Chemistry in Context
In-Class Worksheet for Chapter 1
Spring 2009

1. Classify the following as an element, compound or mixture:
   a. Ozone, O_3 compound
   b. Diesel fuel mixture
   c. Radon, Rn element
   d. Prozac compound
   e. Magnesium, Mg element
   f. Salad dressing mixture

2. Write these numbers in scientific notation:
   a. 34120 3.412×10^4
   b. 0.0024 2.4×10^{-3}
   c. 543000 5.43×10^5
   d. 0.000068 6.8×10^{-5}

3. Write the following in decimal form:
   a. 7.8×10^4 78000
   b. 7.8×10^{-4} 0.00078

4. Convert the percentages below to parts per million (ppm) and the parts per million to percentages.
   a. 0.04 % 400 ppm
   b. 650 ppm 0.065 %
   c. 5% 50000 ppm
   d. 80 ppm 0.008%

5. List the elemental name and the group in which the element is found:
   a. F fluorine, 7A
   b. Ga Gallium, 3A
   c. Ba Barium, 2A
   d. P Phosphorous, 5A
   e. Bi Bismuth, 5A

6. Determine which elements in Question 4 are metals and which are non-metals.
   metals: Gallium, Barium, Bismuth Non-metals: Fluorine + Phosphorous

7. Balance the following reactions:
   a. Combustion of Propane: $\_C_3H_8 + \underline{5}O_2 \rightarrow \underline{3}\,CO_2 + \underline{4}\,H_2O$
   b. Electrolysis of water to form H_2 and O_2: $\underline{2}\,H_2O \rightarrow \underline{2}\,H_2 + \_O_2$
   c. Oxidation of iron to form rust, Fe_2O_3: $\underline{4}\,Fe + \underline{3}\,O_2 \rightarrow \underline{2}\,Fe_2O_3$

(Key)

Chemistry in Context
In-Class Worksheet for Chapter 2
Spring 2009

1. Arrange these types of radiation in order of increasing energy: gamma rays, infrared radiation, radio waves, and visible light.

radio < IR < visible < gamma rays

2. Arrange these types of radiation in order of increasing wavelength: gamma rays, infrared radiation, radio waves, and visible light.

gamma rays < visible < IR < radio

3. a. What is the energy of a 320 nm photon?

$\lambda = 320\ nm \times \frac{10^{-9}\ m}{1\ nm}$ $\quad \nu = c/\lambda = \frac{3\times10^{8}\ m/s}{320\times10^{-9}\ m} = 9.375\times10^{14}\ 1/s$

$E = h\nu = (6.626\times10^{-34}\ J\cdot s)(9.375\times10^{14}\ 1/s) = 6.21\times10^{-19}\ J$

b. Is this photon more biologically damaging than a 240 nm photon? Why or why not? 240 nm is a shorter wavelength than 320 nm. Shorter wavelength means higher energy. Higher energy photons are more damaging, so 240 nm is worse than 320 nm.

4. Using the periodic table as a guide, specify the number of protons and electrons in a neutral atom of each of these elements.
   a. Oxygen (O) 8 protons + electrons
   b. Carbon (C) 6 "
   c. Phosphorous (P) 15 "
   d. Beryllium (Be) 4 "

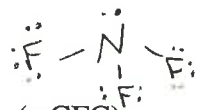
5. Give the number of protons, neutrons, and electrons in each of these elements.

a. Oxygen-16 ($^{16}_{8}O$)	p = 8	n = 8	e = 8
b. Nitrogen-14 ($^{14}_{7}N$)	p = 7	n = 7	e = 7
c. Nitrogen-15 ($^{15}_{7}N$)	p = 7	n = 8	e = 7
d. Chlorine-35 ($^{35}_{17}Cl$)	p = 17	n = 18	e = 17
e. Chlorine-37 ($^{37}_{17}Cl$)	p = 17	n = 20	e = 17
f. Fluorine-19 ($^{19}_{9}F$)	p = 9	n = 10	e = 9

6. Use the elements listed in Problem 5 to give two examples of isotopes.

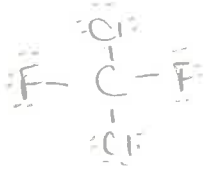
^{35}Cl + ^{37}Cl / ^{14}N + ^{15}N

7. Assuming the octet rule applies, write Lewis structures for each of these molecules.
   a. NF_3



26 outer e⁻

   b. CCl_2F_2 (a CFC)

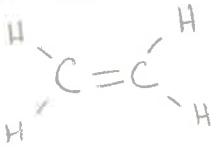


32 outer e⁻

   c. Cl_2

14 outer e⁻

   d. C_2H_4



12 outer e⁻

Chemistry in Context
In-Class Worksheet for Chapter 3
Spring 2009

1. Draw Lewis structures and classify the shapes of the following molecules.

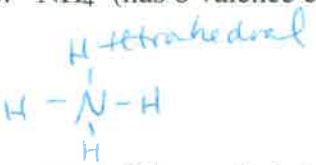
   a. CCl_3F

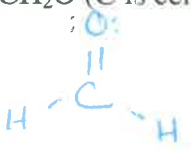
   b. $SeCl_2$ 20 valence e⁻

   c. NH_4^+ (has 8 valence e⁻)

   d. CH_2O (C is central atom)

2. Consider the reaction: $C_3H_8 + 5\ O_2 \rightarrow 3CO_2 + 4\ H_2O$.
   a. How many moles of C_3H_8, O_2, CO_2, and H_2O are in this reaction?

   1 / 5 / 3 / 4

   b. Determine the molar mass of C_3H_8, O_2, CO_2, and H_2O.

   C_3H_8: $3 \times 12.01 + 8 \times 1.008 = 44.094$ g/mol
   O_2: $2 \times 16.00 = 32.00$ g/mol
   CO_2: $12.01 + 2 \times 16.00 = 44.01$ g/mol
   H_2O: $2 \times 1.008 + 16.00 = 18.016$ g/mol

   c. What is the mass of C_3H_8, O_2, CO_2, and H_2O used or formed in this reaction?

   44.094 g/mol $\times 1$ mol $= 44.094$ g C_3H_8
   32.00 g/mol $\times 5$ mol $= 160$ g O_2
   44.01 g/mol $\times 3$ mol $= 132.03$ g CO_2
   18.02 g/mol $\times 4$ mol $= 72.064$ g H_2O

   d. What is the total mass of reactants? What is the total mass of product?

   $44.094 + 160 = 204.094$ g
   $132.03 + 72.06 = 204.094$ g

3. Hexane, C_6H_{14}, will burn with oxygen gas, O_2.
   a. Write a balanced equation for the combustion of hexane.

   $2C_6H_{14} + 19O_2 \longrightarrow 12CO_2 + 14H_2O$

   b. How many moles of CO_2 are formed when 1 mole of hexane is combusted?

   6 mole CO_2 formed when 1 mole of hexane is combusted

   c. How many moles of CO_2 are formed when 8 moles of hexane is combusted?

   48 mole CO_2 formed when 1 mole of hexane is combusted