Name _____ Date _____

Lab #5: Physical Properties
Quantitative Chemistry

PURPOSE:

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_____

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DISCUSSION: The term "property" refers to an identifying feature or characteristic. For example, color and odor are two properties that are often used to describe gases. Properties are either physical or chemical in nature. This investigation will deal with three physical properties (density, boiling point, and melting point) which will be experimentally determined for an unknown liquid.

PART I - DENSITY

Using a 50-mL beaker, obtain about 10 mL of an unknown liquid from the bottles provided. Record the number of the unknown used.

Liquid # _____

Determine the density of your liquid using a 10-mL graduated cylinder.

mass of empty cylinder _____ g

mass of cylinder plus liquid _____ g

mass of liquid _____ g

volume of liquid _____ mL

Calculate DENSITY: (show calculations)

Dispose of the liquid as indicated by your instructor. Clean and put away all other lab equipment.

PART II - BOILING POINT

Obtain a 100-mL beaker. Fill the beaker with about 50 mL of the liquid you used yesterday. Obtain a thermometer. Place the beaker with the liquid on a hot plate and set the hot plate to "6". Stir the heating liquid **gently** with your thermometer. Be careful not to touch the sides or bottom. Use the space on page 3 to create a chart to record the time elapsed and the temperature. Take readings **every thirty seconds** until the liquid boils.

Once the liquid **starts boiling**, take readings for three minutes beyond this point. (Total of 6 additional readings.)

Unplug the hot plate. Allow the liquid to cool, and set it aside for Part III.

PART III - FREEZING POINT

Obtain a large beaker. Place some ice, water, and salt in the beaker and clamp a 150 mm test tube so that it is suspended in the ice water. Pour the warm liquid from Part II into the test tube. Insert the thermometer gently and begin to stir as before. Begin to take time / temperature readings **every 30 seconds** as before, and record the data on page 3.

Once the liquid **starts freezing**, taking readings for three minutes beyond this point. (Total of 6 additional readings.) NOTE: As the liquid freezes, you will have to slow your stirring and eventually stop. If the thermometer becomes frozen in the liquid, do not remove it until you have melted the solid.

Dispose of the liquid as indicated by your instructor. Clean and put away all other lab equipment.

DATA - TIME & TEMPERATURE

BOILING		FREEZING	
Time	**Temperature (°C)**	**Time**	**Temperature (°C)**
0.0 min		0.0 min	
0.5 min (30s)		0.5 min (30s)	
1.0 min		1.0 min	
1.5 min		1.5 min	
2.0 min		2.0 min	
2.5 min		2.5 min	
3.0 min		3.0 min	
3.5 min		3.5 min	
4.0 min		4.0 min	
4.5 min		4.5 min	
5.0 min		5.0 min	
5.5 min		5.5 min	
6.0 min		6.0 min	
6.5 min		6.5 min	
7.0 min		7.0 min	
7.5 min		7.5 min	
8.0 min		8.0 min	
8.5 min		8.5 min	
9.0 min		9.0 min	
9.5 min		9.5 min	
10.0 min		10.0 min	
10.5 min		10.5 min	
11.0 min		11.0 min	
11.5 min		11.5 min	
12.0 min		12.0 min	
12.5 min		12.5 min	
13.0 min		13.0 min	
13.5 min		13.5 min	
14.0 min		14.0 min	
14.5 min		14.5 min	
15.0 min		15.0 min	
15.5 min		15.5 min	
16.0 min		16.0 min	
16.5 min		16.5 min	
17.0 min		17.0 min	
17.5 min		17.5 min	
18.0 min		18.0 min	
18.5 min		18.5 min	
19.0 min		19.0 min	
19.5 min		19.5 min	
20.0 min		20.0 min	
20.5 min		20.5 min	

CALCULATIONS/DISCUSSION:

1. (Day 3 - in class) Prepare two graphs of the time and temperature data using Microsoft Excel. Both graphs should be done on the same set of axes.

2. From your graphs, answer the following questions:

    a. What does the temperature of your liquid do once the boiling point is reached?

    b. .... at the freezing point?

3. Using the following table, identify your liquid.

LIQUID	DENSITY(g/mL)	FREEZING (°C)	BOILING(°C)
T. Butyl alcohol	.779	25.5	82.6
Cyclohexane	.779	6.5	81.4
Ethanol	.789	< 0.0	78.3
Benzene	.897	5.5	80.0
Water	1.000	0.0	100.0

IDENTITY_____

4. Why was it necessary to determine several characteristic properties in order to determine the identity of the unknown?