

THE RELATIONSHIP BETWEEN ATOMIC NUMBER AND THE RADIUS OF ATOMS

I In this activity you will graph the radii of atoms as a function of their atomic numbers. From this graph you can make generalizations about the relationship of atomic number and atomic size.

Purpose: to study the relationship between atomic number and atomic size in order to see whether there is a definite pattern (trend) within periods or families or both.

Table of Atomic Radii in Angstrom Units

1 H 0.30	15 P 1.10	29 Cu 1.28	42 Mo 1.36
2 He 0.93	16 S 1.04	30 Zn 1.33	43 Tc -
3 Li 1.52	17 Cl 0.99	31 Ga 1.22	44 Ru 1.33
4 Be 1.11	18 Ar .80	32 Ge 1.22	45 Rh 1.34
5 B 0.88	19 K 2.31	33 As 1.21	46 Pd 1.38
6 C 0.77	20 Ca 1.97	34 Se 1.17	47 Ag 1.44
7 N 0.70	21 Sc 1.60	35 Br 1.14	48 Cd 1.49
8 O 0.66	22 Ti 1.46	36 Kr 1.00	49 In 1.62
9 F 0.64	23 V 1.31	37 Rb 2.44	50 Sn 1.40
10 Ne .55	24 Cr 1.25	38 Sr 2.15	51 Sb 1.41
11 Na 1.86	25 Mn 1.29	39 Y 1.80	52 Te 1.37
12 Mg 1.60	26 Fe 1.26	40 Zr 1.57	53 I 1.33
13 Al 1.43	27 Co 1.25	41 Nb 1.43	54 Xe 1.28
14 Si 1.17	28 Ni 1.24		

Procedure:

1. Using microsoft excel or graph paper, construct a graph with atomic numbers on the horizontal (x) axis and atomic radii on the vertical (y) axis
2. Enter atomic symbol in first column
3. Enter atomic radii in second column
4. Choose insert graph from menu bar
5. Select XY scatter and lines connected, follow the prompts to finish.
6. Be sure to label the data points and title and axes.

OR ON GRAPH Paper (Use entire paper i.e. spread out the values on your axis)

- a. plot atomic number on the x axis and atomic radii values on the y axis
- b. label each point with the symbol of the element
- c. Circle group 1A and group VIIIA elements on your graph

The Relationship Between Atomic Number and Ionization Energy

You have discovered that the atomic number of an element is an important factor in the relation to electron configuration and atomic radius. Are atomic number and ionization energy also related? In this activity you will plot ionization energy versus atomic number in an attempt to answer this question.

PURPOSE: To study the relationship of atomic number and the ionization energy and in order to see whether there is a definite pattern (trend) within periods or families.

1. H 13.5	15. P 11.0	29. Cu 7.7	42. Mo 7.2
2. He 24.5	16. S 10.4	30. Zn 9.4	43. Tc -skip value for computer
3. Li 5.4	17. Cl 13.0	31. Ga 6.0	44. Ru 7.5
4. Be 9.3	18. Ar 15.8	32. Ge 8.1	45. Rh 7.7
5. B 8.3	19. K 4.4	33. As 10.5	46. Pd 8.3
6. C 11.2	20. Ca 6.1	34. Se 9.7	47. Ag 7.6
7. N 14.5	21. Sc 6.6	35. Br 11.8	48. Cd 9.0
8. O 13.6	22. Ti 6.8	36. Kr 14.0	49. In 5.8
9. F 17.3	23. V 6.7	37. Rb 4.2	50. Sn 7.3
10. Ne 21.5	24. Cr 6.8	38. Sr 5.7	51. Sb 8.6
11. Na 5.1	25. Mn 7.4	39. Y 6.6	52. Te 9.0
12. Mg 7.6	26. Fe 7.9	40. Zr 7.0	53. I 10.4
13. Al 6.0	27. Co 7.9	41. Nb 6.8	54. Xe 12.1
14. Si 8.1	28. Ni 7.6		

Procedure:

1. Using microsoft excel or graph paper, construct a graph with atomic numbers on the horizontal (x) axis and ionization energy on the vertical (y) axis
2. Enter atomic symbol in first column
3. Enter ionization energy in second column
4. Choose insert graph from menu bar
5. Select XY scatter and lines connected, follow the prompts to finish.
6. Be sure to label the data points and title and axes.

OR ON GRAPH Paper Use entire paper (i.e. spread out the values on your axis)

- a. plot atomic number on the x axis and ionization energy values on the y axis
- b. label each point with the symbol of the element
- c. Divide the graph into sections by drawing vertical red lines through the atomic numbers of elements having the highest ionization energies. These are represented by the peaks on your graph.

Tabulation of Results:

1. List in separate vertical columns the elements having
 - a. the highest ionization energy in each section of the graph
 - b. the lowest ionization energy in each section of the graph
 - c. the next-to-highest ionization energy in each section of the graph (do not list elements on the red lines)

Conclusions:

1. Describe the pattern formed by your graph. How can you explain the pattern? (NOTE: Relate the pattern to the electron configuration of the elements. Consider the filling of s, p, and d orbitals in your answer.)
2. Write
 - (a) about the effect of atomic number on ionization energy within a vertical column?
 - (b) Within a section of the graph (energy level)?Give a reason for your answer.