**GRAPHING PERIODIC TRENDS LAB**

**PURPOSE: (COPY)**

To understand trends of the periodic table and practice methods of graphing.

**BACKGROUND INFORMATION**

The periodic table, while confusing to look at initially, is ordered very intentionally. Aside from being arranged in order of increasing **atomic number**, the number of protons in an atom, there are also other trends to make note of. For instance the **atomic radius**, or half-the distance between the nuclei of two atoms of the same element. Additionally the i**onization energy**, or the amount of energy required to remove a valence electron from the atom, has a fairly uniform pattern. In this lab, you will be investigating the trends using the data table provided in order to garner a better understanding of these two atomic properties.

**PROCEDURE:**

Graph the following information according to the steps described.

**HYPOTHESIS**: **(ANSWER)**

How do you think the atomic radius will be affected as the atomic number increases (will it go up or down)? What about going down the group (Group 1 – Alkali Metals and Group 2 – Alkaline Earth Metals)? What about for ionization energy?

**PRE-LABORATORY QUESTIONS** *(COMPLETE SENTENCES – Do NOT copy down the questions!)*

1. What is atomic radius?
2. In this lab what is atomic radius being measured in (*look at the table below for help*)?
3. What is ionization energy?
4. In this lab what is first ionization energy being measured in (l*ook at the table below for help*)?

# **RESULTS:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Atomic**  **Number** | **Atomic Radius**  **(Picometers)** | **First Ionization Energy**  **(Joules)** |
| **Li** | 3 | 1.23 | 124 |
| **Be** | 4 | 0.89 | 215 |
| **B** | 5 | 0.80 | 191 |
| **C** | 6 | 0.77 | 260 |
| **N** | 7 | 0.70 | 335 |
| **O** | 8 | 0.66 | 314 |
| **F** | 9 | 0.64 | 402 |
| **Ne** | 10 | 0.63 | 497 |
| **Na** | 11 | 1.57 | 119 |
| **Mg** | 12 | 1.36 | 176 |
| **Al** | 13 | 1.25 | 138 |
| **Si** | 14 | 1.17 | 188 |
| **P** | 15 | 1.10 | 242 |
| **S** | 16 | 1.04 | 239 |
| **Cl** | 17 | 0.99 | 299 |
| **Ar** | 18 | 0.98 | 363 |
| **K** | 19 | 2.03 | 100 |
| **Ca** | 20 | 1.74 | 141 |
| **Rb** | 37 | 2.16 | 96 |
| **Sr** | 38 | 1.91 | 131 |
| **Cs** | 55 | 2.35 | 90 |
| **Ba** | 56 | 1.98 | 120 |

**Graph 1: Atomic Radius (Elements 3-20)**

For **elements 3-20** make a graph of atomic radius as a function of atomic number**. Plot atomic number on the X axis and atomic radius on the Y axis**.

After creating the graph, use a colored pen or pencil to draw a **vertical line** that represents that beginning of each period (horizontal row on the periodic table).

**Graph 2: Atomic Radius (Group 1 vs. Group 2)**

**Plot atomic number on X axis and atomic radius on Y axis** (like Graph 1). This time you are making two lines.

**Line 1 = Group 1 (Alkali Metals)**

**Line 2 = Group 2 (Alkaline Earth Metals)**

Use your Periodic Table to help you decide which elements belong to which group.

Provide a table next to your graph indicating which elements are in Group 1 and Group 2, **AND A LEGEND** telling me which line is which.

**Graph 3: Ionization Energy (Elements 3-20)**

For **elements 3-20**, make a graph of the energy required to remove the easiest electron (first ionization energy) as a function of atomic number. **Plot Atomic Number on the X axis and First Ionization on the Y axis.**

After creating the graph, use a colored pen or pencil to draw a **vertical line** that represents that beginning of each period (horizontal row on the periodic table).

**Graph 4: Ionization Energy (Group 1 vs. Group 2)**

**Plot Atomic Number on X axis and First Ionization on Y axis** (like Graph 1). This time you are making two lines.

**Line 1 = Group 1 (Alkali Metals)**

**Line 2 = Group 2 (Alkaline Earth Metals)**

Use your Periodic Table to help you decide which elements belong to which group.

Provide a table next to your graph indicating which elements are in Group 1 and Group 2, **AND A LEGEND** telling me which line is which.

**POST-LABORATORY QUESTIONS**: (*COMPLETE SENTENCES – Do NOT copy down the questions!*)

1. Looking at Graph 1, what do you notice happens to the atomic radius from atomic number 3 until 10? What happens from 10 to 11? Looking at your Periodic Table, why do you think this occurs?
2. Looking at Graph 2, what do you notice happens to the atomic radius as you go down the alkali metals in Group 1? Does the same happen in Group 2?
3. Looking at Graph 3, what do you notice happens to the ionization energy from atomic number 3 until 10? What happens from 10 to 11? Looking at your Periodic Table, why do you think this occurs?
4. Looking at Graph 4, what do you notice happens to the ionization energy as you go down the alkali metals in Group 1? Does the same happen in Group 2?