Laboratory Investigation Name _____

Chemistry: Form L3.3A Date _____ Period _____

Graphing Periodic Relationships

PROBLEM

Which properties of elements are repeated periodically?

INTRODUCTION

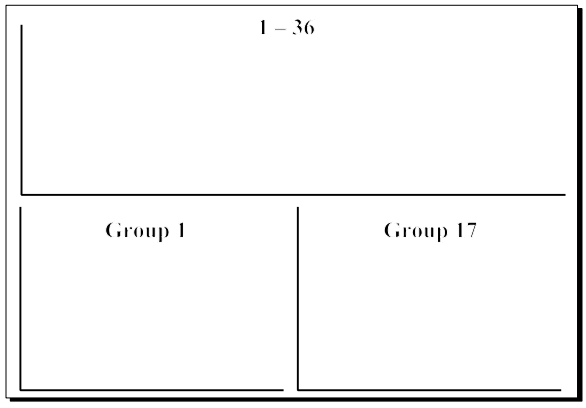
Mendeleev noticed that when the elements were arranged in order of increasing mass, chemical properties repeated periodically. This periodicity was the first observation leading to the organization of the *Periodic Table of the Elements*. Following Mendeleev, Moseley showed that periodicity was related to atomic number rather than mass. As a result, the elements in the modern *Periodic Table* are arranged in increasing order of atomic number. In this laboratory investigation, you will graph the relationship between atomic number and atomic radius, number of valence electrons, and oxidation state. Then you will analyze your graphs to determine if there is periodic repetition.

MATERIALS (*per group*)

Graph paper; *Periodic Table of the Elements*

PROCEDURE

1. Prepare three graphs with atomic number on the *X*-axis and **atomic radius** on the *Y*-axis. The first graph should show all the elements with atomic numbers 1 through 36. The second graph should show all the elements in Group 1. The third graph should show all the elements in Group 17. Place all three graphs on one side of a single sheet of graph paper as shown in the diagram to the right. Plot the points using data from the *Periodic Table of the Elements*. Do *NOT* draw the best straight line or curve. Instead, connect the points in order.



2. Prepare three graphs with atomic number on the *X*-axis and **number of valence electrons** on the *Y*-axis. The first graph should show all the elements with atomic numbers 1 through 36. The second graph should show all the elements in Group 1. The third graph should show all the elements in Group 17. Place all three graphs on one side of a single sheet of graph paper as shown in the diagram to the upper right. Plot the points using data from the *Periodic Table of the Elements*. Do *NOT* draw the best straight line or curve. Instead, connect the points in order.

3. Prepare three graphs with atomic number on the *X*-axis and **ionization energy** on the *Y*-axis. The first graph should show all the elements with atomic numbers 1 through 36. The second graph should show all the elements in Group 1. The third graph should show all the elements in Group 17. Place all three graphs on one side of a single sheet of graph paper as shown in the diagram to the upper right. Plot the points using data from the *Periodic Table of the Elements*. Do *NOT* draw the best straight line or curve. Instead, connect the points in order.

OBSERVATIONS

Attach graphs to laboratory report.

CONCLUSIONS

1. Referring to the graph showing the atomic radius for elements 1 to 36, how do the data show periodicity (periodic repetition of properties)? _____

2. What happens to atomic radius within a family (Group 1 or 17) as atomic number increases? How does this effect the properties of the elements within the family? _____

3. Referring to the graph showing the number of valence electrons for elements 1 to 36, how do the data show periodicity? _____

4. What happens to the number of valence electrons within a family (Group 1 or 17) as atomic number increases? How does this effect the properties of the elements within the family? _____

5. Referring to the graph showing the ionization energy for elements 1 to 36, how do the data show periodicity? _____

6. What happens to ionization energy within a family (Group 1 or 17) as atomic number increases? How does this effect the properties of the elements within the family? _____

7. Based on your data, why are the elements in Group 1 grouped together? What about Group 17? _____

8. What causes the observed periodicity? _____