Chem 121 – Winter 2011
Quiz 1

Show all your work for full credit, and PAY ATTENTION TO SIGNIFICANT FIGURES in each of your calculations. If anything is unclear, please ask. Cell phones off.

1. [4 pts] How many significant figures are in each of the following numbers?

<table>
<thead>
<tr>
<th></th>
<th>a) 12,000.0</th>
<th>b) 2.10 x 10^3</th>
<th>c) 10,000</th>
<th>d) 0.00033</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6</td>
<td>3</td>
<td>1, 2, 3, 4 or 5</td>
<td>2</td>
</tr>
</tbody>
</table>

2. [6 pts] Perform the following calculations, and include the proper units and correct number of significant figures in your answer:

a) \((0.013 \text{ m}) \times (5.400 \times 10^{-5} \text{ m}) = 7.0 \times 10^{-7} \text{ m}^2\)

b) \(32.0 \text{ mm} - 31.80 \text{ mm} = \frac{32.0 \text{ mm}}{31.80 \text{ mm}} = 0.2 \text{ mm} \)

c) \(\frac{(0.440 \text{ g})}{(22.4 \text{ mL} - 20.4 \text{ mL})} = \frac{0.22 \text{ g/mL}}{2.0 \text{ mL}}\)

3. [4 pts] Two liquids are separated by the process of distillation. During this process, two physical changes occur in the liquid with the lower boiling point. Name these two changes.

- boiling (evaporation)
- condensation

4. [8 pts] Identify each of the following as a physical (P) or chemical (C) change:

_ C _ a) Sodium bicarbonate (NaHCO₃) releases CO₂ gas when heated.

_ C _ b) Xenon gas is very unreactive.

_ P _ c) Nitrogen gas and oxygen gas are combined to form a mixture of the two gases.

_ P _ d) A piece of dry ice (solid carbon dioxide) is put into a balloon, and the balloon is tied. The balloon gradually inflates, and, after one hour, it pops.

5. [8 pts] Convert the following values, showing all conversion factors:

a) 5.0 x 10⁶ mg to lb

\[
5 \text{ pts} \quad 5.0 \times 10^6 \text{ mg} \left(\frac{0.001 \text{ g}}{1 \text{ mg}}\right) \left(\frac{1 \text{ lb}}{453.6 \text{ g}}\right) = 110 \text{ lb}
\]

or

\[
1.1 \times 10^2 \text{ lb}
\]

(continued)
b) 66 kL to gal

\[
66 \text{ kL} \left( \frac{1000 \text{ L}}{1 \text{ kL}} \right) \left( \frac{1 \text{ gal}}{3.7856 \text{ L}} \right) = 1.7 \times 10^5 \text{ gal}
\]

c) 0.0078 cJ to \(\mu\)J

\[
0.0078 \text{ cJ} \left( \frac{0.01 \text{ L}}{1 \text{ cL}} \right) \left( \frac{1 \text{ \(\mu\)J}}{10^{-6} \text{ L}} \right) = 78 \text{ \(\mu\)J}
\]

7. [5 pts] Circle the numbers below that are \text{exact} numbers:

- 11 people on a soccer team
- 15 mL of water in a beaker
- The density of water is 1.0 g/mL
- 100 cm in a meter
- It rains an average of 11 inches in October

\text{Not exact!}

8. [4 pts] Provide the name or symbol of each of the following:

- fluorine \(F\)
- helium \(He\)
- magnesium \(Mg\)
- neon \(Ne\)

9. [4 pts] Read the following ruler and graduated cylinder to the appropriate number of significant figures:

- Ruler is marked to 0.1 cm
  
  \[\text{length} = 7.01 \text{ cm}\]
  
  \[\text{marked to 1 mL}
  \]
  
  \[\text{... must estimate to 0.1 mL!}\]

- Volume = 76.0 mL

\text{Metric prefixes: \(k = 1000\); \(c = 0.01\); \(m = 0.001\); \(\mu = 0.000001\)}

\[1 \text{ cm}^3 = 1 \text{ mL}\]

\[1 \text{ lb} = 453.6 \text{ g}\]

\[1 \text{ cm}^3 = 1 \text{ mL}\]

\[1 \text{ gal} = 3.7856 \text{ L}\]