Chemistry: Periodic Table Trends Graphing Mini-Lab

WHAT TO TURN IN:	Graph	Questions #1-12

Purpose: To find trends within the periods and groups of the periodic table.

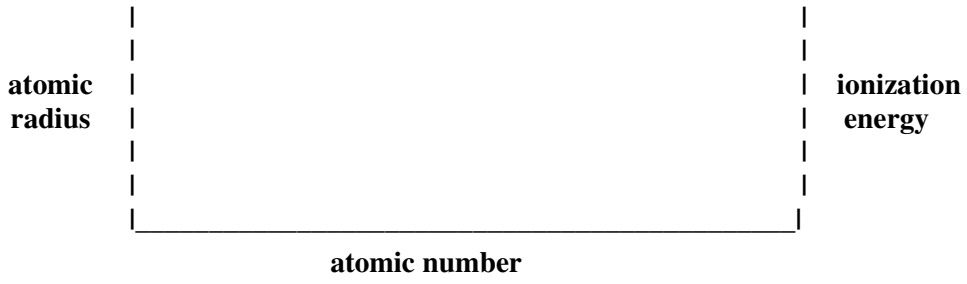
Introduction

When the elements are arranged in order of increasing atomic number, there is a periodic recurrence of properties that leads to the grouping of the elements. This is *periodicity*. Elements in vertical columns form groups that are characterized by similarities in physical and chemical properties. These similarities are due, in a large part, to the fact that all of the elements within a group have the same outer-shell (valence) electron number. In this activity you will explore the group and periodic variations of atomic radius and first ionization energies.

Procedure – Double line graph

1) Using the data listed in the table on the next page, plot the ionization energy and the atomic radius of each element on the y-axis against the atomic number on the x-axis. Use two different colors. Plot both sets of data on the same graph.
2) Draw a triangle around the points represented by Group IA elements.
3) Draw a square around the points representing the period 2 elements.

GRAPHING GUIDELINES: Use a ruler; use pencil; title the graph; label each axis; make the graph fit the whole piece of paper; keep the increments on each axis consistent.



Questions

1) How do the atomic radii change as you go down Group IA?
2) How do the ionization energies change as you go down Group IA?
3) How do the atomic radii change as you go across period 2?
4) How do the ionization energies change as you go across period 2?
5) Define ionization energy in common terms.
6) Define periodicity in your own words.
7) Why are periodic trends only "trends" and not exact patterns?
8) What is the Law of Octaves?
9) Apply the Law of Octaves to this lab.
10) Why are the ionization energies of helium and neon so high?
11) In the data table, what does the unit "nm" mean?
12) In the data table, what does the unit "kJ/mol" mean?

DATA

Element	Atomic #	Atomic Radius (nm)	First ionization energy (kJ/mol)
Hydrogen	1	0.037	1312
Helium	2	0.540	2372
Lithium	3	0.152	519
Beryllium	4	0.111	900
Boron	5	0.088	799
Carbon	6	0.077	1088
Nitrogen	7	0.070	1406
Oxygen	8	0.066	1314
Fluorine	9	0.064	1682
Neon	10	0.070	2080
Sodium	11	0.186	498
Magnesium	12	0.160	736
Aluminum	13	0.143	577
Silicon	14	0.117	787
Phosphorus	15	0.110	1063
Sulfur	16	0.104	1000
Chlorine	17	0.099	1255
Argon	18	0.094	1519
Potassium	19	0.231	418
Calcium	20	0.197	590