

Chapter 2

Analyzing Data

Honors Chemistry

Warm Up! Compare these Medical Reports

Dr. A

Patient was young, tall, and thin with blue eyes and brown hair. I touched his forehead and I inferred that he had a temperature. Patient described a sore throat and, upon inspection, it appeared swollen. I performed a throat culture and prescribed the appropriate medication for a diagnosis of strep throat. The patient was instructed to take a couple pills a day until the medication is finished.

Dr. B

Patient was 17 years of age, 6'2" and 170 lbs. His temperature was 99.7 °F. After inspecting his ears nose and throat, his throat was swollen, (at a level of about 7 on a scale of 1-10) and he described his level of throat discomfort at a 6 out of 10. I performed a throat culture and prescribed the appropriate medication for strep throat. The patient was instructed to take 2 pills in the morning and 2 at night for 1 week.

Measurement

- What makes a “good” measurement??
 - Accuracy
 - Reproducibility
- Standard
 - Unit based on something reproduced in nature or an event in the physical world.
 - Can be reproduced exactly!

Metric Measurements

- English System
- US and Liberia
- Variety of quantities with subunits of $\frac{1}{2}$, $\frac{1}{4}$, etc...
- Metric System
- All other countries and ALL scientists
- Based on standards, all reproducible and universal
- Subunits all factors of 10

Mass (gram - base)



- SI Unit – Kg ($1 \text{ kg} = 1000\text{g}$)
 - Person or car
- Centigram – cg ($100 \text{ cg} = 1 \text{ g}$)
 - Canned goods
- Milligram – mg ($1000 \text{ mg} = 1 \text{ g}$)
 - Medicine
- Nano – ng ($1 \times 10^9 \text{ ng} = 1 \text{ g}$)
 - Nano prefix usually used for wavelength (nm)

Warm Up! (Grab a sheet!)

- What makes a good standard?
- What is the metric unit for length?
- What is the metric unit for mass?
- If an object floats on water, is the density of the object less than or more than the density of water?

Today's Agenda

- Question of the Day: How do we convert between units?
- Textbooks
- Notes on metric conversions
- Conversion Problems (metric, temperature)
- Density
- Homework: 60-84 evens Due Wednesday

Prefixes

Prefix	Symbol	Numerical Value in Base Units	Power of 10 Equivalent
Giga	G	1,000,000,000	10^9
Mega	M	1,000,000	10^6
Kilo	K	1000	10^3
--	--	1	10^0
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}
Pico	p	0.000000000001	10^{-12}

Interactive Table Explore SI prefixes at glencoe.com.

Base Metric Units

Quantity	Base Unit
Time	second (s)
Length	meter (m)
Mass	kilogram (kg)
Temperature	kelvin (K)
Amount of a substance	mole (mol)

Warm Up!

- Convert! Write out your inventory!
- How many s are in 30 ms?
- How many km are in 1.3×10^5 nm?
- 298 K to °C
- 55 °C to K

Today's Agenda

- Question of the Day: What is density and how can you find mass and volume with the density equation?
- Review conversions
- Density
- Practice
- Scientific Notation
- Homework due tomorrow! Quiz Tuesday!!

Warm Up!

- You are determining the density of a liquid.
- You have 0.05 L (convert to mL) whose mass is 62 g. What is the density?

- If there are 12 eggs in a carton, a box holds 20 cartons, and 30 boxes are loaded onto a truck. How many eggs are on 1 truck?

Warm Up!

You find a piece of metal on the floor and you want to identify it by its density (in g/mL). You weigh the metal on a balance and the mass is 0.0152 kg. You measure its volume by placing it in water. Initially you have 5 mL and after adding the metal the water level rises to 7 mL. What is the density?

(Hint: convert kg to grams!)

Today's Agenda

- QOTD: What is scientific notation and what do we do with the exponents?
- Scientific notation
- Mathematical manipulation of scientific notation (add/sub, mult/divide)
- Review worksheet (do in class finish for Friday)!
- Homework: Worksheet Due Friday!

Scientific Notation

- For when you have to deal with REALLY big or REALLY small #'s.

400,000 becomes 4×10^5

Positive exponent when the decimal moves to the LEFT

Positive is a BIG #

0.0000000004 becomes 4×10^{-10}

Negative exponent when the decimal moves to the RIGHT

Negative is a LITTLE #

Express in Scientific Notation

- 1,392,000 km 1.392×10^6 km
- 0.000000028 g/cm³ 2.8×10^{-8} g/cm³
- 32,570,000 mg 3.257×10^7 mg
- 0.0000453 L 4.53×10^{-5} L

Adding and Subtracting

A large, empty rectangular box with a thin blue border, intended for students to write or draw their work for the first part of the lesson.A second large, empty rectangular box with a thin blue border, identical to the first one, intended for students to write or draw their work for the second part of the lesson.

Multiplication and Division

- When multiplying – ADD exponents!

$$(2 \times 10^3) \times (4 \times 10^4) = 8 \times 10^7$$

The diagram illustrates the multiplication of two numbers in scientific notation. The equation is $(2 \times 10^3) \times (4 \times 10^4) = 8 \times 10^7$. The coefficients 2 and 4 are multiplied to get 8, indicated by a blue arrow pointing from the text "2 x 4" below to the coefficient 8. The exponents 3 and 4 are added to get 7, indicated by a blue arrow pointing from the text "3 + 4" below to the exponent 7 in 10^7 .



Your Turn!

- $(7 \times 10^8 \text{ m}) + (3 \times 10^7 \text{ m}) =$
- $(4 \times 10^{-3} \text{ m}) - (5 \times 10^{-4} \text{ m}) =$
- $(7 \times 10^8 \text{ m}) \times (3 \times 10^7 \text{ m}) =$
- $(10 \times 10^4 \text{ m}) \div (5 \times 10^3 \text{ m}) =$

Warm Up!

- From Chapter 2 homework!

Convert!

- 5.7 g to mg 37.5 g/mL to kg/L

Sci Notation

- $(9.15 \times 10^{-3} \text{ cm}) + (3.48 \times 10^{-4} \text{ cm})$
- $(6.48 \times 10^{-3} \text{ m}) - (2.81 \times 10^{-3} \text{ m})$
- $(1.2 \times 10^6 \text{ L}) \times (1.5 \times 10^{-7} \text{ L})$

Today's Agenda

- Question of the Day: How is a dimensional analysis problem set up and solved?
- Dimensional analysis problems
- Conversion/Density Worksheet
- Worksheet due tomorrow! Quiz Tues on Ch 2 Sections 1 and 2

Dimensional Analysis

- Solve word problems like a chain!
- Try this one!
- Dr. Germain gives her bunnies 6 carrots per day. How many carrots has she given the bunnies in the 7 years they have lived with her? (There are 365 days per year.)

Formula for Dimensional Analysis Problems

1. What is the question??

How many carrots ← **desired unit**

2. What are the given conversions??

5 years ← **starting unit**

3. Start solution and use conversions to get rid of units!

$\left(\frac{6 \text{ carrots}}{1 \text{ day}} \right)$ $\left(\frac{365 \text{ days}}{1 \text{ year}} \right)$

4. Check that all units cancel except the **desired units!!**

$$\cancel{5 \text{ years}} \times \frac{365 \cancel{\text{ days}}}{1 \cancel{\text{ year}}} \times \frac{6 \text{ carrots}}{1 \cancel{\text{ day}}} = 10,950 \text{ carrots}$$

Where do I start?

- Make an inventory of ALL data given!
- Find the question sentence.
- Write down the desired quantity.
- Start conversion with the other quantity in the question sentence.

“How many carrots has she given the bunnies in the 7 years they have lived with her?”

Desired quantity



Start the conversion with this!!!



TRY THESE! (past students made up the first!)

- The average businessman eats 2 hotdogs a week. Assuming there are 4 weeks in a month, how many hotdogs does the average businessman eat in 10 years?

(from homework...)

- The average mass of a kernel of popcorn is 0.125 g. If 1 lb = 16 oz and 1 oz = 28.3 g, then how many kernels of popcorn are there in 0.5 lbs of popcorn?

Warm Up!

- SET THESE UP...they are wrong without work!
- 1 box of munchkins holds 25 munchkins. A crate of munchkins holds 5 boxes. A truck transporting munchkins carries 100 crates. How many munchkins are there on 3 trucks?
- There are 6 hours in a school day. There are 180 days in a school year. You attend school for 12 years. How many hours have you spent in school by graduation?

Today's Agenda

- Question of the Day: Can you write the best multi-step dimensional analysis question (and solve it)?
- Homework questions (wed or fri work)
- Lab completion
- Write your own dimensional analysis.

From homework

- What is 3.337 g/cm^3 in kg/mL ?
- A troy ounce is equal to 480 grains, and 1 grain is equal to 64.8 mg. If the price of gold is \$560 per troy ounce, what is the cost of 1 gram of gold?