GEMS 160  Feb 3, 2006

- Pick-up keypad
- Chemistry news
  - Today; Daniel Callam, Chelsea Bossenbroek
  - Monday; Zachary DeJonge (info by 8:00 pm Saturday)
- News notebooks to be submitted next Friday
  - Four weeks of info (Jan 16, 23, 39, Feb 6)
  - Review guidelines in syllabus
- Exams, Ch. 3 HW returned on Monday
- Jump ahead to chapter 9
- Ch. 9 HW posted later today, due 2/10

Group: ‘New car smell’ includes toxins - Dan Callam

- The Ecology Center, a group based in Ann Arbor, reports that the chemicals that cause the “new car smell” are dangerous
- PBDEs used as fire retardants, phthalates soften PVC plastics
- Both are found in dust, which are then inhaled by riders
- Can cause birth defects, impaired learning, and liver toxicity in test animals
- The group calls for manufacturers to improve ventilation and cleaning
- Mercedes, Chrysler, and Toyota among those with higher levels

Nano World: Organic-carbon nanotube hybrid

- Scientists have created the World's first hybrid organic molecular and carbon nanotube electronics.
- Problem was: unstable connections between molecules and their electrodes
- Solution: Develop a hybrid that is air and water stable
- The researchers found they could plug in organic molecules that created electronic devices that changes how well they conducted with alterations in the acidity or alkalinity levels.
- What this could potentially lead to:
  - Diagnosis of diseases
  - Environmental monitoring
  - Advanced computers

Which of the following reactions is an exploding balloon?

- 15% 1. $\text{H}_2\text{O}_2 \rightarrow \text{H}_2\text{O} + \text{O}_2$
- 85% 2. $\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}$
- 0% 3. $\text{Mg} + \text{O}_2 \rightarrow \text{MgO}$
- 0% 4. $\text{Fe} + \text{O}_2 \rightarrow \text{Fe}_3\text{O}_4$

Which of the following reactions boils water on your stove?

- 1. $\text{H}_2\text{O}_2 \rightarrow \text{H}_2\text{O} + \text{O}_2$
- 7% 2. $\text{Na} + \text{H}_2\text{O} \rightarrow \text{H}_2 + \text{NaOH}$
- 11% 3. $\text{Mg} + \text{O}_2 \rightarrow \text{MgO}$
- 81% 4. $\text{CH}_4 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
Which of the following reactions produces a blinding white light?

- 1. $H_2O_2 \rightarrow H_2O + O_2$
- 2. $Na + H_2O \rightarrow H_2 + NaOH$
- 86% 3. $Mg + O_2 \rightarrow MgO$
- 6% 4. $Fe + O_2 \rightarrow Fe_2O_3$

Some reactions you have seen:

- $H_2 + O_2 \rightarrow H_2O$
- $Na + H_2O \rightarrow H_2 + NaOH$
- $H_2O_2 \rightarrow H_2O + O_2$
- $CH_4 + O_2 \rightarrow CO_2 + H_2O$
- $Mg + O_2 \rightarrow MgO$
- $Fe + O_2 \rightarrow Fe_2O_3$
- All of the above release energy

- Reactants $\rightarrow$ Products
- Show changes, but not complete because there is not conservation of mass.
- Number and type of atoms on both sides of the arrow must be the same = Balanced Equation
- Why are balanced equations important?
  - Predict how much product from limited reactants
  - How much reactant is needed to make something
- Balanced equations and you -
  - Recognize if an equation is balanced
  - Work with any balanced equation

- Balanced reactions have equal amounts of atoms of each type as products and reactants. To balance, you can change coefficients, but not subscripts.

- $H_2 + O_2 \rightarrow H_2O$ (not balanced)
- $2H_2 + O_2 \rightarrow 2H_2O$ (balanced)

Na + H$_2$O $\rightarrow$ H$_2$ + NaOH

What is not balanced?

- 0% 1. Na
- 100% 2. H
- 0% 3. O

When balanced the coefficient for water is

- 0% 1. 1
- 81% 2. 2
- 32% 3. 3
- 8% 4. 4
A few more examples

• \( \text{CH}_4 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O} \)
• \( \text{Mg} + \text{O}_2 \rightarrow \text{MgO} \)
• \( \text{Fe} + \text{O}_2 \rightarrow \text{Fe}_2\text{O}_3 \)

Toll House Cookies (2 dozen)

• 1/2 cup unsalted butter at room temperature
• 1/4 cup vegetable shortening at room temperature
• 1/2 cup packed light brown sugar
• 1/2 cup granulated sugar
• 2 eggs
• 2 teaspoons vanilla
• 1 1/2 cup all purpose flour
• 1/2 teaspoon baking soda
• 1/2 teaspoon baking powder
• 1/2 teaspoon salt
• 2 cups (1 12oz package) semisweet chocolate chips

? How many cookies could you make if you only had 7 eggs? How many oz of chocolate chips would then be required?
? How much flour would be needed to prepare 100 cookies? How many oz of chocolate chips?

Some chemical questions?

• \( 2 \text{H}_2 + \text{O}_2 \rightarrow 2 \text{H}_2\text{O} \)
• How much energy (or water) can be obtained from 100 grams of \( \text{H}_2 \)?
• \( \text{CH}_4 + 2 \text{O}_2 \rightarrow \text{CO}_2 + 2 \text{H}_2\text{O} \)
• How much \( \text{CO}_2 \) is produced by burning 1 kg of methane?
• \( 4 \text{Fe} + 3 \text{O}_2 \rightarrow 2 \text{Fe}_2\text{O}_3 \)
• How much iron ore (Fe<br>\(_2\text{O}_3\)) is needed to produce 2 tons of Fe?

• The balanced equations are written in terms of atoms and molecules, but the way the products and reactants are dealt with in the real world is in terms of weights and volumes.

Counting in the chemical world

• In the commercial world a common counting unit is the dozen, a pair, a gross
• In the chemical world the counting unit is the mole. How many moles of something is given by the coefficient in the balanced equation.
• A mole is \( 6.02 \times 10^{23} \) particles
• When counting in moles, the atomic weight from the periodic table represents the mass in grams of one mole of the element.