

Name: _____ Date: _____

Chemistry ~ Ms. Hart

Class: Anions or Cations



4.7 Relationships Among Elements – Lab #10

Background Information

The periodic table is a wonderful source of information about all of the elements scientists have discovered. In this activity, you will investigate the relationship among the elements' atomic radii, and the positions in the periodic table.

The atomic radius is the distance from the nucleus of an atom to the outermost electron. This is basically how big or wide the atom is.

The radii for elements with atomic numbers from 1 – 38 are given in Table S of your reference tables. The radii are so small that a very small metric unit called a picometer is used. A picometer (pm) is one trillionth of a meter.

Objectives

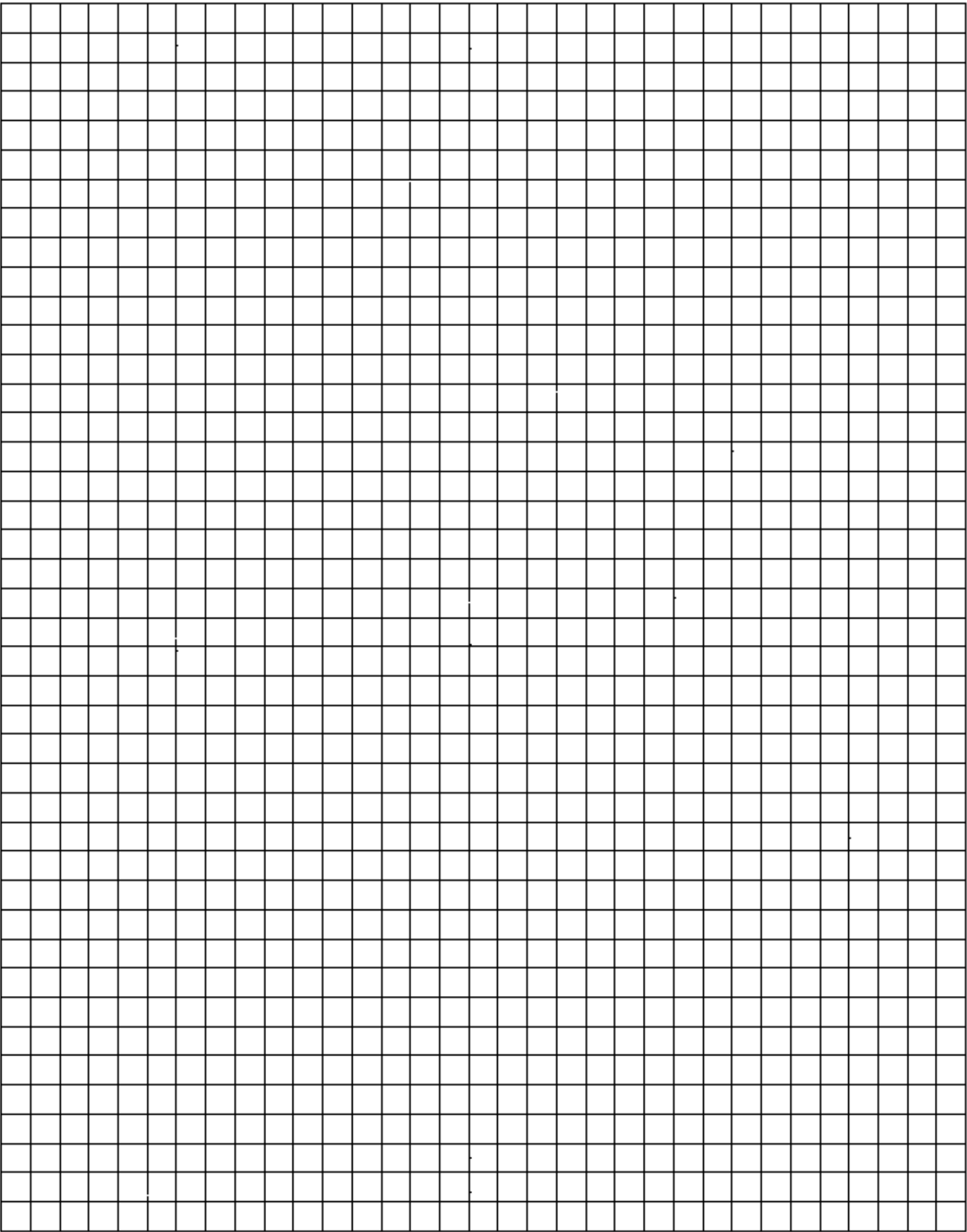
In this experiment you will:

- Plot the atomic radii of elements with the atomic numbers 1 – 38 and
- Examine the graph for repeated patterns
- Interpret your graph results to determine relationships among various elements

Procedure:

- 1) Title your graph “Atomic number vs. Atomic Radii”
- 2) The x-axis should be the “Atomic Number” and the y axis should be the “Atomic radii (pm)”
- 3) Graph your data, choosing an appropriate scale for each axis.

Lab #10 Atomic Radius Rubric				
Data	<input type="checkbox"/> Title of graph and axis are correctly named. <input type="checkbox"/> Scale is accurate <input type="checkbox"/> Data is plotted correctly. <input type="checkbox"/> All dots are connected.	<input type="checkbox"/> Missing 1 out of 4	<input type="checkbox"/> Missing 2 out of 4	<input type="checkbox"/> Missing 3 out of 4
Analysis Questions	<input type="checkbox"/> All answers are completed and correct. <input type="checkbox"/> All answers are thoroughly explained and supported by the experimental data.	<input type="checkbox"/> 5 answers are completed/correct. <input type="checkbox"/> Most answers are thoroughly explained and supported by the experimental data.	<input type="checkbox"/> 4 answers are completed/correct. <input type="checkbox"/> Most answers are thoroughly explained and supported by the experimental data.	<input type="checkbox"/> Less than 4 answers are completed/correct.
Conclusion	<input type="checkbox"/> Answers the purpose of the lab <input type="checkbox"/> Summarizes observations clearly. <input type="checkbox"/> Makes a prediction of why the observed trends exist.	<input type="checkbox"/> Missing 1 out of 3	<input type="checkbox"/> Missing 2 out of 3	<input type="checkbox"/> Missing all three



Analysis Questions

- 1) Look at the **shape** of your graph. What **pattern** do you observe?

- 2) What **group**/family is represented by the **highest peaks** in your graph? (*Hint – look at the atomic number of the 4 highest points and see what group they are on your periodic table.*)

- 3) For this question, look only at the 4 *highest peaks* on your graph from question 2. What do you notice about the **trend in atomic radii** of the elements as you move from peak to peak (from *left to right*)?

- 4) What **group**/family is represented by the *lowest peaks* in your graph? (*Hint – look at the atomic number of the 3 lowest points and see what group they are on your periodic table.*)

- 5) For this question, look only at the 3 *lowest peaks* on your graph from question 4. What do you notice about the **trend in atomic radii** of the elements as you move from lowest peak to lowest peak (from *left to right*)?

- 4) What period are the first 2 data points in (reading from lowest atomic number to highest atomic number)? _____

What period are the next 8 data points in? _____

What period are the second set of 8 data points in? _____

What period are the next 18 data points in? _____

What period are the last 2 data points in? _____

- 6) What do you notice about the **trend in atomic radii** of the elements as you move from the high peak to the low peak (for each of the first 3 peaks)?

Conclusion Summary:

Directions: Use answers from the questions above to summarize the trends you observed in atomic radii on the periodic table.

7) What was the purpose of this lab?

8) What are the trends you observed in atomic radius within a **Group**?

In general, as you move from top to bottom within a group _____

Make a hypothesis to explain this trend based on what you know about how the structure of an atom changes within a group from top to bottom.

9) What are the trends you observed in atomic radius within a period?

In general, as you move across the periodic table within a period (left to right), _____

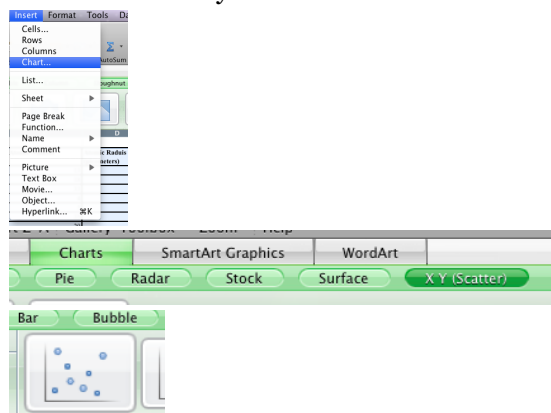
The highest atomic radii within a period will be in the _____ elements.

The lowest atomic radii within a period will _____ elements.

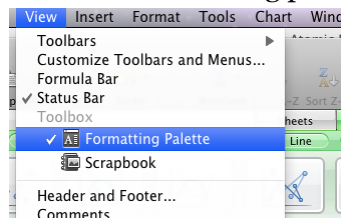
Make a hypothesis to explain this trend based on what you know about how the structure of an atom changes within a group from top to bottom.

If I ever want to do it with computers:

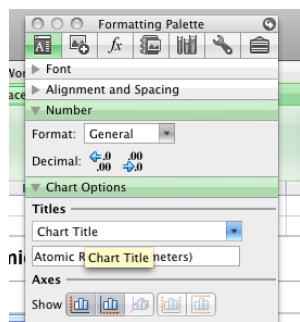
- 1) Enter the data into Microsoft Excel.
- 2) Create a graph.
 - a. With your mouse, select the atomic number and atomic radii columns. (With your mouse click on the box with your atomic number header and drag over the data including the titles; let go of the mouse click when you have selected all the data).
 - b. Insert a scatter plot. While data is selected in “a” select insert from the menu at the top ->Chart. Select xy scatter from the menu. Select the first chart option shown.



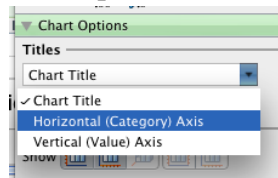
- c. The x axis should have the atomic number data and the y axis should be the atomic radii.
- 3) Format your graph.
 - a. Delete the legend
 - b. Title your graph “Atomic number vs. Atomic Radii”. If your graph has no title to edit, go to view ->Formatting palette. Make sure you have clicked on your chart.



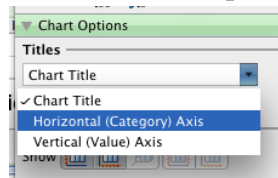
Edit the chart title by typing in your title in the formatting palette.



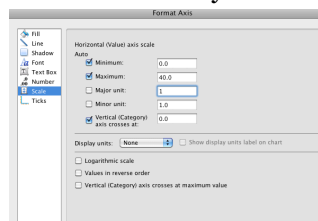
- c. Label your x-axis “Atomic Number”. On the formatting palette, pull horizontal axis from the drop down menu and edit the title.



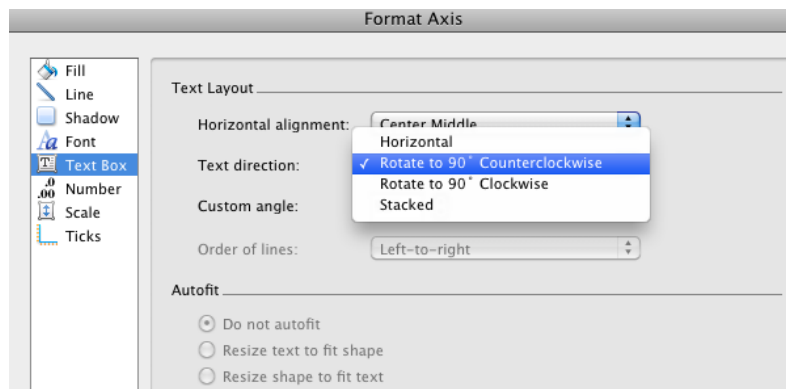
- d. Label your y-axis “Atomic Radius (picometers)”. On the formatting palette, pull vertical axis from the drop down menu and edit the title.



- e. Format your x-axis to use a major unit of 1 to facilitate answering the questions below. Double click on your x-axis. On the left click on Scale. Change the major unit to 1.



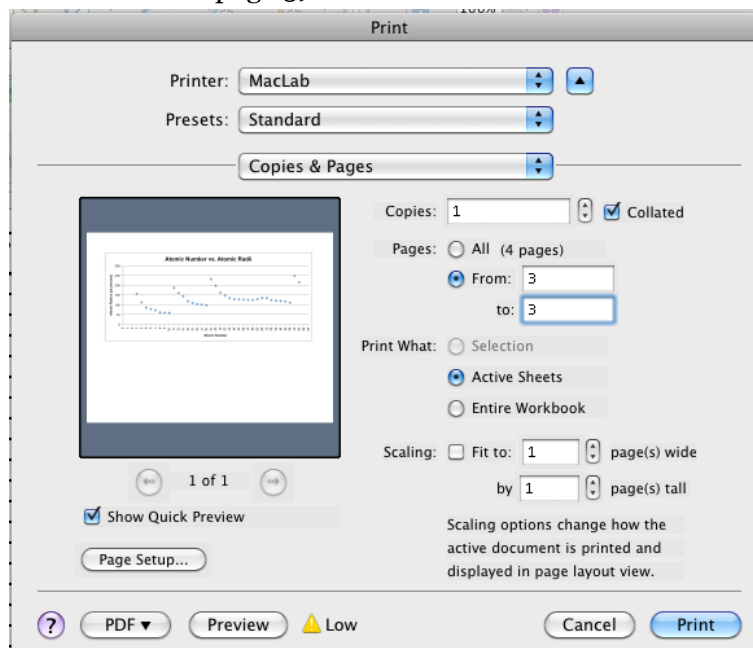
Then select text box from the left.



Select rotate 90 degrees counterclockwise so the scale fits; you may need to make your table longer by stretching it with your mouse.

- 4) Save and print your graph.
- Make sure that your graph is selected with you mouse.
 - Go to File -> page setup. Change orientation to landscape. Click ok.
 - Move your graph and adjust its size to fit on one page; (its own page as indicated by the dotted lines on your screen.

- d. Go to file -> print. Select pages: from and change so you are only printing your graph (see below mine was page 3).



- e. Keep your graph open to help you answer questions below. If you put your cursor (mouse) over the point on the graph it will tell you the coordinate of the point. This might be helpful to answer the questions below about the peaks.