Name of Chemist:_____ Date of the Investigation:_____

Patterns of Chemical Reactivity

Learning Goals
I will be:
❒ developing skills of investigation and communication.
❒ able to use appropriate terminology related to chemical trends, including : atomic radius, effective nuclear charge, electrostatic forces of attraction and ionization energy.
❒ able to explain how patterns in the electron arrangement and forces in atoms result in periodic trends (e.g., in atomic radius, ionization energy in the periodic table)

Problem:
The purpose of this laboratory investigation is to determine the patterns in chemical reactivity of the metallic elements lithium, sodium, potassium, magnesium, and aluminum with water.

Materials:

❒safety goggles	❒samples of lithium, sodium, potassium, and magnesium	❒250-mL beaker
❒knife	❒litmus paper (red)	❒tweezers
❒water bottle	❒wire gauze	

Safety:
Personal Protection: Safety Glasses and Apron

CHEMICAL DISPOSAL: Make sure all the metal has reacted and rinse out all solutions with water. Place any leftover solids in a designated waste container.

Procedure:
❒ 1. Fill the 250-mL beaker 3⁄4 full with tap water.

❒ 2. Your teacher will supply you with a small piece of aluminum.

❒ 3. Using tweezers carefully drop the piece of aluminum into the beaker of water.

❒ 4. After the reaction is complete, use the tweezers and test the contents of the beaker with a piece of red litmus paper and blue litmus paper. Note any colour changes

❒ 5. Carefully discard the water down the drain and return the remaining aluminum to the teacher. Repeat the procedure with a small piece of magnesium.

❒ 6. Repeat the procedure with a small piece of lithium and then sodium. Make sure to blot these metals with paper towel to remove oil residue.

❒ 7. Your teacher will demonstrate the addition of potassium to water.

❒ 8. Clean the beaker at the end of class. SHOW your teacher BEFORE putting your equipment away.

Observations:

Metal	Describe the reactivity in water	Litmus Colour Changes (initial --> final colour) Blue turns red in acid, but stays blue in a base. Red turns blue in a base, but stays red in an acid
Al		
Mg		
Li		
Na		
K		

Discussion/Interpretation:

1. Compare the chemical reactivity of the following pairs of metals based exclusively on the observations made in the lab.

    a) sodium, magnesium, and aluminum (representing across a period from left to right).
    b) lithium, sodium and potassium (representing going down a group from top to bottom).

2. Based on the litmus test do metals form acids or bases when they react with water?

3. Explain the chemical reactivity of sodium, magnesium, and aluminum using the concepts of atomic radius, electrostatic forces of attraction and ionization energy in your explanation.

4. Explain the chemical reactivity of lithium, sodium and potassium using the concepts of atomic radius, electrostatic forces of attraction and ionization energy in your explanation.

Conclusion:

Summarize the trend in chemical reactivity of metals going across a period from left to right and going down a group from top to bottom.

Sources of Error:

State one source of error, the evidence of the error and the effect the error may have on the experiment.