

Graphing Periodic Trends Activity

Purpose: The purpose of this activity is to investigate and understand by graphing the periodic trends in atomic radius, melting point, ionization energy, and electronegativity

Procedure: Using Microsoft Excel, create an x-y scatter plot with atomic number on the **x** axis and your assigned trend on the **y** axis. Each member of your group will complete one graph, and then you will answer the questions as a group next class.

Graphs:

- | | |
|--|----------------|
| 1. Atomic Number vs. Atomic Radius | Partner: _____ |
| 2. Atomic Number vs. Melting Point | Partner: _____ |
| 3. Atomic Number vs. Ionization Energy | Partner: _____ |
| 4. Atomic Number vs. Electronegativity | Partner: _____ |

Analysis:

1. Label your graphs with the element symbol underneath the atomic numbers.
2. Using your printed graph and a colored pencil, connect the data points for the Noble gas elements with a red line. This will separate the periods.
3. Using your printed graph and a colored pencil, connect the data points for the alkaline earth elements with a blue line.
4. Using your printed graph and a colored pencil, connect the data points for the halogen family elements with a green line.
5. For **each** property, use your graph to describe what happens to the property as you move from left to right across a period.
6. For **each** property, use your graph to describe what happens to the property as you move from top to bottom down a group.
7. Write the short cut electron configurations for neon and fluorine and use the configurations to explain why the first ionization energy of neon is greater than that of fluorine.
8. Write the short cut electron configurations for sulfur and sodium and use the configurations to explain why the atomic radius of sulfur is less than that of sodium.
9. Write the short cut electron configurations for lead and silicon and use the configurations to explain why the atomic radius of lead is greater than that of silicon
10. Write the short cut electron configurations for oxygen and nitrogen and use the configurations to explain why the first ionization energy of oxygen is less than that of nitrogen.
11. Write the short cut electron configurations for aluminum and chlorine and use the configurations to explain why the first ionization energy of aluminum is less than that of chlorine.
12. Is Melting Point a periodic trend? Use evidence from your graph to support your answer.
13. Using your graphs and the answers to your analysis questions, add the following to the diagram of the periodic table below.
 - a. Draw a red arrow to show which direction atomic radius increases across a period.
 - b. Draw another red arrow to show which direction atomic radius increases within a group.
 - c. Draw a blue arrow to show which direction ionization energy increases across a period.
 - d. Draw another blue arrow to show which direction ionization energy increases within a group.

- e. Draw a green arrow to show which direction electronegativity increases across a period.
- f. Draw another green arrow to show which direction electronegativity increases within a group.

hydrogen 1 H 1.0079																	helium 2 He 4.0026	
lithium 3 Li 6.941	beryllium 4 Be 9.0122											boron 5 B 10.811	carbon 6 C 12.011	nitrogen 7 N 14.007	oxygen 8 O 15.999	fluorine 9 F 18.998	neon 10 Ne 20.180	
sodium 11 Na 22.990	magnesium 12 Mg 24.305											aluminum 13 Al 26.982	silicon 14 Si 28.086	phosphorus 15 P 30.974	sulfur 16 S 32.065	chlorine 17 Cl 35.453	argon 18 Ar 39.948	
potassium 19 K 39.098	calcium 20 Ca 40.078	scandium 21 Sc 44.956	titanium 22 Ti 47.867	vanadium 23 V 50.942	chromium 24 Cr 51.996	manganese 25 Mn 54.938	iron 26 Fe 55.845	cobalt 27 Co 58.933	nickel 28 Ni 58.693	copper 29 Cu 63.546	zinc 30 Zn 65.39	gallium 31 Ga 69.723	germanium 32 Ge 72.61	arsenic 33 As 74.922	selenium 34 Se 78.96	bromine 35 Br 79.904	krypton 36 Kr 83.80	
rubidium 37 Rb 85.468	strontium 38 Sr 87.62	yttrium 39 Y 88.906	zirconium 40 Zr 91.224	niobium 41 Nb 92.906	molybdenum 42 Mo 95.94	technetium 43 Tc [98]	ruthenium 44 Ru 101.07	rhodium 45 Rh 102.91	palladium 46 Pd 106.42	silver 47 Ag 107.87	cadmium 48 Cd 112.41	indium 49 In 114.82	tin 50 Sn 118.71	antimony 51 Sb 121.76	tellurium 52 Te 127.60	iodine 53 I 126.90	xenon 54 Xe 131.29	
caesium 55 Cs 132.91	barium 56 Ba 137.33	57-70 *	lutetium 71 Lu 174.97	hafnium 72 Hf 178.49	tantalum 73 Ta 180.95	tungsten 74 W 183.84	rhenium 75 Re 186.21	osmium 76 Os 190.23	iridium 77 Ir 192.22	platinum 78 Pt 195.08	gold 79 Au 196.97	mercury 80 Hg 200.59	thallium 81 Tl 204.38	lead 82 Pb 207.2	bismuth 83 Bi 208.98	polonium 84 Po [209]	astatine 85 At [210]	radon 86 Rn [222]
francium 87 Fr [223]	radium 88 Ra [226]	89-102 * *	lawrencium 103 Lr [262]	rutherfordium 104 Rf [261]	dubnium 105 Db [262]	seaborgium 106 Sg [266]	bohrium 107 Bh [264]	hassium 108 Hs [269]	meitnerium 109 Mt [268]	unnilium 110 Uun [271]	ununium 111 Uuu [272]	unubium 112 Uub [277]	ununquadium 114 Uuq [289]					

* Lanthanide series

lanthanum 57 La 138.91	cerium 58 Ce 140.12	praseodymium 59 Pr 140.91	neodymium 60 Nd 144.24	promethium 61 Pm [145]	samarium 62 Sm 150.36	europium 63 Eu 151.96	gadolinium 64 Gd 157.25	terbium 65 Tb 158.93	dysprosium 66 Dy 162.50	holmium 67 Ho 164.93	erbium 68 Er 167.26	thulium 69 Tm 168.93	ytterbium 70 Yb 173.04
actinium 89 Ac [227]	thorium 90 Th 232.04	protactinium 91 Pa 231.04	uranium 92 U 238.03	neptunium 93 Np [237]	plutonium 94 Pu [244]	americium 95 Am [243]	curium 96 Cm [247]	berkelium 97 Bk [247]	californium 98 Cf [251]	einsteinium 99 Es [252]	fermium 100 Fm [257]	mendelevium 101 Md [258]	nobelium 102 No [259]

** Actinide series