Warm Up

What was the dependent variable in the Diet Coke and Mentos experiment?

Warm Up

What element goes with these symbols?

C

Ca

Cs

Objectives for the Day:

TSWBAT:

1. Work safely in the lab with various apparati and techniques. Standard: C1.2
2. Record data from scientific instruments in metric units that reflect the precision and accuracy for the instrument. Standard: C1.3

Agenda for the day:

1. Safety Precautions Handout
2. General Lab Safety
3. Glassware
4. Review of Scientific Notation
5. Measurements
6. Significant Figures

General Comments about lab safety:

1. Injuries: what should you do?
2. Fires: locate the fire blanket and fire extinguisher. WATER is not always safe to use for putting out fires.
3. Acids and bases: what happens if you get them on your skin?

5.Location of gas shut-off switch.

6. PPE = personal protective equipment:

goggles	gloves
aprons	closed shoes

7. Fume Hoods: how they work and why we need them.

Goggles

Goggles

Goggles

Goggles

SDS

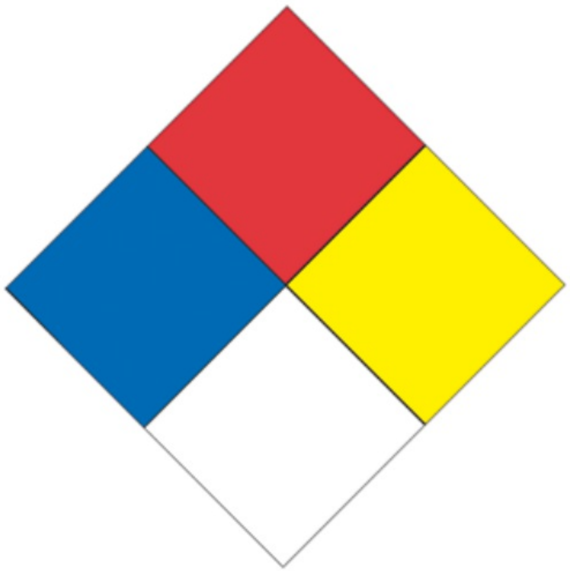
Safety Data Sheet

- Every chemical we work with has a SDS supplied by the manufacturer.
- There are 9 parts to a SDS.
- Information includes health hazards, safe handling practices, how to put out fires involving that chemical and storage instructions (plus more.)

Where do we keep the book of SDS forms?

When should you read about the chemicals you are using in a lab?

NFPA Labels



The numbers
0-4 will appear
in the red, blue,
& yellow boxes

Color code: Red=flammability, Blue=health
Yellow = instability, White = special or ox.





Hazard Signs for Chemicals

Flammable

Corrosive

Toxic

Radiation Hazard

Biohazard

Pregnancy and chemicals

Glassware/ Lab Equipment

- Graduated Cylinder
- Erlenmeyer Flask
- Beaker
- Beaker Clamp
- Ring Stand
- Ring

Glassware, continued

- Crucible and cover
- Crucible Tongs
- Mortar and Pestle
- Scoopula
- Plastic Weigh Boat
- Porcelain Evaporating Dish
- Watch Glass

Scientific Notation

Review: we use scientific notation to express numbers that are either very small or very large. This saves us from writing zeros.

Examples:

1. The diameter of an atom is 0.00000000005 meters (m)

It is faster and easier to write:

5×10^{-11} m

Another example:

The diameter of the earth is
12 756 200 m

or 1.27562×10^7 m

Note that when you convert a very small number, you move the decimal to the right, and the exponent is NEGATIVE:

$0.0001\ g = 1 \times 10^{-4}\ g$

When you convert a very large number you move the decimal to the LEFT and the exponent is POSITVE:

1 000 000 atoms = 1×10^6 atoms

To help you review scientific notation, use p. R56 in Appendix C
at the back of your book.

Practice: Convert the following to scientific notation:

1. 4312
2. 6 000 000
3. 0.00712
4. 10

Learning Check

Select the correct scientific notation for each.

A. 0.000 008

1) 8×10^{6}
2) 8×10^{-6}
3) 0.8×10^{-5}

B. 72,000

1) 7.2×10^{4}

2) 72×10^{3}

3) 7.2×10^{-4}

Measurements

	Length	Volume	Mass	Temp
SI Units	m	m^3	kg	K
Metric Units	m	L	g	°C

Warm Up

Convert to scientific notation:

0.000623

Measured Numbers and How to Report Them.

We often use tools to take measurements in science. Some tools you will use include a balance, a ruler, and a graduated cylinder.

When we take measurements we are concerned with both accuracy and precision.

Accuracy

Definition: a measure of how close a measurement comes to the actual or true value of whatever is measured.

Precision

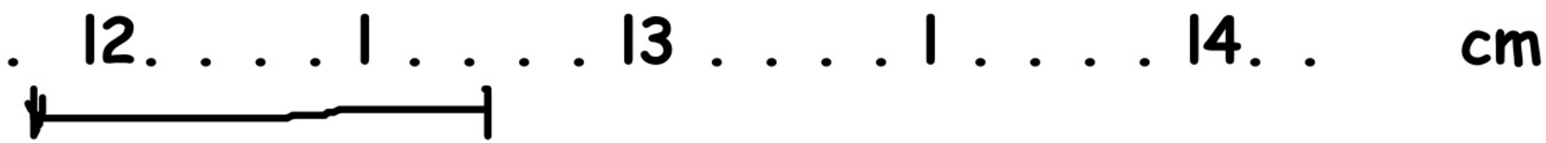
Definition: a measure of how close a series of measurements are to one another.

High accuracy,
low precision

High precision,
low accuracy

What would high accuracy AND high precision look like?

Reading a Meter Stick:



The markings on the meter stick at the end of the purple line are read as

the first digit 2

plus the second digit 2.7

The last digit is obtained by *estimating*.

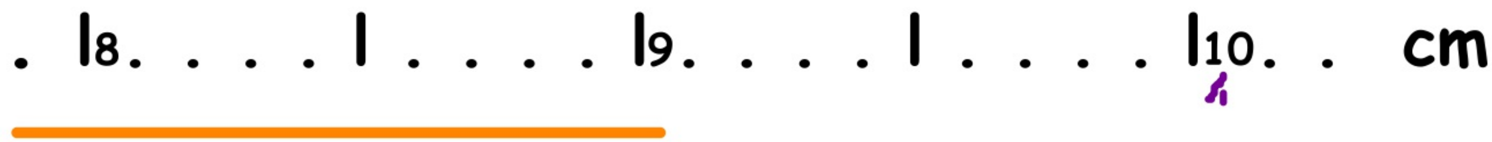
The end of the line might be estimated between 2.7–2.8 as half-way (0.5) or a little more (0.6), which gives a reported length of 2.75 cm or 2.76 cm.

Known and Estimated Digits

In the length reported as 2.76 cm,

The digits 2 and 7 are certain (known).
The final digit 6 was estimated (uncertain).
All three digits (2.76) are significant including the estimated digit.

Learning Check:



What is the length of the orange line?

1) 9.0 cm
2) 9.03 cm
3) 9.04 cm

. l8. . . . l . . . . . l9. . . . . l . . . . . l10. .   cm

The length of the orange line could be reported as

2) 9.03 cm

or 3) 9.04 cm

The estimated digit may be slightly different. Both readings are acceptable.

Zero can be a measured number:

. |3. . . . | . . . . |4. . . . | . . . . |5. . cm

For this measurement, the first and second known digits are 4.5.
Because the line ends on a mark, the estimated digit in the hundredths place is 0.

There are two types of numbers we will use in chemistry:

1. Significant Figures (measured)
2. Exact numbers (counted or defined)

Warm Up

Draw 3 targets and show:

1. Precision (high)
2. Accuracy (high)
3. Both

Significant Figures

1. Come from measurements.

2. Last digit in a measured number is always an estimate. Estimates can't be wrong-they are your best guess.

3. Significant figures are a communication tool. The more precise the tool you used to make the measurements the more significant figures you will report.

Exact Numbers:

1. From counting. For example, how many jelly beans are in a box? This number would not be measured, it would be counted. It is exact.

2. Definitions are "exact numbers." 12 eggs is defined as 1 dozen. One yard is defined as 3 feet.

3. Exact numbers are said to have an INFINITE number of significant figures.