Chemistry 6A Fall 2007

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Wed. 9/12/07

Office Hrs on website.

Add's will be signed in lab this week

Chem. 6A this week:

Lab: Check-in, Exercise 1 from lab manual (quiz 1)
Lecture: Chapter 1 & 2

Chem. 6A next week:

Lab: Experiment 2 *(You will need goggles!!)*
Lecture: Chapter 2

I will post a copy of exercise 1 on the website "lab page" for those of you that don't have a lab book to download.

Please review appendix "A" in your text and sections 1.5 through 1.9 prior to coming to lab this week.

A few words about OWL:

1. Log in to your ***LAB*** section, my name is ***NOT*** on the list
2. Complete the ***TUTORIALS*** 1st before any other assignments.
3. Read the ***INSTRUCTIONS*** on the HW page again before emailing me.

I can't hold your hand through this, remember you are in ***BIG SCHOOL*** now!

No whining or excuses, if you can download and install the latest ***Puff-Diddy Doo-da*** ring tone for your cell phone, ***rip music***, or manage a ***MySpace*** page then you can make OWL work.

It's time to play…

Name that Element!

Na	sodium
Ba	barium
Hg	mercury
Si	silicon

It's time to play…

Name that compound!

NaF	sodium fluoride
$BaCl_2$	Barium chloride
magnesium nitrate	$Mg(NO_3)_2$
SO_3	Sulfur trioxide

You need to learn nomenclature ASAP in order to keep up with the material!

Dimensional Analysis

Dimensional analysis converts one unit to another by using ***conversion factors***.

unit (1) × *conversion factor* = unit (2)

The resulting quantity is equivalent to the original quantity, it differs only by the units.

Conversion factors come from equalities: 1 m = 100 cm

$$\frac{1\text{ m}}{100\text{ cm}} \quad \text{or} \quad \frac{100\text{ cm}}{1\text{ m}}$$

Examples of Conversion Factors

Exact Conversion Factors: Those in the same system of units

1 m = 100 cm

$$\frac{1\text{ m}}{10^2\text{ cm}} \quad \text{or} \quad \frac{10^2\text{ cm}}{1\text{ m}}$$

Use of exact CF's will not affect significant figures.

Inexact Conversion Factors: CF's that relate quantities in different systems of units

1.000 kg = 2.205 lb

SI units British Std.

$$\frac{1.000\ \text{kg}}{2.205\ \text{lb}} \quad \text{or} \quad \frac{2.205\ \text{lb}}{1.000\ \text{kg}}$$

(4 sig. figs.)

Use of inexact CF's will affect significant figures.

Solving Problems with dimensional analysis:

Step 1: PUT YOUR CALCULATOR DOWN!

Don't even think about touching that puppy until you have a plan!

Step 2: Read the problem carefully.

Determine the units are to be solved for.
Write them down!

Step 3: Identify the units and data given in the problem.

Label all factors and measurements with the proper units.

Step 4: Write down any conversion factors you may need.

Example: How many inches are there in 2.6 miles?

Step 1: Put the calculator down!
Step 2: Define the units needed and units given.

units needed:	units given
inches (in)	miles

Step 3: Write down any conversion factors that relate the two:

1 mile = 5280 ft 1 ft = 12 in

Example: How many inches are there in 2.6 miles?

Step 4: Convert from the units given to the units needed using the conversion factor you wrote down.

$$2.6\ \cancel{\text{miles}} \times \frac{5280\ \cancel{\text{ft}}}{1\ \cancel{\text{mile}}} \times \frac{12\ \text{in}}{1\ \cancel{\text{ft}}}$$

notice how the units cancel out! You end up with the units needed!

1 mile = 5280 ft 1 ft = 12 in

Example: How many inches are there in 2.6 miles?

Step 5: Now you can use your calculator to solve for the numerical answer. *(watch your sig figs!)*

$$2.6\ \text{miles} \times \frac{5280\ \text{ft}}{1\ \text{mile}} \times \frac{12\ \text{in}}{1\ \text{ft}} =$$

2 sf — *exact* — *exact* — *answer 2 sf*

$$= \frac{2.6 \times 5280 \times 12}{1 \times 1}\ \text{in} = 1.6474 \times 10^5\ \text{in}$$

$$= 1.6 \times 10^5\ \text{in}$$

Example: How many inches are there in 2.6 miles?

Step 7: Look at the magnitude of your answer. Does it look right?

$$1.6 \times 10^5\ \text{in}$$

- A mile is a pretty big thing…
- An inch is much smaller…
- Therefore it should take a large number of inches to represent a mile…

Did you get a big *number*? **You bet-cha!**

now move on!

Example: How many square inches (in^2) are there in 2.6 square feet (ft^2)?

You might think that you can just square the units…

$$2.6\ ft^2 \times \left(\frac{12\ in^2}{1\ ft^2}\right)^2$$

But this is wrong!

One must square the whole conversion factor.

Example: How many square inches (in^2) are there in 2.6 square feet (ft^2)?

$$2.6\ ft^2 \times \left(\frac{12\ in}{1\ ft}\right)^2$$

↓

$$2.6\ ft^2 \times \frac{12^2 in^2}{1^2 ft^2} = 2.6\ ft^2 \times \frac{144\ in^2}{1\ ft^2}$$

Example: How many square inches (in^2) are there in 2.6 square feet (ft^2)?

$$2.6\ \cancel{ft^2} \times \frac{144\ in^2}{1\ \cancel{ft^2}} = 374.4\ in^2$$

2 sf $= \underline{370\ in^2}$

Once again a in^2 is smaller than a ft^2 so you expect you answer to have a larger magnitude.

had you used the conversion factor: $\frac{12\ in^2}{1\ ft^2}$ Your answer would have been 31 in^2

In class Practice: *(you can set the problem up if you don't have your calculator handy)*

Determine the number of mm^2 in 3.25 in^2. 1 in = 2.54 cm

$$\left(\frac{2.54\ cm}{1\ in}\right)^2 \quad \left(\frac{10\ mm}{1\ cm}\right)^2$$ ***conversion factors***

Set up: $in^2 \longrightarrow cm^2 \longrightarrow mm^2$

$$3.25\ \cancel{in^2} \times \frac{2.54^2\ \cancel{cm^2}}{1\ \cancel{in^2}} \times \frac{10^2\ mm^2}{1\ \cancel{cm^2}} = 2100.\ mm^2$$

3 sf *3 sf* *exact* *3 sf*

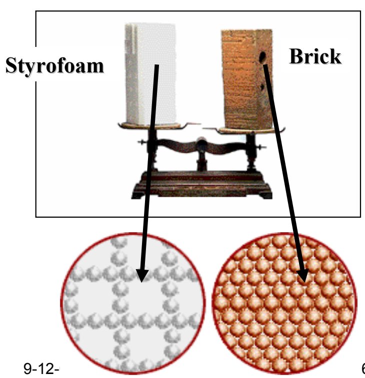
or $2.10 \times 10^3\ mm^2$

Density: The ratio of mass to volume

$$d = \frac{\text{Mass}}{\text{Volume}} = \frac{\text{grams}}{cm^3}$$

Since 1 cm^3 = 1mL…

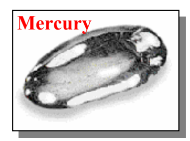
$$d = \frac{g}{mL}$$



The more closely packed the particles of substance are, the greater the density.

Given the same mass of brick and Styrofoam, the Styrofoam will have a greater volume.

A substance can be identified by its density…



13.6 g/cm³

21.5 g/cm³

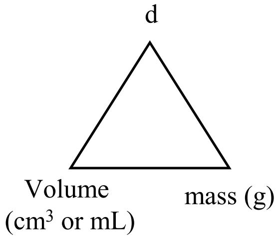
2.7 g/cm³

Metals are more dense than non-metals, gasses are less dense than both.

Density is an INTENSIVE property of matter.
does <u>NOT</u> depend on quantity of matter.

Density and its units:

Moving clockwise from *d*:



$$d = \frac{\text{mass}}{\text{Vol}}$$

Notice how the units relate:

If you know any two,
you know the 3rd!

Given *density* and *Volume*,
you can determine *mass*

and so on…