

## Chemistry 221 - Lect 2 - 9/30

If you missed the first day of class:

- Access class notes, etc using the web site
- <http://web.pdx.edu/~shusteg>

You must attend your lab this week.

You may enroll in CH 284 - Chem Workshops

Access General Chemistry Pre-Test  
through Blackboard

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## How do we learn about chemicals?

- Classify them by their behaviors
- Categories allow us to predict other behaviors (e.g., drug design)
- Do tests or experiments
- Identify their properties

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**Question:** How do iron and silver differ?

Corrosion: example of a Chemical Property - describes how substance reacts with other substances.

Other unique property of iron?  
magnetic

Can we use this to analyze iron content in foods? (demo)

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**Physical Properties?**

Allow us to recognize and distinguish a substance from other substances

- Density
- Color
- Odor
- Melting point
- Boiling point
- Hardness

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**Demonstration: other behaviors**

Mixture: Oil, Water, Food Coloring

- Which layer does food coloring mix with?
- Which layer is on bottom?
- Which physical property relates to this observation?

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**Density = Mass per unit volume**  
**=  $m/V = g/cm^3 = g/mL$**

Density of water ~  $1 g/cm^3$   
=  $0.997 g/cm^3 @ 25\text{ }^\circ C$

Is oil more or less dense than water?

- What would you see if more dense?
- What would you see if less dense?

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**Extra Credit this term**  
**Topic 1 - water and water resources**

To earn points:

- Post to discussion board blog
- One fact (with reference) about water, water resource, bottled water and its production
- Each unique post = 2 points
- Maximum posts per week = 3
- Maximum posts per topic = 5

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**Review Metric Units**

Metric system basis for SI units or  
Système International d'Unités

SI base units:

length: meter (m)

mass: kilogram (kg)

temperature: kelvin (K)

chemical amount: mole (mol)

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**Indicate orders of magnitude - prefixes**

*Table 2.2 Common SI prefixes*

Prefix	Name	Meaning
G	giga	$10^9$
M	mega	$10^6$
k	kilo	$10^3$
d	deci	$10^{-1}$
c	centi	$10^{-2}$
m	milli	$10^{-3}$
$\mu$	micro	$10^{-6}$
n	nano	$10^{-9}$
p	pico	$10^{-12}$

You should  
memorize  
these.

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## How to do it

Techniques for unit conversion:  
dimensional analysis

Convert 25 feet to meters

1 ft = 0.305 m  $\rightarrow$  conversion factor

Equivalent to: 0.305 m/ft or 1 ft / 0.305 m  
(25 ft)(0.305 m/ft) = 7.63 m

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## Practice

The diameter of a silicon atom is

$2.3 \times 10^{-8}$  cm. What is this distance in  
nanometers?

Using unit conversions:

1 cm =  $1 \times 10^{-2}$  m    1 nm =  $1 \times 10^{-9}$ m

$(2.3 \times 10^{-8} \text{ cm})(1 \times 10^{-2} \text{ m} / 1 \text{ cm})(1 \text{ nm} / 1 \times 10^{-9} \text{ m})$   
= 0.23 nm

Or:  $(2.3 \times 10^{-8} \text{ cm})(1 \text{ m} / 100 \text{ cm})(1 \times 10^9 \text{ nm} / 1 \text{ m})$

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## Cooperative Problems

- Things to think about
  - What assumptions are you making?
  - What approximations?
  - Challenge each other
  - All contribute
- Set up groups
  - minimum of 3, max of 5
  - pick a recorder
  - introduce yourself
  - record names

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**Problems:** do as many as you can

1. Ping Pong Balls
2. Haiku challenge
3. Coke/Diet Coke Demo:
  - What is happening and why?
  - How would you test your hypothesis
  - Detail some experiments

Turn in with names of group members

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### Ping Pong Balls

Determine the number of ping pong balls needed to fill the lecture hall.

Report your answer for the room volume in both English and metric units.

Supplies: rulers and ping pong balls

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### Haiku Challenge

(courtesy of Targol Saedi)

A haiku is a poem that has the following rhyme pattern:

- Line one: five syllables
- Line two: seven syllables
- Line three: five syllables

Create two separate haiku with the following elements using their NAMES not symbols:

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## Haiku

- Two elements that are in the same group(column) can not be used in the same poem.
- Elements that are in the same period(row) must be in the same line.
- Each line may not have a mass of more than 250 amu.

The elements are:

Ag, Mn, Li, Ni, Se, Cu, P, Sr, Ti, C, Cr, Zn, Cl

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## Form a HYPOTHESIS:

A tentative explanation of some regularity of nature.

What would your hypothesis be??

What experiments would you do to test your hypothesis?

<http://www.geocities.com/Heartland/4269/nutrition.html>

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## Coke vs Diet Coke

Carbonated water	Carbonated water
High fructose corn syrup	Carmel color
Carmel color	Phosphoric acid
Phosphoric acid	Natural flavors
Natural flavors	caffeine
caffeine	Aspartame (NutraSweet)
	Potassium benzoate
	Citric acid

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