

# Exercise 5.3a

## Graphing Periodic Trends

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

Date: \_\_\_\_\_ Per: \_\_\_\_\_

**DIRECTIONS:** Draw a line in the middle of a piece of graph paper, separating the page into top and bottom. On the top, plot a graph of ionization energy (y-axis) vs. atomic number (x-axis). On the bottom, plot a separate graph of atomic radius vs. atomic number. For each graph connect successive dots with straight lines. Also, ensure that identical atomic numbers are plotted on the same vertical position on the sheet (i.e. atomic number 1 in the top graph should be on the same line as atomic number 1 in the bottom graph).

1. Examine your graph of ionization energy vs. atomic number.
  - a) Which elements are found at the main peaks on your graph (there should be three)? What do these elements have in common?
  - b) Which elements are found at the main troughs on your graph (there should be three)? What do these elements have in common?
2. Examine your graph of atomic radius vs. atomic number.
  - a) Which elements are found at the peaks on your graph? What do these elements have in common?
  - b) Which elements are found at the troughs on your graph? What do these elements have in common?

Atomic number	Element symbol	1 <sup>st</sup> ionization energy (kJ/mol)	Atomic radius (pm)
1	H	1312	32
2	He	2372	31
3	Li	520	123
4	Be	899	90
5	B	801	82
6	C	1086	77
7	N	1402	75
8	O	1314	73
9	F	1681	72
10	Ne	2081	71
11	Na	496	154
12	Mg	738	136
13	Al	578	118
14	Si	786	111
15	P	1012	106
16	S	1000	102
17	Cl	1251	99
18	Ar	1521	98
19	K	419	203
20	Ca	590	174

3. How are atomic radii and ionization energy related? (i.e. As atomic radius increases, what happens to the ionization energy?)
4. Generally as you go from left to right across a period on the periodic table, what happens to atomic radius? What about ionization energy?

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5. Generally, as you go down a group in the periodic table, what happens to atomic radius and ionization energy?
6. When Na forms an ion it loses its outer electron to become  $\text{Na}^+$ . Draw Bohr models for Na and  $\text{Na}^+$ . What element does  $\text{Na}^+$  resemble (with respect to its electron arrangement)? In general, which group's electron configuration do the alkali metals resemble when they form ions (i.e. lose an outer electron)?
7. Why does radius increase as you go down a group (hint: think of Bohr models)? Why would an increase in radius make it easier to lose an outer electron (i.e. give a lower ionization energy)?
8. What happens to the number of protons in the nucleus as you go across a period? Use this to explain the trends in atomic radius and ionization energy across a period.
9. Define electron affinity. In which corner of the periodic table is it highest? Explain why this is so.
10. Define electronegativity. Where on the periodic table is it highest? Explain why this is the case.

***Make sure your name and period number is on your graph and staple it to this page.***