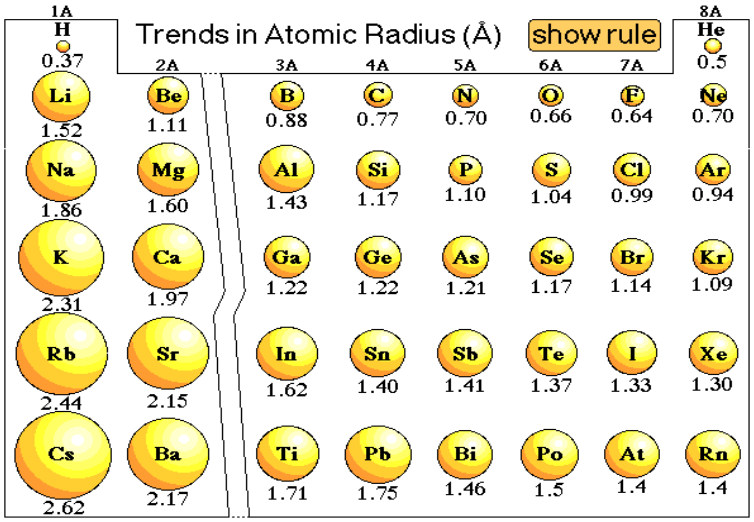
Periodic Trends Lab

Background: The Periodic Table is an organizational tool used by scientists. By putting the elements in order of their atomic number many different trends are shown. Two such trends are atomic radius and electronegativity. The **atomic radius** is a physical property which measures of the size of an element's atoms. **Electronegativity** is a chemical property that describes the ability of an atom to attract electrons towards itself. It often predicts the reactivity of elements.

Purpose: To identify the trends for atomic radius and electronegativity in the periodic table by graphically depicting them.

Pre-lab:

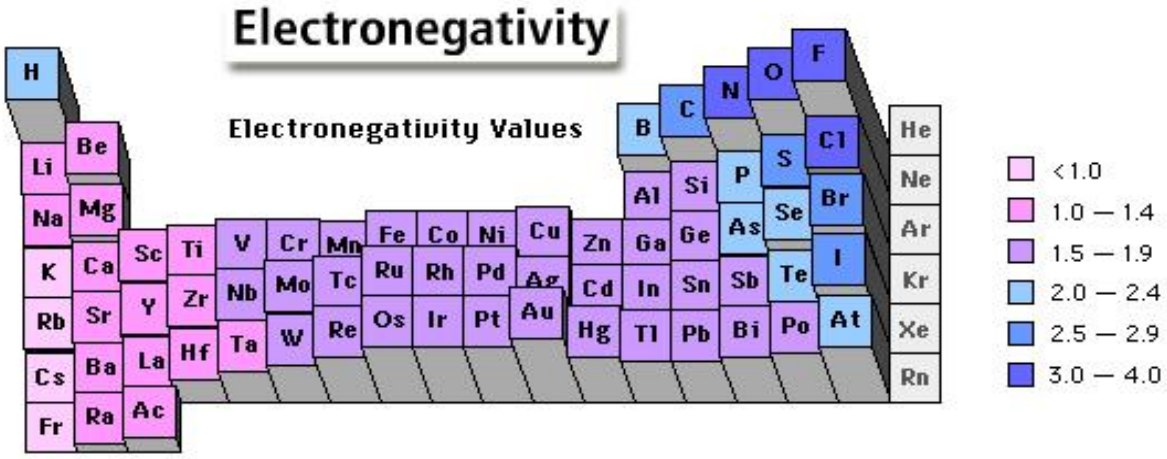


1. Restate the purpose in your own words.
2. Explore the image to the left.

a. What appears to be the trend in atomic radius as you move from left to right in a row?

b. What appears to be the trend in atomic radius as you move down a column?

3. Explore the image below.
   a. What appears to be the trend in electronegativity as you move from left to right in a row?
   b. What appears to be the trend in electronegativity as you move down a column?



Data:

Element	Atomic Number	Atomic Radius (pm)	Electronegativity Values *
hydrogen	1	53	2.20
helium	2	31	no data*
lithium	3	167	0.98
beryllium	4	112	1.57
boron	5	87	2.04
carbon	6	67	2.55
nitrogen	7	56	3.04
oxygen	8	48	3.44
fluorine	9	42	3.98
neon	10	38	no data*
sodium	11	190	1.31
magnesium	12	145	1.61
aluminum	13	118	1.90
silicon	14	111	2.19
phosphorus	15	98	2.58
sulfur	16	88	3.16
chlorine	17	79	3.16
argon	18	71	no data*
potassium	19	243	0.82
calcium	20	194	1.00
scandium	21	184	1.36
titanium	22	176	1.54
vanadium	23	171	1.63
chromium	24	166	1.66
manganese	25	161	1.55
iron	26	156	1.83
cobalt	27	152	1.88
nickel	28	149	1.91
copper	29	145	1.90
zinc	30	142	1.65
gallium	31	136	1.81
germanium	32	125	2.01
arsenic	33	114	2.18
selenium	34	103	2.55
bromine	35	94	2.96
krypton	36	88	no data*

Procedure: *Your group will be assigned Procedure A or B. Only complete that set of directions.*

A. Use the data to create a scatter plot graph of atomic radius vs. atomic number.

1. Use a **pencil** in case you mess up!
2. **Title** your graph
3. **X-axis** = Atomic Number and **Y-axis** = Atomic Radius (pm)
4. Select a **# range** for each axis that fills most of the page. More increments = Better!
5. Plot your data points in a **scatter plot** on your graph.
6. Join the dots with a line.
7. Place an asterisks (*) on the point that is for the first element of each period.
8. Put a square around the point that is the last element for each period.
9. Highlight/color the part of the graph that depicts each period a different color.
10. Color the periods of your mini periodic table the correct corresponding colors. Use glue stick to attach mini periodic table onto your graph.

B. Use Data Table 2 to create a scatter graph of electronegativity vs. atomic number.

1. Use a **pencil** in case you mess up!
2. **Title** your graph
3. **X-axis** = Atomic Number and **Y-axis** = Electronegativity Value
4. Select a **# range** for each axis that fills most of the page. More increments = Better!
5. Plot your data points in a **scatter plot** on your graph.
6. Join the dots with a line.
7. Place an asterisks (*) on the point that is for the first element of each period.
8. Put a square around the point that is the last element for each period.
9. Highlight/color the part of the graph that depicts each period a different color.
10. Color the periods of your mini periodic table the correct corresponding colors. Use glue stick to attach mini periodic table onto your graph.

Analysis: *Swap partners so that one member has an **atomic radius** graph and the other has an **electronegativity** graph. Answer in complete sentences that restate the question in your answer.*

1. Using the **Atomic Radius** vs. Atomic Number Graph answer the following questions.
   a) What pattern do you see in the second period that is repeated in the third period?
   b) How does this graph agree with your observations of atomic radius made earlier?
   c) Are there any exceptions to the pattern? (Yes or No)
   d) Is the pattern of atomic radius absolute or general (always true or generally true)? Explain.

2. Using the **Electronegativity** vs. Atomic Number Graph answer the following questions.
   a) What pattern do you see in the second period that is repeated in the third period?
   b) How does this graph agree with your observations of electronegativity made earlier?
   c) Are there any exceptions to the pattern? (Yes or No)
   d) Is the pattern of electronegative absolute or general (always true or generally true)? Explain.

3. Consider how both of the properties that you have examined show **periodicity** (trends).

	Increase	Decrease	No change
general trend for atomic radius as you move from left to right on the PT.			
general trend for atomic radius as you move from top to bottom on the PT.			
general trend for electronegativity as you move from left to right on the PT			
general trend for electronegativity as you move from top to bottom on the PT.			

4. Look at the data table.
   a) List the elements with no data.
   b) What do the elements without data have in common?
   c) Why do you think they don't have electronegativity data?

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