Chemistry 6A Fall 2007

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Friday 9/14/07

Office Hrs on website

Chem. 6A next week:

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

Lecture: Chapter 2

Lab books have been out in the book store, if you don't see them in the stacks, there are some in the back… go ask.

No goggles, no lab!
No open toed shoes allowed!
No pre-lab, no lab!
No excuses!

Cuz when it comes to OWL, I know:

•When you log on!
•Where you logged in from! (IP address)
•How Long you were logged on!
•nd how many attempts you make per question!

Quit slackin' and hop to it!

It's time to play…

Name that Element!

S	sulfur
F	Fluorine
lead	Pb
silver	Ag

It's time to play…

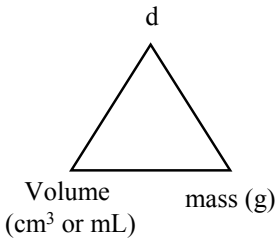
Name that compound!

$CuCl_2$	copper (II) chloride
K_2SO_4	potassium sulfate
sodium acetate	$NaC_2H_3O_2$
Aluminum hydroxide	$Al(OH)_3$

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

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…

PROBLEM: Mercury (Hg) has a density of 13.6 g/cm^3.
What is the mass of 95 mL of Hg?

What are the units needed? mass (grams, g)

What units are given? density (g/cm^3)

What additional units are given? mL

What additional information do we know? 1 mL = 1cm^3

So, to solve the problem, we must convert to the units ***needed*** from the units ***given***.

PROBLEM: Mercury (Hg) has a density of 13.6 g/cm^3.
What is the mass of 95 mL of Hg?

First begin with the quantity given:

95 mL

These units do not match the units of density so one must change them using a ***conversion factor***:

A conversion factor is a relationship between two quantities; each equality yields two conversion factors.

$1\ \text{ml} = 1\text{cm}^3 \rightarrow \frac{1\ \text{mL}}{1\ \text{cm}^3}$ or $\frac{1\ \text{cm}^3}{1\ \text{mL}}$

PROBLEM: Mercury (Hg) has a density of 13.6 g/cm^3.
What is the mass of 95 mL of Hg?

Now set up a series of multiplication steps that convert the units:

$$95\ \cancel{\text{mL}} \times \frac{1\ \cancel{\text{cm}^3}}{1\ \cancel{\text{mL}}} \times \frac{13.6\text{g}}{\cancel{\text{cm}^3}} = 1292.00\ \text{g}$$

2 sf *exact* *3 sf* ans. *2 sf*

Cancel units that appear in the numerator and denominator:

Now round your answer to the correct number of sig. figs.:

1292.00 g → 1300 g (2 *sf*)

Calculating the density of an regular shaped object:

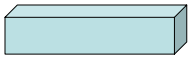
A 37.61 g block of a metal alloy has dimensions of 42 mm × 12 mm × 11 mm. What is its density in g/cm^3?

1st, put the calculator down!

mass is given

You need volume!

Recall that… $d = \frac{\text{mass}}{\text{Volume}}$



$V = L \times h \times w$

$$d = \frac{37.61\text{g}}{(42\ \text{mm} \times 12\ \text{mm} \times 11\ \text{mm}) \times \left(\frac{1\ \text{cm}}{10\ \text{mm}}\right)^3}$$

Calculating the density of an regular shaped object:

A 37.61 g block of a metal alloy has dimensions of 42 mm × 12 mm × 11 mm. What is its density in g/cm^3?

$$d = \frac{37.61\text{g}}{(42\ \text{mm} \times 12\ \text{mm} \times 11\ \text{mm}) \times \left(\frac{1\ \text{cm}}{10\ \text{mm}}\right)^3}$$

$$d = \frac{37.61\text{g}}{5544\ \cancel{\text{mm}^3} \times \frac{1\ \text{cm}^3}{10^3\ \cancel{\text{mm}^3}}} = 6.8\ \frac{\text{g}}{\text{cm}^3}$$

2 sf

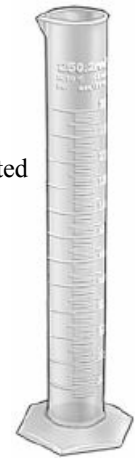
Let's say you want to determine the density of an irregular shaped object.
You can measure the mass on a balance easily, but obtaining its volume is difficult.

17.01g

odd shape…

One way to determine the volume is to use a graduated cylinder.

The volume of the object is equal to the volume of water it will displace.



First you fill the graduated cylinder with water…
Then measure the volume…
Then carefully add the object.

5.8 mL →

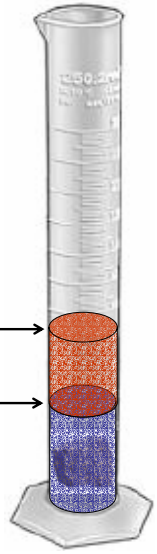
The level of the liquid rises due to displacement.
The difference in volume is the volume of the object.

$$\begin{array}{r} 8.9\ \text{mL} \\ -5.8\ \text{mL} \\ \hline 3.1\ \text{mL} \end{array}$$

The volume is accurate because the liquid fills in completely around the irregular shape!

8.9 mL →

5.8 mL →



Now the density can be determined:

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

17.01g

3.1 mL

odd shape…

$$d = \frac{17.01\text{g}}{3.1\ \text{mL}}$$

$$5.48710\ \frac{\text{g}}{\text{mL}} \quad \text{or} \quad 5.5\ \frac{\text{g}}{\text{mL}}$$

(2 sf)

Chapter 2: Atoms and Molecules

Chapter Learning Goals:

1. Write compound formulas using elemental symbols.
2. Identify the characteristics of protons, neutrons and electrons.
3. Determine the number of protons, neutrons and electrons of isotopes using atomic numbers and masses.
4. Calculate the formula weight of a chemical compound based on formula and atomic mass.
5. Use isotope percent abundances and masses to calculate the average atomic weights of elements.
6. Use the mole concept to relate the number of atoms, moles and grams of a material.

The Representation of Matter:

In chemistry we use chemical formulas and symbols to represent matter.

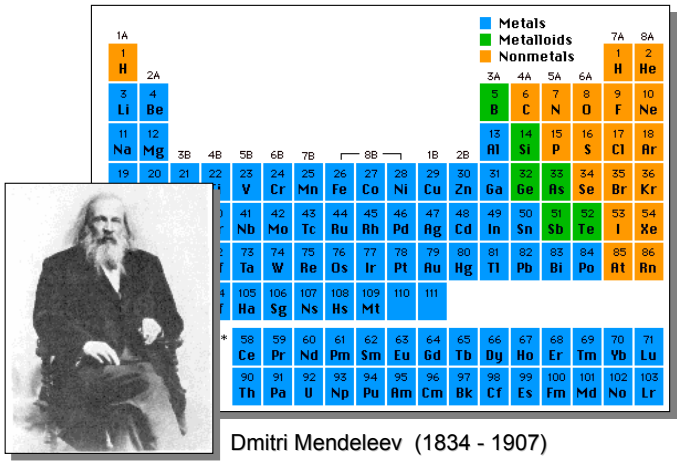
Why?

We are "***macroscopic***": large in size on the order of 100's of cm

Atoms and molecules are "***microscopic***":

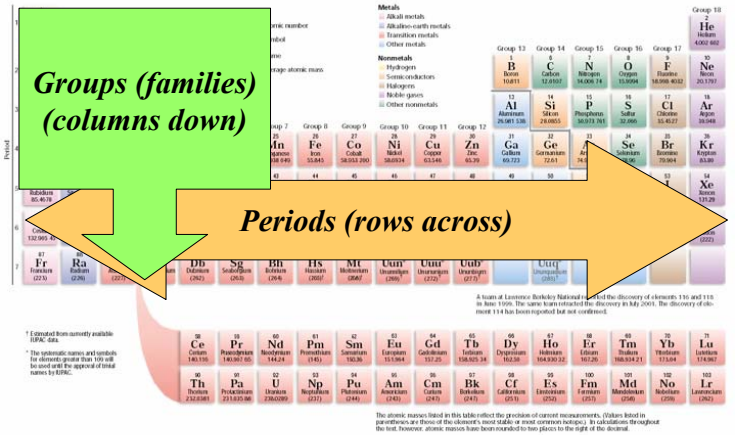
on the order of 10^{-12} cm

Where do we begin… The Periodic Table



Dmitri Mendeleev (1834 - 1907)

The modern periodic table is defined by:



Chemical Symbols and Formula:

Elements:

H = hydrogen

O = oxygen

C = carbon

Molecules:

H_2 = hydrogen

O_2 = oxygen

H_2O = water

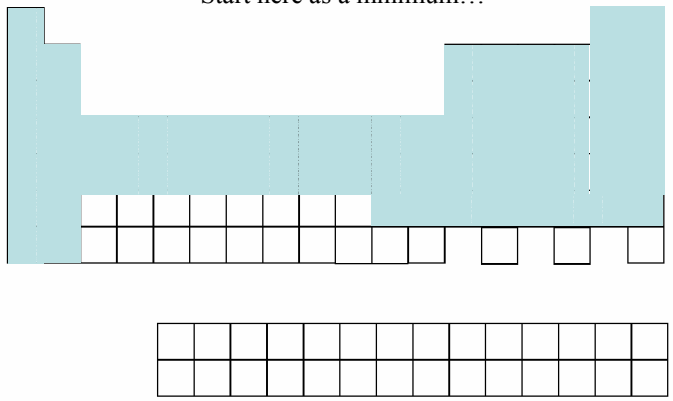
CO_2 = carbon dioxide

Uh-Oh! this is confusing…

Yes it is… Get over it and get used to it!

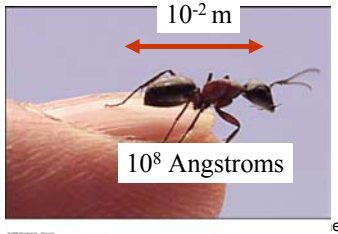
Which elements do we need to know?

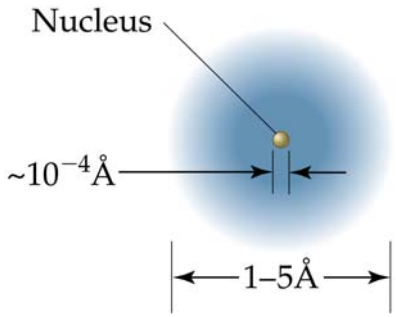
Start here as a minimum…



Why do scientists use chemical symbols like **C**, **Al** and **Fe** to represent atoms?

Because atoms are really small!





1Angstrom = 10^{-10} m

How do I remember all of these things:

1: Memorize the common elements and their symbols

2: Make up flash cards and practice with your classmates, friends or family.

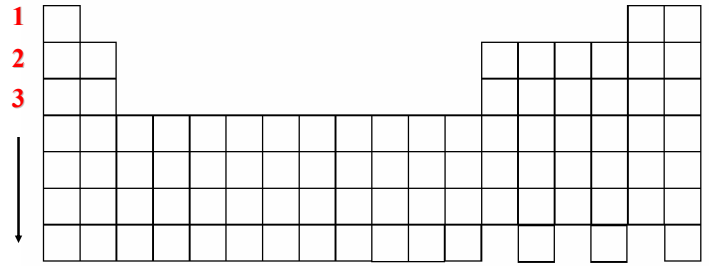
3: Work the exercises in the text!

Practice Practice Practice

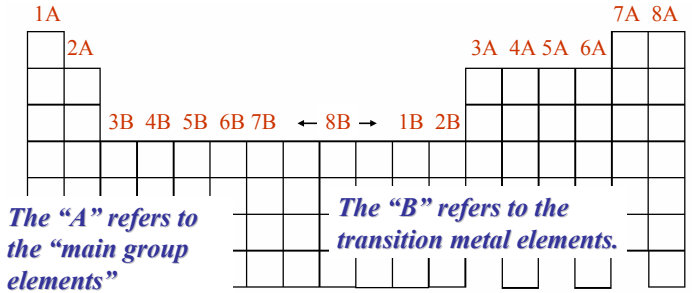
Chemistry is really:

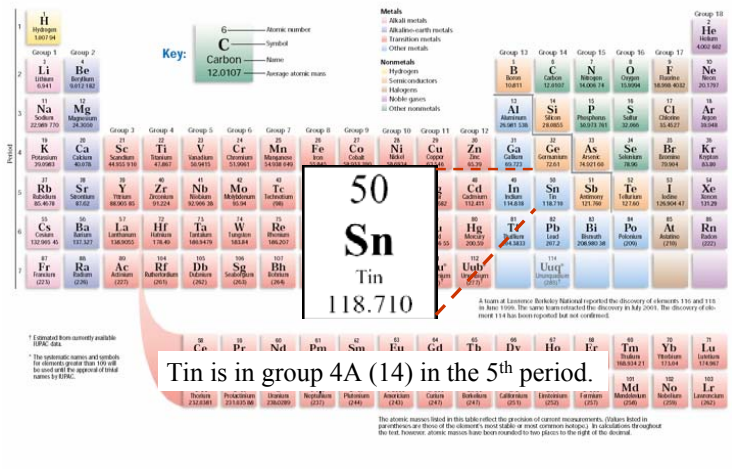
Chem - is - try

The Periods are labeled:

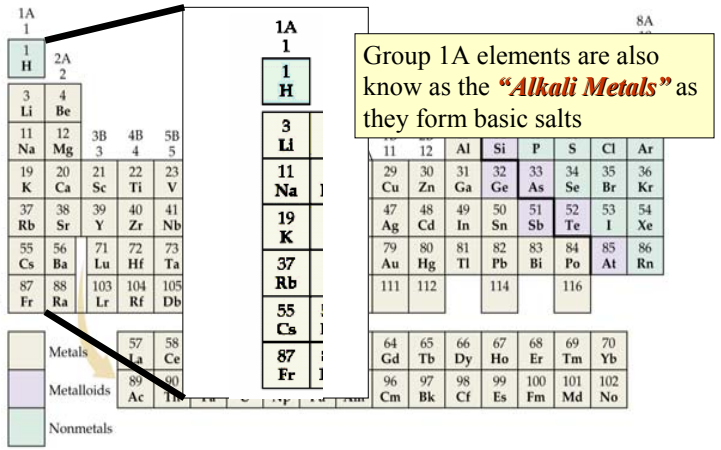


The Groups are labeled:

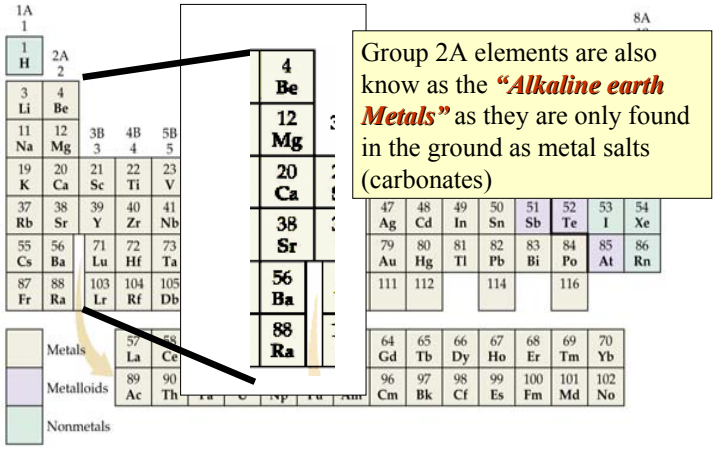




Today's Periodic table



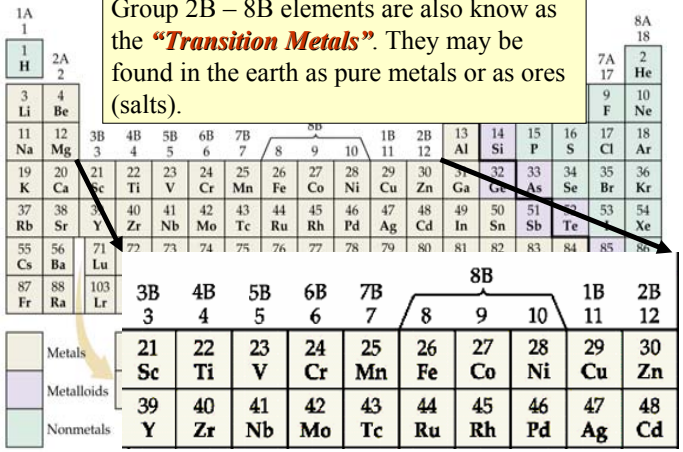
Today's Periodic table



Group 2A elements are also know as the ***"Alkaline earth Metals"*** as they are only found in the ground as metal salts (carbonates)

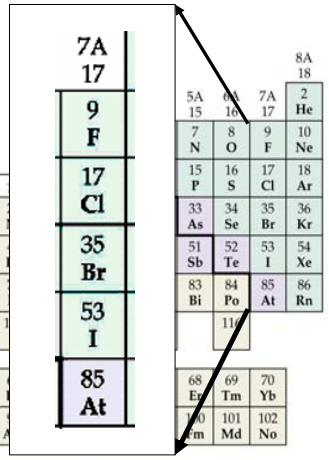
Today's Periodic table

Group 2B – 8B elements are also know as the ***"Transition Metals"***. They may be found in the earth as pure metals or as ores (salts).



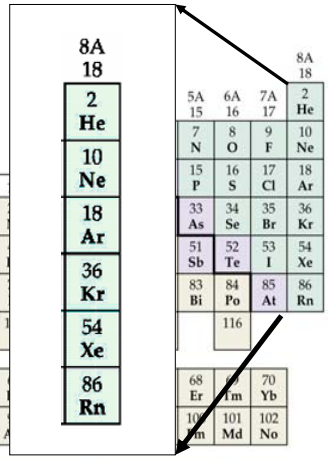
Today's Periodic table

Group 7A elements are also know as the ***"Halogens"***. They form acids with hydrogen and exist as diatomic molecules. (F_2, Cl_2…)



Today's Periodic table

Group 8A elements are also know as the ***"Noble gasses"***. They are inert to reaction for the most part. He is found underground!



Atomic Number, Z

An element's identity is defined by the number of protons in the nucleus: Z