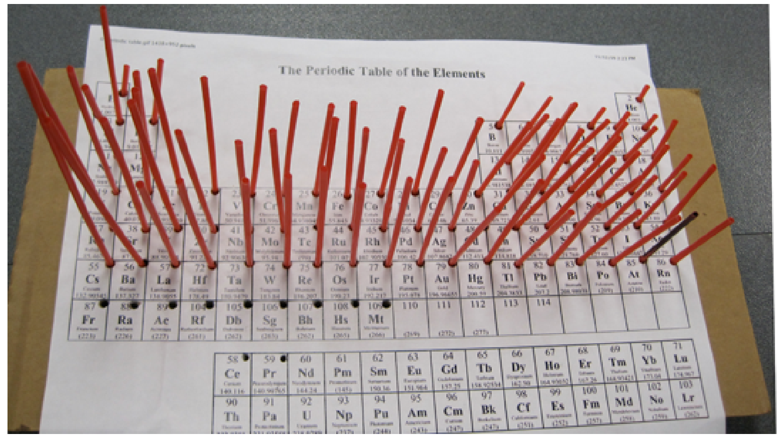
The Periodic Periodic Table

Elemental organization

Create a 3-d way to visualize trends on the periodic table. By using straws (or other objects) show how the various properties of elements are used to organized elements into elements shape it is.

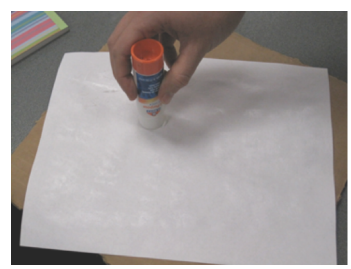


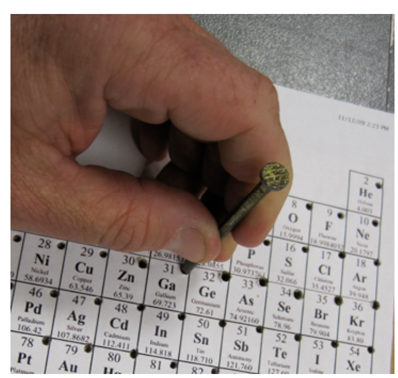
<u>Materials:</u>

- Copy of a period table.
- Glue stick
- Scissors
- Metric measuring device
- Thick, rigid and easily punctured materials such as: cardboard, Styrofoam or foam core board.
- A pointed object that can puncture a hole in you material above (i.e. a Nail, a wooden skewer, etc…_)
- Any long, easy to cut object that can easily fit into the hole diameter created by the pointed object above (i.e. Straws, coffee stirrers, wooden skewers, etc). This will create your

<u>Assembly:</u>

1. Print off periodic table provided at end of this document or find one on the web.
2. Cut your rigid material to the size of the printed periodic table.
3. If using cardboard, it works best if you glue at least two pieces together to make a thicker piece.
4. Using a glue stick paste the periodic table onto a piece of cardboard.
5. Using a sharp implement (nail, skewer…. etc) puncture a hole through the printed periodic table and the cardboard under layer. Punch a hole within each listed element's border.





<u>To do:</u>

1. Cut a length of straw (or other object) to represent the relative scale of one property of an element. Listed below are several properties that can be plotted:
   radii, ionization energy, electron affinity, electron negativity, density, melting and boiling points, etc…
   a. Measure and cut each straw based on their published elemental property data.
   b. Length of straws must be decided upon after looking, analyzing and scaling the data.

Here’s an example of plotting atomic radii from Li to Ne:

i. A good way to start is to pick a single row or period of elements. I working with period 2 on the periodic table: Lithium to Neon, their atomic radii are: Li is 167 Pico meters, Be is 112, ….Ne is 38.

ii. For each straw’s length, I scaled it the following way: I took the number in pico maters, divided by 20 and then changed it from pico meters into centimeters.

Symbol	Radii in pm	Changed by	Scaled value changed to cm
Li	167	Divided by 20	8.3
Be	112	Divided by 20	5.6
B	87	Divided by 20	4.4
C	67	Divided by 20	3.4
N	56	Divided by 20	2.8
O	48	Divided by 20	2.4
F	42	Divided by 20	2.1
Ne	38	Divided by 20	1.9

2. Insert the cut straws into the appropriate hole that you punched into the periodic table.
3. Look at the trend and shape of your staws.

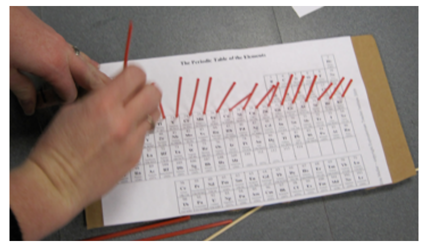
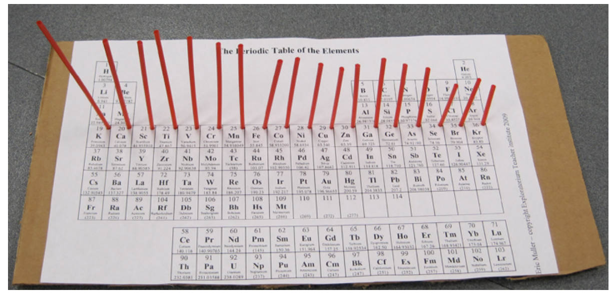


Table below is from:
From http://en.wikipedia.org/wiki/Atomic_radius

Calculated atomic radii

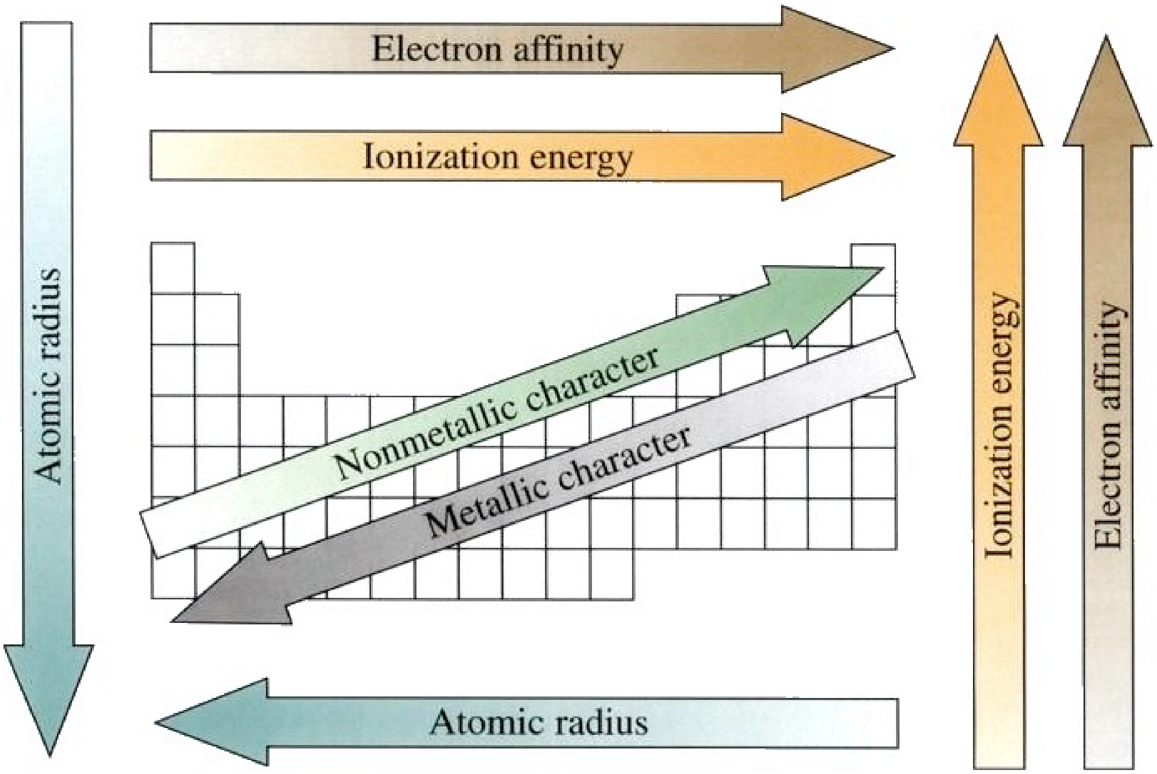
The following table shows atomic radii computed from theoretical models, as published by Enrico Clementi and others in 1967. [8] The values are in picometres (pm).

Group (vertical) / Period (horizontal)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	H 53																	He 31
2	Li 167	Be 112											B 87	C 67	N 56	O 48	F 42	Ne 38
3	Na 190	Mg 145											Al 118	Si 111	P 98	S 88	Cl 79	Ar 71
4	K 243	Ca 194	Sc 184	Ti 176	V 171	Cr 166	Mn 161	Fe 156	Co 152	Ni 149	Cu 145	Zn 142	Ga 136	Ge 125	As 114	Se 103	Br 94	Kr 88
5	Rb 265	Sr 219	Y 212	Zr 206	Nb 198	Mo 190	Tc 183	Ru 178	Rh 173	Pd 169	Ag 165	Cd 161	In 156	Sn 145	Sb 133	Te 123	I 115	Xe 108
6	Cs 298	Ba 253	*	Hf 208	Ta 200	W 193	Re 188	Os 185	Ir 180	Pt 177	Au 174	Hg 171	Tl 156	Pb 154	Bi 143	Po 135	At	Rn 120
7	Fr	Ra	**	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Uub	Uut	Uuq	Uup	Uuh	Uus	Uuo
Lanthanides	*	La	Ce	Pr 247	Nd 206	Pm 205	Sm 238	Eu 231	Gd 233	Tb 225	Dy 228	Ho	Er 226	Tm 222	Yb 222	Lu 217		
Actinides	**	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr		



What's going on?

You created rows and columns of bar graphs. This landscape of straws shows how elemental properties change or are similar as you go right, left or up and down the periodic table. These patterns are what make the periodic table so useful.



From: http://en.wikipedia.org/wiki/Periodic_trends

Good on-line resources for this activity:

http://en.wikipedia.org/wiki/Periodic_trends
http://en.wikipedia.org/wiki/Atomic_radius
http://en.wikipedia.org/wiki/Ionization_energy
http://en.wikipedia.org/wiki/Electron_affinity
http://en.wikipedia.org/wiki/Electronegativity
http://en.wikipedia.org/wiki/Metallic_character - Chemical_properties
http://environmentalchemistry.com/yogi/periodic/atomicradius.html
http://www.webelements.com/periodicity/

The Periodic Table of the Elements

1 **H** Hydrogen 1.00794																	2 **He** Helium 4.003
3 **Li** Lithium 6.941	4 **Be** Beryllium 9.012182											5 **B** Boron 10.811	6 **C** Carbon 12.0107	7 **N** Nitrogen 14.00674	8 **O** Oxygen 15.9994	9 **F** Fluorine 18.9984032	10 **Ne** Neon 20.1797
11 **Na** Sodium 22.989770	12 **Mg** Magnesium 24.3050											13 **Al** Aluminum 26.981538	14 **Si** Silicon 28.0855	15 **P** Phosphorus 30.973761	16 **S** Sulfur 32.066	17 **Cl** Chlorine 35.4527	18 **Ar** Argon 39.948
19 **K** Potassium 39.0983	20 **Ca** Calcium 40.078	21 **Sc** Scandium 44.955910	22 **Ti** Titanium 47.867	23 **V** Vanadium 50.9415	24 **Cr** Chromium 51.9961	25 **Mn** Manganese 54.938049	26 **Fe** Iron 55.845	27 **Co** Cobalt 58.933200	28 **Ni** Nickel 58.6934	29 **Cu** Copper 63.546	30 **Zn** Zinc 65.39	31 **Ga** Gallium 69.723	32 **Ge** Germanium 72.61	33 **As** Arsenic 74.92160	34 **Se** Selenium 78.96	35 **Br** Bromine 79.904	36 **Kr** Krypton 83.80
37 **Rb** Rubidium 85.4678	38 **Sr** Strontium 87.62	39 **Y** Yttrium 88.90585	40 **Zr** Zirconium 91.224	41 **Nb** Niobium 92.90638	42 **Mo** Molybdenum 95.94	43 **Tc** Technetium (98)	44 **Ru** Ruthenium 101.07	45 **Rh** Rhodium 102.90550	46 **Pd** Palladium 106.42	47 **Ag** Silver 107.8682	48 **Cd** Cadmium 112.411	49 **In** Indium 114.818	50 **Sn** Tin 118.710	51 **Sb** Antimony 121.760	52 **Te** Tellurium 127.60	53 **I** Iodine 126.90447	54 **Xe** Xenon 131.29
55 **Cs** Cesium 132.90545	56 **Ba** Barium 137.327	57 **La** Lanthanum 138.9055	72 **Hf** Hafnium 178.49	73 **Ta** Tantalum 180.9479	74 **W** Tungsten 183.84	75 **Re** Rhenium 186.207	76 **Os** Osmium 190.23	77 **Ir** Iridium 192.217	78 **Pt** Platinum 195.078	79 **Au** Gold 196.96655	80 **Hg** Mercury 200.59	81 **Tl** Thallium 204.3833	82 **Pb** Lead 207.2	83 **Bi** Bismuth 208.98038	84 **Po** Polonium (209)	85 **At** Astatine (210)	86 **Rn** Radon (222)
87 **Fr** Francium (223)	88 **Ra** Radium (226)	89 **Ac** Actinium (227)	104 **Rf** Rutherfordium (261)	105 **Db** Dubnium (262)	106 **Sg** Seaborgium (263)	107 **Bh** Bohrium (262)	108 **Hs** Hassium (265)	109 **Mt** Meitnerium (266)	110 (269)	111 (272)	112 (277)	113	114				

58 **Ce** Cerium 140.116	59 **Pr** Praseodymium 140.90765	60 **Nd** Neodymium 144.24	61 **Pm** Promethium (145)	62 **Sm** Samarium 150.36	63 **Eu** Europium 151.964	64 **Gd** Gadolinium 157.25	65 **Tb** Terbium 158.92534	66 **Dy** Dysprosium 162.50	67 **Ho** Holmium 164.93032	68 **Er** Erbium 167.26	69 **Tm** Thulium 168.93421	70 **Yb** Ytterbium 173.04	71 **Lu** Lutetium 174.967
90 **Th** Thorium 232.0381	91 **Pa** Protactinium 231.03588	92 **U** Uranium 238.0289	93 **Np** Neptunium (237)	94 **Pu** Plutonium (244)	95 **Am** Americium (243)	96 **Cm** Curium (247)	97 **Bk** Berkelium (247)	98 **Cf** Californium (251)	99 **Es** Einsteinium (252)	100 **Fm** Fermium (257)	101 **Md** Mendelevium (258)	102 **No** Nobelium (259)	103 **Lr** Lawrencium (262)