1. (12 points) What are the three methods outlined in your text for separating mixtures into their component compounds or elements? Describe each with a diagram/sketch and a sentence

1.

2.

3.

Provide a definition for Boiling Point:
2. (5 points) Provide answers with the correct Significant figures.

\[(1.235 + 2.7346 \times 10^{-2}) - 4.456 = \]

\[(2.3 \times 10^{-5} \times 3.456 \times 10^{-3}) / (1.22 \times 10^{-11}) = \]

3. (5 points) A student measures the mass of 12 beakers as 134.89 g.
   a. What is the average mass of a beaker?
   b. Which of the numbers in the problem is a counted (pure) number ____ and which of the numbers in the problem is a measured number? ____
   c. What is the fundamental difference between a measured number and a counted number? (1 sentence)

Rounded Number: ________________

4. (5 points) The pictures below depict two graduated cylinders (10 mL and 100 mL) filled with various amounts of water.
   a. What is the volume measurement for each cylinder?

b. Which graduated cylinder (left or right) is capable of providing more accurate measurements of volume? Explain. (1 sentence)
5. (4 points) A solid, when placed in a graduated cylinder, displaces 18.23 mL of water. Determine the density of the solid, if it has a mass of 22.6 g.

Use the following table of information to answer questions 6 - 8.

<table>
<thead>
<tr>
<th>Substance</th>
<th>Density (g/mL)</th>
<th>Melting Point</th>
<th>Boiling Point</th>
<th>Water</th>
<th>Toluene</th>
<th>Ethanol</th>
</tr>
</thead>
<tbody>
<tr>
<td>acetone</td>
<td>0.79</td>
<td>-95</td>
<td>56</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>cyclohexane</td>
<td>0.78</td>
<td>6.5</td>
<td>81.4</td>
<td>I</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>diethyl ether</td>
<td>1.10</td>
<td>-80</td>
<td>50</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>ethanol</td>
<td>0.80</td>
<td>-90</td>
<td>75</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>hexane</td>
<td>0.66</td>
<td>-94</td>
<td>69</td>
<td>I</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>isopropanol</td>
<td>0.79</td>
<td>-98</td>
<td>83</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>α-naphthol</td>
<td>1.10</td>
<td>94</td>
<td>288</td>
<td>I</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>naphthalene</td>
<td>1.15</td>
<td>80</td>
<td>218</td>
<td>I</td>
<td>S</td>
<td>SI</td>
</tr>
<tr>
<td>sodium chloride</td>
<td>1.5</td>
<td>801</td>
<td>2000</td>
<td>S</td>
<td>I</td>
<td>S</td>
</tr>
<tr>
<td>water</td>
<td>1.0</td>
<td>0</td>
<td>100</td>
<td>S</td>
<td>I</td>
<td>S</td>
</tr>
</tbody>
</table>

6. (6 points) Imagine your instructor gave you an unknown liquid and the information above. Which of the above substances might the unknown liquid be (list all)? Briefly explain.

(Note that room temperature is about 22 °C)

If the liquid is insoluble in water, then which of the liquids could it be?
7. (2 points) Imagine your unknown liquid was determined to be soluble (S) in water and ethanol, but insoluble (I) in toluene. Given the information above, identify the unknown liquid. Briefly explain.

8. (5 points) Provide 3 specific (intensive) properties

Provide an extensive/accidental property. __________________________

Provide one use of a specific property______________________________

9. (6 points) A 25.35 g sample containing ammonium chloride (NH₄Cl), sand and sodium chloride (NaCl). The sample is strongly heated for ten minutes. Once all of the ammonium chloride has sublimed, the mass of the sample is measured as 12.65 g. When water was added to mixture, decanted and evaporated, the white powder remaining was 6.58 g. Determine the percent composition of all three components in the mixture.
10. 15 points.
In the experiment for finding the molar mass of a gas, the following measurements were made. What is the molar mass of the gas

Weight of conical flask + inner foil + rubber band = 65.55 g
Weight of conical flask + inner foil + rubber band + gas = 67.55 g

Volume of flask = 145 mL.

Barometric Pressure = 30.1 inches Mercury (1 inch = 2.54 cm, 1 cm = 10 mm, 760 mm = 1 atm)

\[ PV = nRT \] (R gas constant = 0.0821 L atm/mol/K). (Hint: P is atm, V in L, T in K.)

\[ n = \text{moles; } n = \frac{\text{mass of gas}}{\text{Molar Mass of gas}} \]

Molar Mass of gas =?

Show calculations.

What is Avagadro’s Law?
How does the Avagadro’s Law help in determining molar mass of gases?

How was the Temperature of the gas maintained at a constant value during this experiment?
11. (10 points)
How many decimal places are there in the readings of the following devices?

a. Beaker ______
b. Buret ______
c. graduated cylinder______
d. triple beam balance______
e. pipet______

Draw the set-up for measuring the melting point of a solid

In the melting point of a solid experiment, the measured melting point was 5 degrees away from the theoretical value. What could be three reasons for this deviation?

1. 

2. 

3. 

_______________ /75
Best Wishes!