

Name: _____

Period: _____

Seat#: _____

Pre-Activity Questions

- 1) Define Group/Family:
- 2) Define Period:
- 3) Define Atomic Radius:
- 4) Define First Ionization Energy:

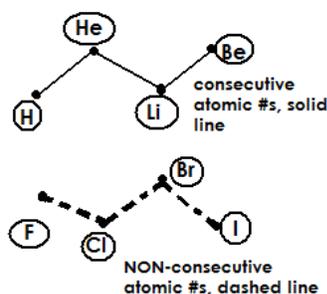
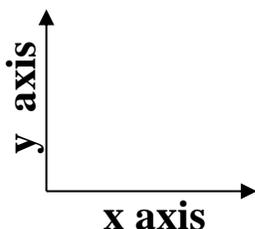
In 1912, Mosely summarized the properties of the elements with relation to their atomic number in a law, which states:

"The properties of the elements are a periodic function of their atomic numbers"

In this activity, you will study the relationship between the atomic numbers of the elements and some of their physical properties. You will compare data on such properties as the ionization energy and the atomic radius of some of the elements with their atomic numbers. You will be graphing elements in the **alkali metal, nitrogen, oxygen, halogen, noble gas** families.

Read and follow these directions carefully to make your graphs:

- Plan to make two line graphs.
- The **atomic number** should be plotted on the **horizontal** axis. Remember, no skipping #'s even though you are not plotting every single element! Never change the scale you have chosen.
- Ionization energy** and atomic **radius** should be plotted on the **vertical** axis. You are making two separate graphs and the vertical scale for each will be quite different. One graph has ionization energy as the vertical axis, one graph has atomic radius as the vertical axis.
- Circle** each point and **label** it with the **symbol** of each element.
- Some of the elements will have consecutive atomic numbers. H, He, and Li are examples (1, 2, 3). **Connect the points representing consecutive** elements by a **solid line** in pencil.
- Use a **broken or dashed line** to connect the points representing elements that are **not consecutive**. For example, Li with an atomic number of 3 should be connected with a broken line to N with the atomic # of 7.
- Figure out which elements belong to the same group. Connect the elements of the **same group** with **solid lines**, each group should be done with a different color.
- Create a key** in which you identify the groups/families that relate to the colors you use.



Dougherty Valley HS Chemistry
Graphing Periodic Trends

Atomic Property Data to Graph

	X axis for Graph #1 and Graph #2	Y axis for Graph #1	Y axis for Graph #2
Element	Atomic Number	Ionization Energy (Electron Volts)	Atomic Radius (Angstroms)
H	1	13.6	0.37
He	2	24.6	0.8
Li	3	5.4	1.23
N	7	14.5	0.74
O	8	13.6	0.74
F	9	17.4	0.722
Ne	10	23.6	1.1
Na	11	5.1	1.57
P	15	11.0	1.10
S	16	10.4	1.04
Cl	17	13.0	0.99
Ar	18	15.8	1.5
K	19	4.3	2.03
As	33	10.5	1.21
Se	34	9.8	1.17
Br	35	11.8	1.14
Kr	36	14.0	1.7
Rb	37	4.2	2.16
Sb	51	8.6	1.41
Te	52	9.0	1.37
I	53	10.4	1.33
Xe	54	12.1	1.9
Cs	55	3.9	2.35

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Graphing Periodic Trends

Post Activity Questions

- 1) Across a Period (\rightarrow) atomic radius tends to _____
- 2) Across a Period (\rightarrow) first ionization tends to _____
- 3) Down a group (\downarrow) atomic radius tends to _____
- 4) Down a group (\downarrow) first ionization tends to _____
- 5) Why does the atomic radius increase as you go down a group?

- 6) Why is there a general increase in ionization energy as you go across a period (\rightarrow)

- 7) Why do the noble gases have such high ionization energies?

Extension Questions

- 1) Without looking up the exact numbers, just predict which element would have the larger radius, and explain why you are making this prediction.
 - a. Ca or Sr

 - b. Ga or Br

- 2) Without looking up the exact numbers, just predict which element would have the larger ionization energy, and explain why you are making this prediction.
 - a. I or At

 - b. At or Rn

- 3) Look at the following data and try to explain why there is a big increase when you get to the 3rd Ionization Energy (when you take a third electron away)

<i>Ionization Energies for Magnesium</i>	
1 st Ionization	7.6 eV
2 nd Ionization	14 eV
3 rd Ionization	80 eV

- 4) Without looking up the exact numbers, just predict which Ionization (1st, 2nd, 3rd, etc) of Aluminum would you expect to exhibit a giant leap in magnitude compared to the previous ones? (Similar to what you saw in the question above). Explain why you are predicting that Ionization to be the one with the big increase?