

Dougherty Valley HS Chemistry  
Discovering Trends in a Chemical Family

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**Purpose:** To compare and contrast the properties of magnesium and calcium as they react with water and hydrochloric acid.

**Background:** [Complete prior to class] The periodic table gives clues to the properties of elements in each chemical family, or group (the vertical columns in the table). For example, for column 1A, Li to Cs, we talked about that the reactivity of these metallic elements with air and water increases with increasing atomic number.

**Define:** Group:

Name the different groups of the periodic table:

**Hypothesis:** [Answer the purpose – how do you think the reactions will be different/same] – Complete prior to class

**Materials:**

2 pieces of Mg ribbon (2-3 cm)  
Phenolphthalein indicator  
1.0M HCl

2 small chunks of Ca  
Distilled or Deionized H<sub>2</sub>O

**Apparatus:** 2 - 250ml beakers    Forceps  
Sandpaper                                    2 test tubes  
Test-tube rack                                50ml graduated cylinder

**Procedure:**

- 1. Put on your safety goggles and apron (if available)
- 2. Place 15 ml of distilled water in a test tube and 50 ml of water in a 250ml beaker
- 3. Put 1-2 drops of phenolphthalein indicator into both the test tube and the beaker. (Phenolphthalein turns pink in the presences of a base) **CAUTION:** *Phenolphthalein solution is poisonous and flammable. Do not get it in your mouth; do not swallow any. Be sure there are no flames in the lab when you are using it.*
- 4. Clean a small piece of Mg ribbon with sandpaper to remove surface corrosion. Put the Mg ribbon into the test tube
- 5. Using forceps obtain a small chunk of Ca and put it into your beaker. **CAUTION:** *Do not touch the Ca with your hands.* Gloves are available if you like.
- 6. Observe the reactions for 5 minutes and record the observations in your data table. If you do not see anything happening in the test tube, set it aside until the next day and then observe it again
- 7. Place 15ml of 1.0 M HCl in a test tube and 50 ml of 1.0 M HCl in a 250 ml beaker
- 8. Clean a piece of Mg ribbon and obtain a small chunk of Ca, as described in steps 4 and 5. Place the Mg in the test tube and the Ca chunk in the beaker. Observe and record your findings, include how fast the reaction occurred, in your data table

**Data Analysis:** [Give your Table a name]

Observations		
	Reaction with H <sub>2</sub> O	Reactions with HCl
Mg		
Ca		

**Question Set:** [Copy and Answer]

1. Which metal reacted faster with water? With Acid?
2. Consult your text or other references and find out if beryllium reacts the same way as Mg and Ca with water and acid. Explain.
3. Make a statement about the trends in reactivity as you move down the column of alkaline earth metals.
4. Predict the reactivity of strontium and barium, based on your activity in this lab.

**Conclusion:** Include the following: [300 words in paragraph form]

- How, do you think, are strontium and barium metals stored based on the reactivity? Explain your answer.
- If sufficient radium could be gathered for a test, predict its reactivity with water and hydrochloric acid. Explain.
- Why would it be dangerous to handle even a small amount of radium?
- Group VIIA (The halogens – nonmetallic elements) reactivity decreases as the atomic number increases. Why do you think this group of elements is opposite Group IA? Explain.
- What should you have learned from this experiment regarding trends of the periodic table?