**Investigating Periodic Trends of Alkaline Earths**

**Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

This lab is based on a portion of a college lab activity. Your goal is to identify periodic trends in reactivity of alkaline earth metals and then apply the discovered trends to help you identify an unknown cation in ice melt.

It is most efficient to use a well plate for this part of the experiment. Determine the relative solubilities of the sulfate, carbonate, oxalate, and chromate salts of the alkaline earth metal ions. Since all nitrate salts are soluble, start with approximately 1 mL volumes (one dropperfull) of

0.1 *M* solutions of barium nitrate, calcium nitrate, magnesium nitrate, and strontium nitrate. Add only one drop of the appropriate anion solution to each alkaline earth metal ion solution. Ensure that the quantity of anion added is consistent. You will be adding the anions of interest in the following forms:

sulfate 1 drop of 1 *M* H2SO4 carbonate: 1 drop of 1 *M* Na2CO3 oxalate: 1 drop of 1 *M* K2C2O4

chromate: 1 drop of 1 *M* K2CrO4 (dissolved in 1 *M* acetic acid)

1. Records your observations. How do you know if a salt is insoluble? Is solubility binary or does it appear to be a spectrum?
2. Rank the *alkaline earth metal ions* in order of their tendency to form insoluble salts (most soluble to least soluble). Comment on the relationship between this ranking and the periodic table.

The ice melt with the unknown cation has been dissolved to a 0.1M concentration.

1. Describe how you will figure out the nature of the cation?
2. Report the identity of your unknown salt.
3. Describe completely how you arrived at this conclusion. If the metal ion had been one of the other three, what would have happened differently?
4. Some ice melts are made of combinations of metal halides. Would your test be sufficient to identify more than one alkaline earth metal ion? Why or why not?