

Salt Lake Community College, Chemistry Department

Chem 1110 Workshop 1

Topic: Number, Units and Conversions

Objective:

- Review some simple math rules
- Physical Quantities: Units and Scientific Notation
- How to do Dimensional Analysis?
- Density

Simple Math Rules Review:

- **Multiplication Rule (add the exponents):** $a^1 \times a^1 = a^2$,
 $a^m \times a^n = a^{m+n}$
 $a \times b = b \times a$ (order is not important)
- **Division (subtract the exponents):** $a^4 / a^2 = (a^{4-2}) = a^2$
 $a^m / a^n = a^{m-n}$

Prefixes used in the SI unit (Metric system):

giga	G	10^9
mega	M	10^6
kilo	k	10^3
deci	d	10^{-1}
centi	c	10^{-2}
milli	m	10^{-3}
micro	u	10^{-6}
nano	n	10^{-9}

Example= 1 (Gm) gigameter = 1×10^9 m

1 megameter= 1×10^6 m

1 cm = 1×10^{-2} m or 1/100 m or 0.01 m

Note: In SI system all lengths units will be based on meter (m).

How to do Dimensional Analysis?

For calculations to yield the correct answers they **MUST** also yield the correct units.

- The best way to do dimensional analysis is to use **CONVERSION FACTOR(S)**.
- Selection of a conversion factor:

$$\cancel{\text{given unit}} \times \underline{\text{desired unit}} = \text{desired unit}$$

$\cancel{\text{given unit}}$

Conversion Factor

Density:

The physical property that relates the mass of an object to its volume, mass per unit volume

$$\text{density} = \frac{\text{mass (g)}}{\text{volume (cm}^3 \text{ or mL)}}$$

Volume Unit: 1 liter, L

What is it?

$$1 \text{ L} = 1000 \text{ cm}^3 \text{ (by definition)}$$

But... using prefix milli, milliliter (mL) is... $1 \text{ L} = 1000 \text{ mL}$

$$\text{therefore, } 1 \text{ mL} = 1 \text{ cm}^3$$

Practice Problems:

1. Do the following calculations (final answer in scientific notation):

a) $(6 \times 10^{400}) \times (3 \times 10^{700})$

b) $(48 \times 10^{1200}) / (2 \times 10^{-400})$

2. Convert 120 pounds (lb) to grams (g). Note: $1 \text{ lb} = 453.6 \text{ g}$

3. Convert 120 milligrams (mg) to kilograms (kg).

4. Convert the speed of 515 meters per second (m/s) to miles per hour (mi/hr).

5. The recommended adult dose of Ceftriaxone, an antibiotic, is 10.00 mg/kg of body

mass. Calculate the dose in milligrams for a 150-lb adult. 1 lb = 453.59 g.

6. An extra-strength aspirin contains 0.500 g of aspirin. How many grains is this? (1 grain = 64.8 mg)
7. An object has a mass of 40.1 g and occupies a volume of 9.51 mL. The density of this object is...