Announcements – Lecture II – Tuesday, May 20th

1. Class Web Site: www.chem.umass.edu/genchem
2. Daily Quizzes: Start, Wednesday, May 21st
   (No make-ups … 2 scores dropped)
3. Add/Drop: Friday, May 23rd
4. No Class: Monday, May 26th , Memorial Day
5. First Lab: Tuesday, May 27th , ISB 155

1.4 Unit Conversions

a) Dimensional Analysis

1.4a Example_1

Prior to the metric system, the common unit of weight was the pound (lb). Under the S.I. System, 1 lb = 453.5g. If an old recipe calls for 9 ounces of flour (16 oz = 1 lb), how many grams of flour is this equivalent to?

$$\frac{9 \text{ ounces}}{\text{ounces}} \left| \frac{\text{g}}{} \right.$$

X Cannot do ... No conversion factor given ... and no web access!

$$\frac{9 \text{ ounces}}{16 \text{ ounces}} \left| \frac{1 \text{ lb}}{} \right. = 0.5625 \text{ lb}$$

$$\frac{0.5625 \text{ lb}}{1 \text{ lb}} \left| \frac{453.5 \text{ g}}{} \right. = 255 \text{g}$$

? What about significant figures?

1.4 Unit Conversions

a) Dimensional Analysis

a) 4.5×10^5 ✗ b) 4.5×10^7 ✓
c) 45 d) 0.45
e) Oops … I made a mistake

1.4a Example_2

A field is 100m long by 45m wide. What is the area in cm^2? (1m = 100cm)

To illustrate the power of dimensional analysis, first find the area in m^2 and then do the conversion to cm^2.

$$\text{Area} = 100\,m \times 45\,m = 4.5 \times 10^3\,m^2$$

$$4.5 \times 10^3\,m^2 = \frac{4.5 \times 10^3\,m\cancel{m} \mid 100\,cm}{1\,\cancel{m}} = 4.5 \times 10^5\,cm.m$$

$$\frac{4.5 \times 10^5\,cm.\cancel{m} \mid 100\,cm}{1\,\cancel{m}} = 4.5 \times 10^7\,cm.cm = 4.5 \times 10^7\,cm^2$$

1.4 Unit Conversions

b) Unit Conversions Using Density

1.4b Example_1

The density of whole blood at 37^{0}C is 1.06 g.cm^{-3}.
What is the mass, in grams of a 15.0 cm^3 sample of blood?

a)	15.9g ✓	b)	14.2g
c)	Neither a or b	d)	Tom I am clueless!

$$1.06\ g.cm^{-3} = \frac{1.06\ g}{1\ cm^3}$$

$$15.0\ cm^3 \times \frac{1.06\ g}{1\ cm^3} = 15.9\ g$$

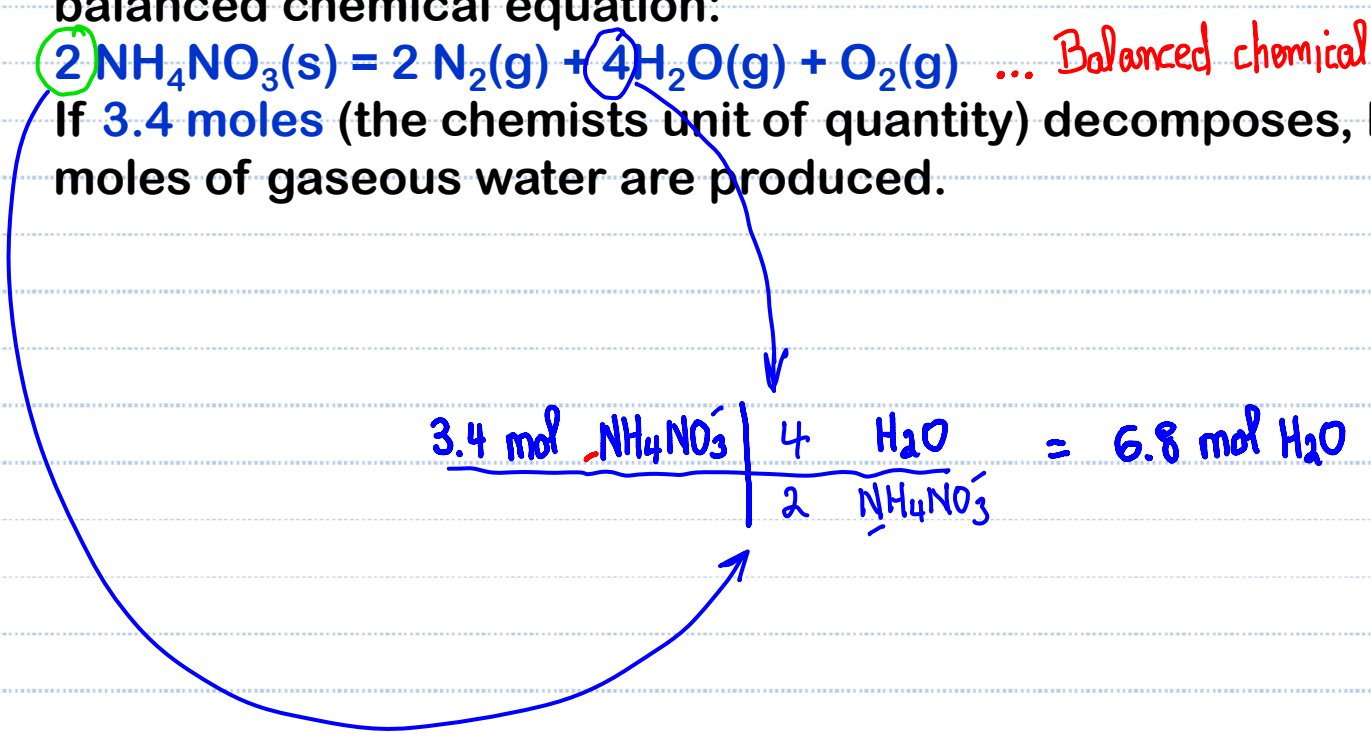
1.4 Unit Conversions

Unit Conversions using Balanced Chemical Equations

Ammonium Nitrate decomposes explosively according to the following balanced chemical equation:

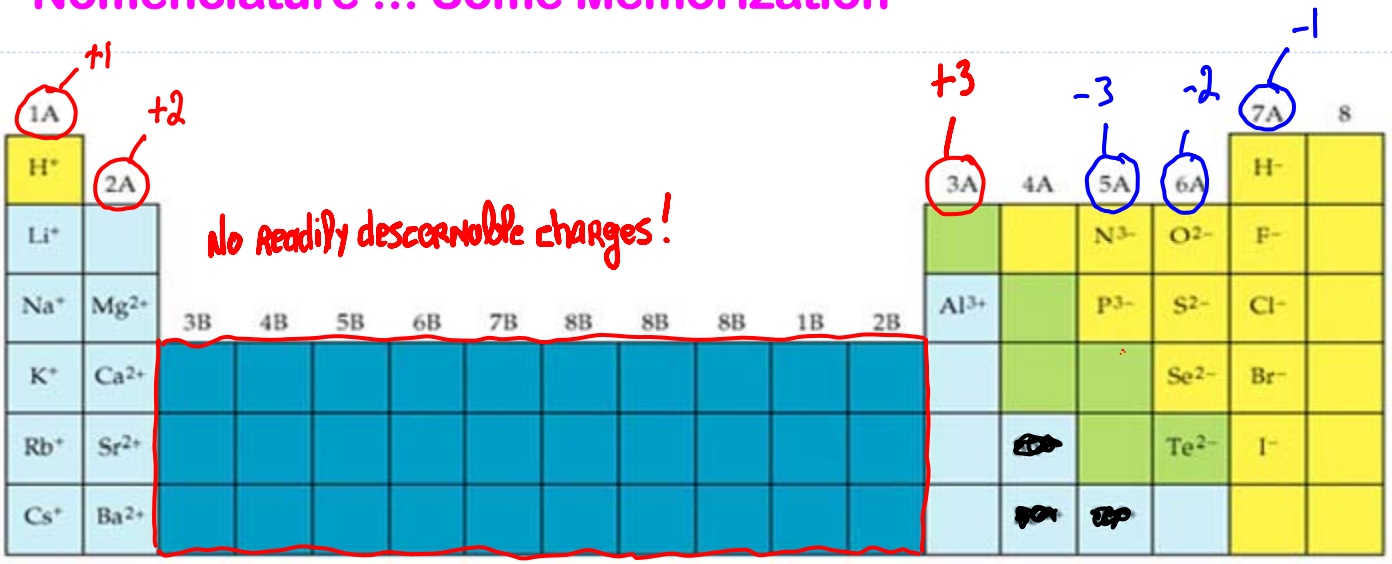
$2\ NH_4NO_3(s) = 2\ N_2(g) + 4\ H_2O(g) + O_2(g)$ ... Balanced chemical equation

If 3.4 moles (the chemists unit of quantity) decomposes, how many moles of gaseous water are produced.



2.2 Elements and the Periodic Table

Nomenclature … Some Memorization



Monoatomic cations … Retain their parent Name

Na : Sodium

Na^+ : Sodium

Monoatomic anions … end in 'ide'

O : Oxygen

O^{2-} : Oxide

2.1 The Structure of the Atom

a) Components of an Atom

*2: $1\,amu = 1.66054 \times 10^{-24}\,g$

Name	Symbol	Mass (g)	Charge	Mass (amu)*2
Proton	${}^{1}_{1}p$	1.673×10^{-24}	+1	1.0073
Neutron	${}^{1}_{0}n$	1.675×10^{-24}	0	1.0087
Electron	${}^{0}_{-1}e$	9.109×10^{-28}	-1	0.0005

a) Chemists tend to ignore the mass of the electron.

b) # Protons ... atom determinator ... Atomic Number ... (Z)

c) # Neutrons ... other mass contributor ... # Protons + # Neutrons = Mass Number ... (A)

d) # Electrons ... determines the overall charge:

Electrons = # Protons, Neutral
Electrons > # Protons, Anion
Electrons < # Protons, Cation

$^{A}_{Z}X$ ⇝ assigned symbol ... carbon = C

2.1 The Structure of the Atom

b) Atomic Number, Mass Number, and Atomic Symbols

2.1b Example_1

Which if any of the following species has the same number of Neutrons as it does Electrons?

$^{47}_{24}Cr$ $^{24}Mg^{2+}$ $^{59}Co^{2+}$ (A) $^{35}Cl^{-}$ (B) $^{125}_{50}Sn$ (C) ^{90}Sr (D)

		# Protons	# Neutrons	# Electrons
	$^{47}_{24}Cr$	24	23	24
	$^{24}Mg^{2+}$	12	12	10
A)	$^{59}Co^{2+}$	27	32	25
B)	$^{35}Cl^{-}$	17	18	18
C)	$^{125}_{50}Sn$	50	75	50
D)	^{90}Sr	38	52	38