

Honors 203/Chemistry 110

Homework 1

Due Tuesday, February 15th.

Spring 2011

1. **CIC 1.1a** Calculate the volume of air that an adult person exhales in an 8 hour day. Assume that each breath has a volume of about 0.5 L and the person exhales 15 times a minute.
2. **CIC 1.2** Given the dry air is 78% nitrogen by volume, how many liters of nitrogen are in 500 L?
3. **CIC 1.3** These gases are found in the troposphere: Rn, CO₂, CO, O₂, Ar, N₂.
 - (a) rank them in order of abundance
 - (b) which concentrations are more conveniently expressed in ppm.
 - (c) which of these are currently regulated as an air pollutant where you live
 - (d) which of these gases are noble gases?
4. **CIC 1.6**
 - (a) The concentration of argon in air is approximately 0.9%. Express this in ppm.
 - (b) The air expelled from the lungs of a smoker has a concentration of 20-50 ppm CO. In contrast, air exhaled by nonsmokers is 0-2 ppm CO. Express each concentration as a percent.
 - (c) In a tropical rain forest, the water vapor concentration may reach 50,000 ppm. Express this as a percent.

- (d) In the dry polar regions, water vapor may be a mere 10 ppm. Express this as a percent.
5. **CIC 1.7** In these diagrams (pg 58), two different types of atoms are represented using a different color and size. Characterize each sample as an element, compound, or mixture. Explain your classification.
6. **CIC 1.9** Express each of the following numbers in scientific notation:
- (a) 1500 m (c) 0.0000075 m
(b) 0.0000000000958 m (d) 150,000 mg
7. **CIC 1.10** Express each of the following numbers in standard (nonscientific) notation:
- (a) 8.5×10^4 g (c) $5.0 \times 10^{-3}\%$
(b) 1.0×10^7 gallons (d) 1×10^{-5} g
8. **CIC 1.11** The threshold for detecting NO_2 by smell is 0.00022 g/m^3 of air.
- (a) express this value in scientific notation
(b) would you expect a similar threshold for CO?
(c) Name another pollutant with a sharp, easily detectable odor.
9. **CIC 1.15** Classify each of these as an element, compound or mixture:
- (a) a sample of dinitrogen monoxide (d) sample of copper
(b) steam from boiling water (e) cup of mayonnaise
(c) bar of deodorant soap (f) helium in a balloon.

10. **CIC 1.16** Each of the following is found in the atmosphere in small amounts: CH_4 , SO_2 , O_3 . (a) What information does each chemical formula convey? (b) What are their names?
11. **CIC 1.17** Hydrocarbons are important fuels that we burn for many different reasons.
- (a) What is a hydrocarbon?
- (b) Put these in order from smallest to largest: propane, methane, butane, octane, ethane
- (c) Propose a mnemonic for the first five hydrocarbons.
12. **CIC 1.21** Balance the following equations:
- (a) $\text{C}_2\text{H}_4 + \text{O}_2 \longrightarrow \text{C} + \text{H}_2\text{O}$
- (b) $\text{C}_2\text{H}_4 + \text{O}_2 \longrightarrow \text{CO} + \text{H}_2\text{O}$
- (c) $\text{C}_2\text{H}_4 + \text{O}_2 \longrightarrow \text{CO}_2 + \text{H}_2\text{O}$
13. **CIC 1.25** Nail polish remover containing 3600 mg of acetone is spilled in a room is 6 m long, 5 m wide and 3 m high, calculate the concentration in micrograms per cubic meter.