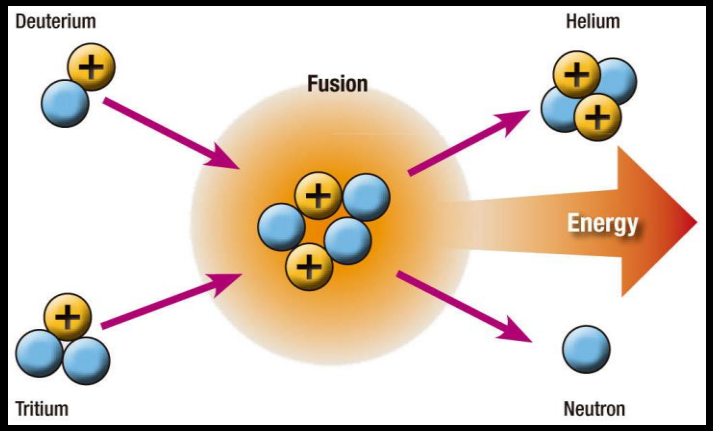
CHEMICAL FOUNDATIONS

WHY IS CHEMISTRY IMPORTANT?

- New materials
- New pharmaceuticals
- New energy sources
- Food supplies
- Help the environment
- Can you think of others?

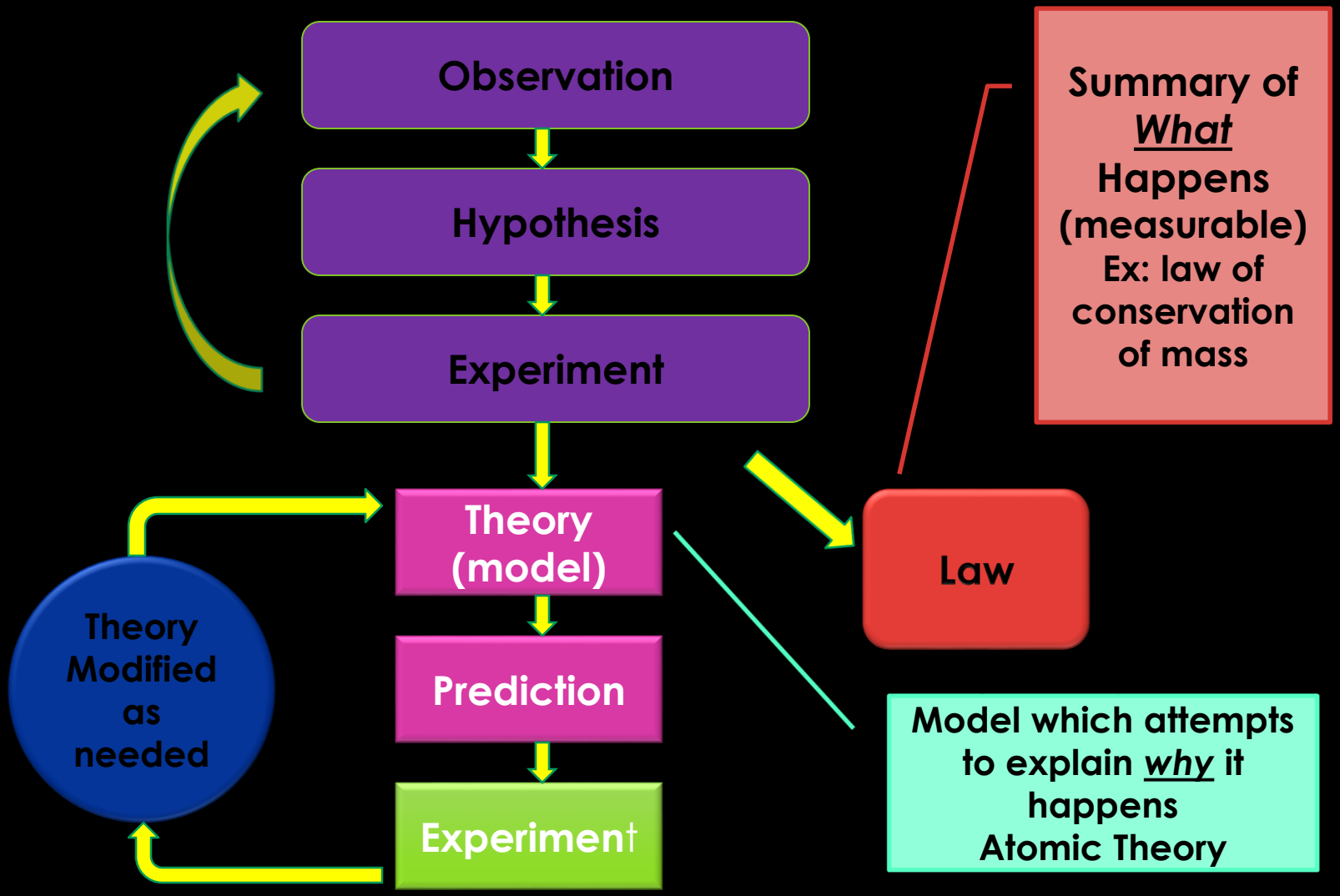




WHAT IS CHEMISTRY?

Chemistry is a central science that deals with the materials of the universe and the changes they undergo.

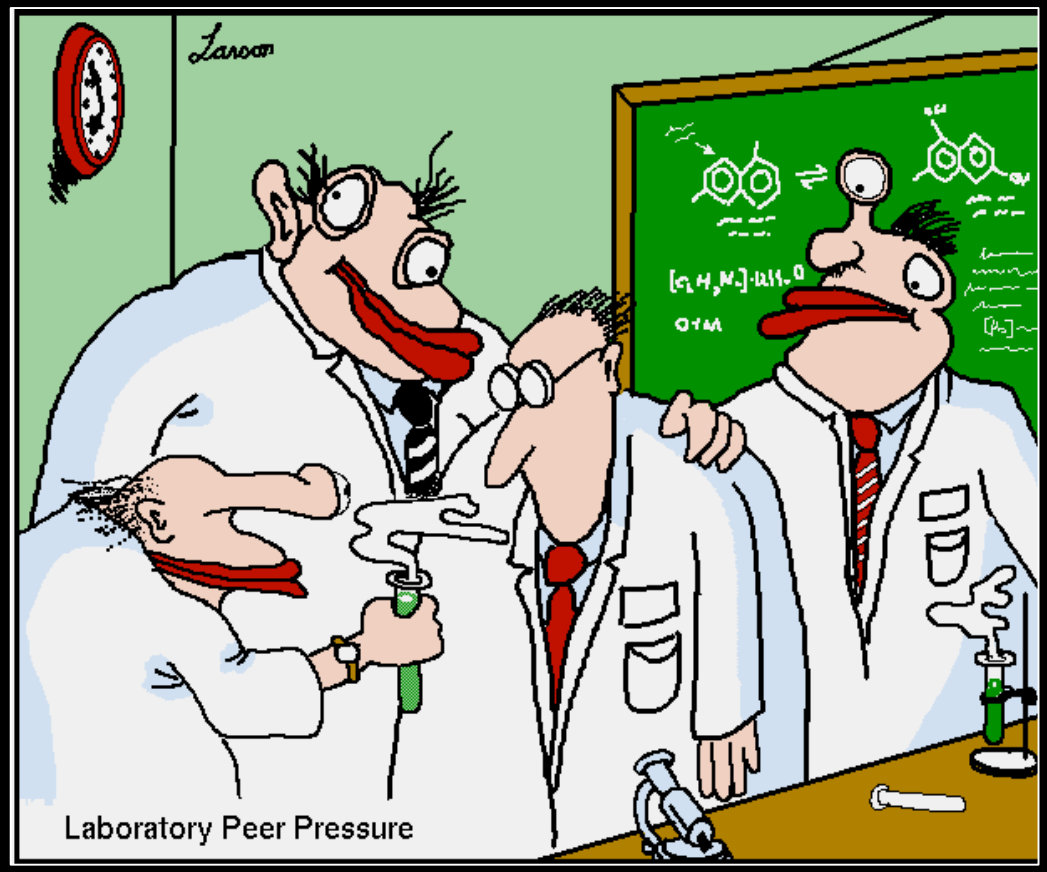
THE SCIENTIFIC METHOD



TYPES OF OBSERVATIONS

Qualitative	Quantitative
Overview: • Deals with descriptions • Data can be **observed but not measured** • Colors, textures, smells etc. •**Qualitative -----Quality**	**Overview:** • Deals with numbers • Data which can be **measured** • Length, Height, volume, weight, speed, time, temp • **Quantitative-----Quantity**
Example: Oil Painting • Blue & green paint • Gold frame • Masterful brush strokes	Example: Oil Painting • 10" x 14" • surface area 140 in^2 • Weight: 8.5 pounds

QUALITATIVE OBSERVATIONS



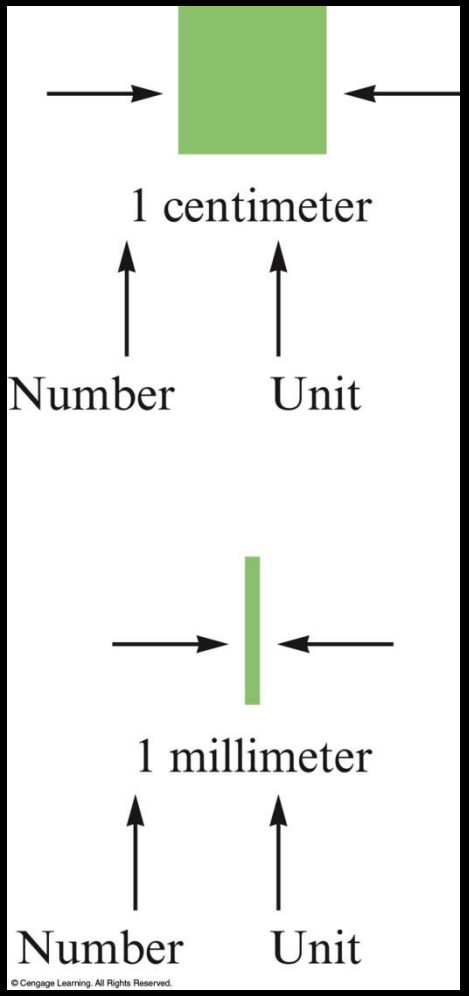
TED TALK:
YOU HAVE NO IDEA WHERE CAMELS REALLY COME FROM

Qualitative Observations	Quantitative Observations

Talk with your table partner and write a list of 5 qualitative and 5 quantitative observations Dr. Rybczynski and her colleagues used to solve the puzzle of the bone fragments found in the High Arctic Fyles Leaf Bed.

MEASUREMENTS IN CHEMISTRY

- **Quantitative observation.**
  - Has 2 parts – number and unit.
  - Number tells comparison.
  - Unit tells scale.



MEASUREMENTS IN CHEMISTRY (CON'T)

Scientific Notation

- Technique used to express very large or very small numbers.
- Move the decimal so that one non zero integer is to left
  - If you moved to the left then the exponent is positive (number is big)
  - If you moved to the right then the exponent is negative (number is small)

$$93{,}000{,}000 = 9.3 \times 10{,}000{,}000 = 9.3 \times 10^{7}$$

Number between 1 and 10

Appropriate power of 10 ($10{,}000{,}000 = 10^{7}$)

Units of Measurement

SI System (Système International d'Unités)

- **units derived from the metric system.**

Physical Quantity	Name of Unit	Abbreviation
Mass	Kilogram	kg
Length	Meter	m
Time	Second	s
Temperature	Kelvin	k
Electric Current	Ampere	A
Amount of substance	Mole	mol
Luminous intensity	Candela	cd

Units of Measurement

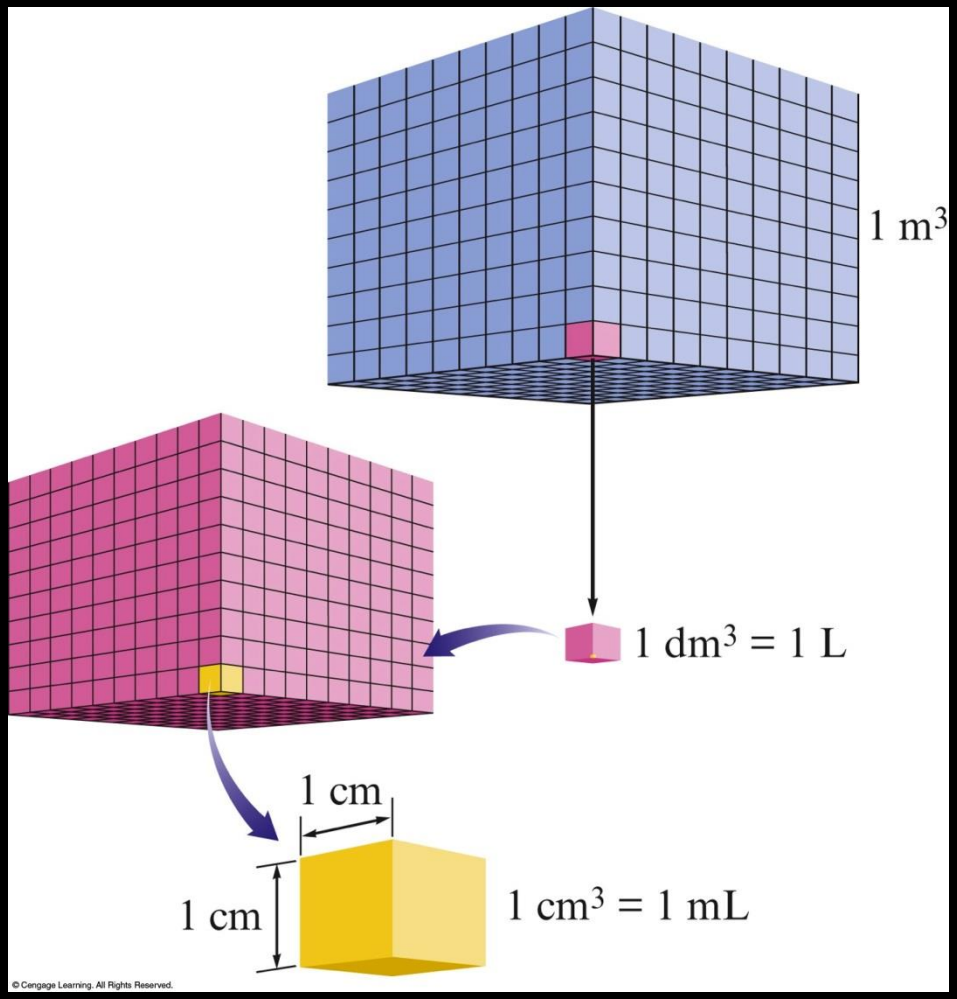
- Prefixes are used to change the size of the unit.

Table 2.2 ▶ The Commonly Used Prefixes in the Metric System

Prefix	Symbol	Meaning	Power of 10 for Scientific Notation
mega	M	1,000,000	10^{6}
kilo	k	1000	10^{3}
deci	d	0.1	10^{-1}
centi	c	0.01	10^{-2}
milli	m	0.001	10^{-3}
micro	μ	0.000001	10^{-6}
nano	n	0.000000001	10^{-9}

Volume

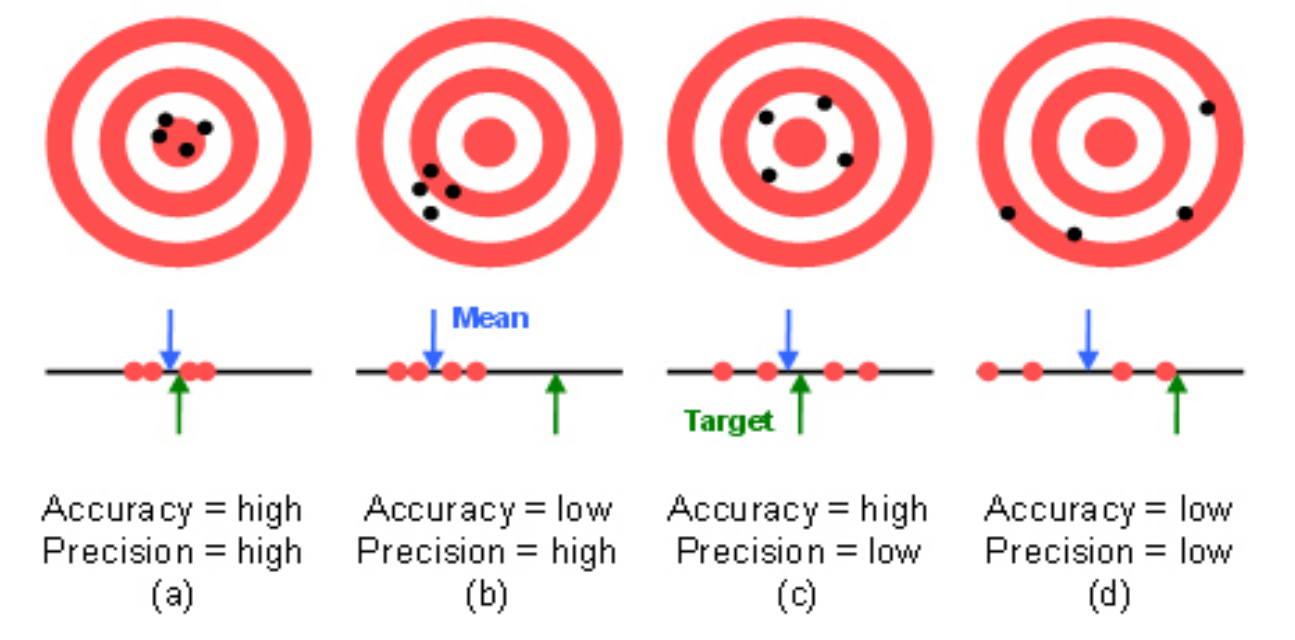
- Measure of the amount of 3-D space occupied by a substance.
- SI unit = cubic meter (m^3)
- Commonly measure solid volume in cm^3.
- 1 mL = 1 cm^3
- 1 L = 1 dm^3



Precision and Accuracy

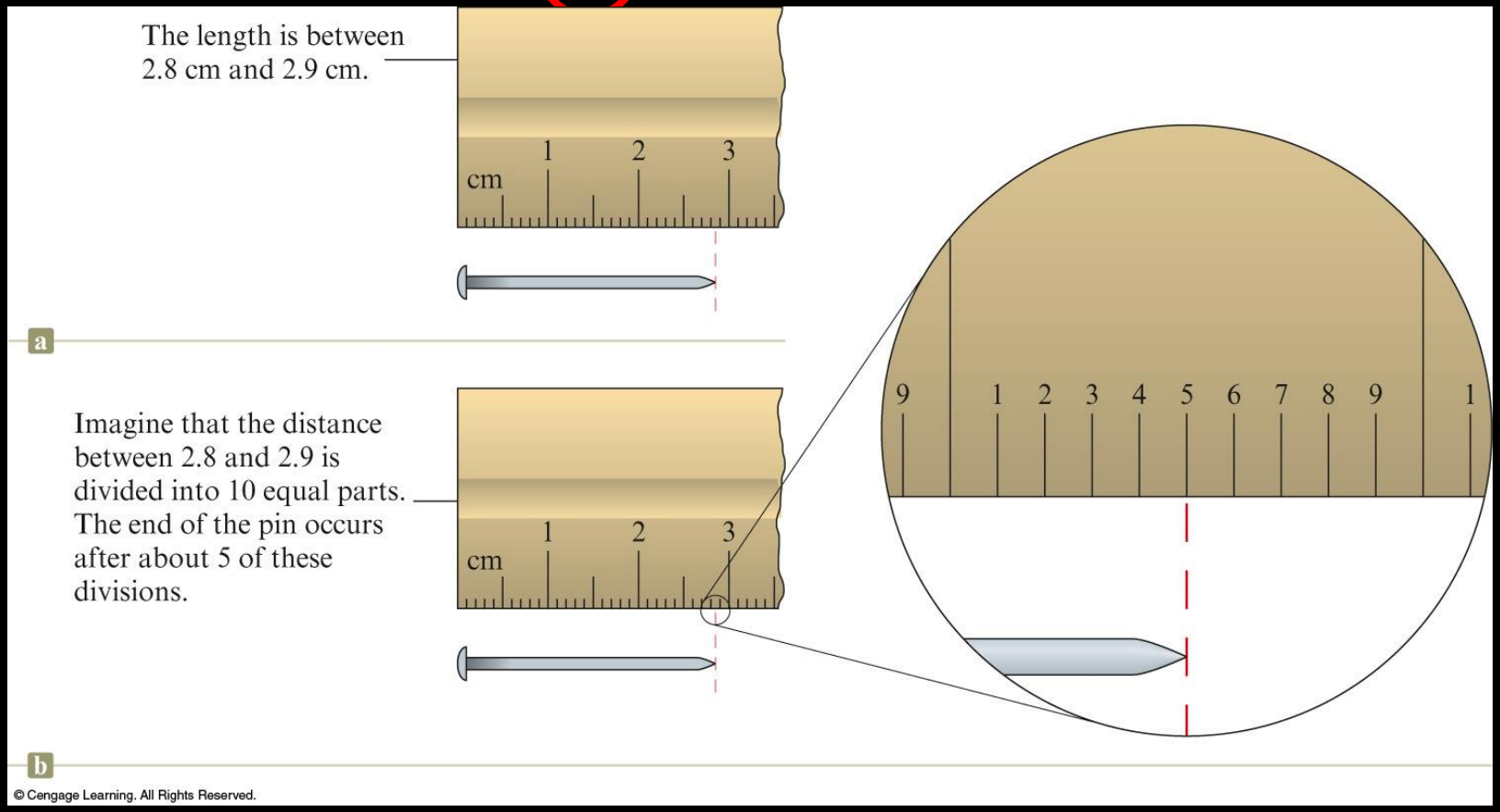
Accuracy: agreement of a particular value with the accepted value.

Precision: agreement among several measurements of the same quantity (reproducibility).



Uncertainty in Measurement (2.4)

- The length of the pin occurs at about 2.85 cm.
  - Certain digits: 2.8 5
  - Uncertain digit: 2.8 5



Uncertainty in Measurement (2.4)

- Volume of a container

Certain digits:

20.1 5 ml

Uncertain digits:

20.1 5 ml

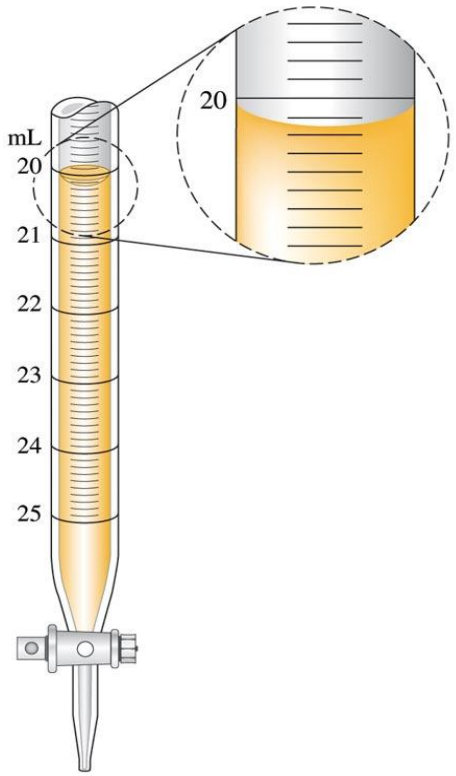


FIGURE 1.9
Measurement of volume using a buret. The volume is read at the bottom of the liquid curve (called the meniscus).