Welcome to day 2!

- Announcements
- Atomic Theory
- Atomic Structure
- Isotopes
Chemistry is?

1. The greatest class on earth
2. Why I get up in the morning
3. The study of the properties and interactions of matter
4. The science that ties all other sciences together
Announcements

• HHMI picnic today – please sign up if on meal plan
• Turn in the ‘hand-in’ problem to room SC3067 (student resource room in NE corner)
  – This is also where you can pick up graded CAPA
• Sorry, but I can’t address questions right after class
  – I have a 9:30 class to get to
  – We need to clear out for GenChem Section 2
  – Try to find me around lunch or early afternoon
The Periodic Table

Your Best Friend

- Arranged in order of increasing mass, the periodic table looks like this.
  - Because rows 6 and 8 are quite long, 14 of these elements are separated from the rest.
- Elements in the same column (group) have similar chemical properties
Unit Conversions

• We frequently need to convert a measurement from one unit to another.
• When multiplying numbers we also multiply units and when dividing numbers we also divide units
• Never forget units!
For Example

- The density of water is 1.0 g/mL.
- What is the density in lbs/Gal?

\[
1.0 \frac{g}{mL} \times \frac{1kg}{1000g} \times \frac{1lb}{0.4536kg} = 0.0022046 \frac{lbs}{mL}
\]

\[
0.0022046 \frac{lbs}{mL} \times \frac{1000mL}{1L} \times \frac{3.785L}{1Gal} = 8.3 \frac{lb}{Gal}
\]

\[
1.0 \frac{g}{mL} = 8.3 \frac{lbs}{Gal}
\]
Atomic Theory

- Developed early 1800’s by John Dalton
- He observed?

Fixed proportions can only result from indivisible matter

Notebook p.7
Summary of Atomic Theory

• All matter is made up of tiny particles called atoms.
• All atoms of a given element have identical chemical properties that are characteristic of that element.
• Atoms form chemical compounds by combining in whole-number ratios.
• Atoms can change how they are combined, but they are neither created nor destroyed in chemical reactions.
  – A.K.A. Conservation of Mass
Dynamic Equilibrium

• Atoms (and therefore molecules) are ALWAYS in motion
• Leads to many critical aspects of chemistry, e.g. Diffusion
• Equilibrium in chemistry is dynamic
  – Particles are constantly moving/exchanging at molecular level
  – Overall, there is no net change
  – Like the Hope College dating pool

Dynamic Equilibrium
Dane Rudhyar, 1947
Atomic Structure

- Nucleus contains protons and neutrons
- Protons determine identity
- Protons + neutrons determines mass
- Protons – electrons determines charge
- Held together by variety of forces (see text)
What is the beam made of?

1. Protons
2. Neutrons
3. Electrons
4. Ions
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Isotopes

- Atoms with different number of neutrons
- Same element, but different mass

\[ A \]
\[ Z \]
\[ X \]

- A is atomic mass
  - # of protons + # of neutrons
- Z is atomic number
  - # of protons
- X – element symbol
  - Redundant with atomic number

Note that mass in periodic table is average atomic mass from all isotopes

- Typo on electron mass p.42 (Table 2-1 is OK)
Atomic Notation Example

- Chlorine 35 and Chlorine 37 are both common
- How many protons, neutrons, and electrons in each?

\[
\begin{array}{c|c}
\text{Cl}^{35} & \text{Cl}^{37} \\
17 & 17 \\
17 \text{ Protons} & 17 \text{ Protons} \\
17 \text{ Electrons} & 17 \text{ Electrons} \\
18 \text{ Neutrons} & 20 \text{ Neutrons} \\
\end{array}
\]
Before 4:00 TODAY

• Turn in index card
• Complete trial post to chemboard
• Make plans to attend HHMI seminars & picnic (and sign up)
  – 3:00 and 4:00 VDW 102
• Pick up CAPA sheets from shelf outside room

By Monday

• Sleep
• Finish CAPA set #1
• Finish reading Chapt 2

Remember: You are done with the homework when you understand it!