

## Lab: Trends in the Atomic Radius and Ionization Energy

**Purpose:** To investigate and explain periodic trends in atomic radius and ionization energy.

### Procedure:

(1) Using the data below you will make two graphs:

- I. Atomic Radius vs. Atomic Number
- II. Ionization Energy vs. Atomic Number

(2) Plot each of the points on the graph paper provided and then connect the points with a line.

Element	Atomic Number	Atomic Radius ( $\times 10^{-12}$ m)	Ionization Energy (kJ/mol)
Hydrogen	1	37	1312
Helium	2	32	2372
Lithium	3	152	519
Beryllium	4	111	900
Boron	5	88	799
Carbon	6	77	1088
Nitrogen	7	70	1406
Oxygen	8	66	1314
Fluorine	9	64	1682
Neon	10	70	2080
Sodium	11	186	498
Magnesium	12	160	736
Aluminum	13	143	577
Silicon	14	117	787
Phosphorus	15	110	1063
Sulphur	16	104	1000
Chlorine	17	99	1255
Argon	18	94	1519
Potassium	19	231	418
Calcium	20	197	590

### Questions:

I. Atomic Radius:

- (1) What happens to the atomic radius between elements two and three? What causes this change? Is this same relationship observed between other elements? Explain.
- (2) What happens to the atomic radius between elements eleven and eighteen? What causes this change? Is this same relationship observed between other elements? Explain.

II. Ionization Energy:

- (1) Which group on the periodic table has the highest ionization energy? Explain.
- (2) Which group on the periodic table has lowest ionization energy? Explain.
- (3) What happens to the ionization energy between elements ten and eleven? What causes this change? Is this same relationship observed between other elements? Explain.
- (4) What happens to the ionization energy between elements three and ten? What causes this change? Is this same relationship observed between other elements? Explain.
- (5) What happens to the ionization energy between elements four and five? What causes this change? Is this same relationship observed between other pairs of elements? Explain.
- (6) What happens to the ionization energy between elements seven and eight? What causes this change? Is this same relationship observed between other pairs of elements? Explain.

### Conclusion:

- (1) Summarize the overall trend observed for atomic radius.
- (2) Summarize the overall trend observed for ionization energy.

Name: \_\_\_\_\_  
Period: \_\_\_\_\_

