Name: _____ Period: _____ Date: _____

Title: **Periodic Properties Lab** (Solubility of Ionic Compounds)	Textbook: Ch. 5
TEKS: 5B-Use the Periodic Table to *identify* and *explain* the properties of chemical families, including alkali metals, alkaline earth metals, halogens, noble gases, and transition metals.	

Purpose: In this experiment, you will investigate the variation in solubility for salts of Group 2A elements (AKA the alkaline earth metals). You will use your results to identify an unknown Group 2A cation.

Background: When elements are arranged in order of increasing atomic number, they exhibit a periodic recurrence of properties. This fact led to the grouping of elements as seen in the periodic table. Elements in vertical columns on the periodic table form groups (families) with similar physical and chemical properties. These similarities are due, in large part, to the fact that all the elements within a group have the same outer electron configuration.

Materials:

Safety Goggles & Apron	24 or 36 well reaction plate
Wash Bottle of Distilled Water	1 M Sodium Hydroxide, NaOH
0.1M Calcium Nitrate, $Ca(NO_3)_2$	0.1M Strontium Nitrate, $Sr(NO_3)_2$
0.1M Barium Nitrate, $Ba(NO_3)_2$	0.1M Magnesium Nitrate, $Mg(NO_3)_2$
1M Sulfuric Acid, H_2SO_4	1M Sodium Carbonate, Na_2CO_3
1M Potassium Chromate, K_2CrO_4	Unknown Salt Solution

Safety: Wear safety goggles and aprons the entire time during this lab and be careful to check the names fo formulas of the chemicals you are working with.

Part I: Solubility's of Salts of Group 2A Elements

1. CAUTION: *Soluble salts of barium and strontium are extremely toxic.* Add 1 mL (20 drops) of Mg $(NO_3)_2$ solution to wells A1-A4. Add 1 mL of $Ca(NO_3)_2$ solution to a wells B1-B4, 1 mL of $Sr(NO_3)_2$ solution to wells C1-C4, and 1 mL of $Ba(NO_3)_2$ solution to wells D1-D4.

2. Add 1 mL (20 drops) of 1M H_2SO_4 to each well A1-D1 to provide sulfate ions for reaction with the Group 2A metal ions. Add 1 mL (20 drops) of 1M Na_2CO_3 to each well A2-D2 to provide carbonate ions for reaction with the Group 2A metal ions.

3. Add 1 mL (20 drops) of 1M K_2CrO_4 to each well A3-D3 to provide carbonate ions for reaction with the Group 2A metal ions. CAUTION: *Chromates are both toxic and irritating.* Add 1 mL (20 drops) of 1M NaOH to each well A4-D4 to provide hydroxide ions for reaction with the Group 2A metal ions.

4. If the salt ($MgSO_4$, $CaSO_4$, $SrSO_4$, or $BaSO_4$) is insoluble in water, a precipitate will be formed. Record the solubility of each metal sulfate salt in Data Table 2 using the following letter codes: S= soluble, I= insoluble

5. Obtain an unknown salt solution from your teacher. The solution will contain ions of a Group 2A metal. Perform the solubility tests to identify the unknown ion. Treat the unknown as if it were toxic and an irritant.

6. Dispose of the materials in the reaction plate as directed by your teacher. Rinse the wells with distilled water.

Data Table: Solubility of Salts of Group 2A Elements

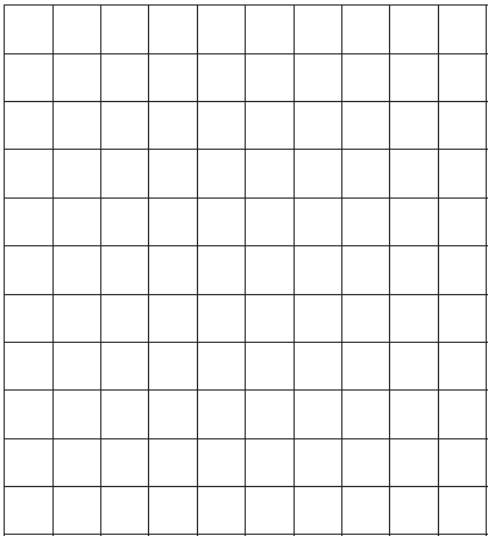
	SO_4^{2-}	CO_3^{2-}	CrO_4^{2-}	OH^-
Mg^{2+}				
Ca^{2+}				
Sr^{2+}				
Ba^{2+}				
Unknown				

Unknown # _____ Identity of Cation of Unknown _____

Part II: Density of Group 4A Elements

1. Research the densities of tin, lead, and silicon. Prepare a graph of density versus period number (PT row) for tin, lead, and silicon. (Title, label each axis, connect all points with a generally straight line.)

Group 4A Elements		
Element	**Period**	**Density (g/cm^3)**
Si	3	
Sn	5	
Pb	6	



2. Use the graph to estimate the density of germanium (Ge; PT period 4) and label your estimate on the graph.

Analysis: (Complete sentences and show all work set-up for any mathematical calculations.)

1. Identify and describe any relationship that you see between the solubility of salts containing alkaline earth metal ions and the position of the metals in the periodic table.

2. How did you identify the unknown cation? How certain are you that you are correct?

3. The *accepted value* of the density for germanium is 5.46 g/cm^3. Calculate the percent error between your estimated value and the accepted value for the density of germanium.

$$percent\ error = \frac{accepted\ value - estimated\ value}{accepted\ value}\ x\ 100\%$$