

# The Periodic Table of the Elements : A hunt for its origins

**Periodic Table of the Elements**

1 1IA 11A	2 IIA 2A											13 IIIA 3A	14 IVA 4A	15 VA 5A	16 VIA 6A	17 VIIA 7A	18 VIIIA 8A	
1 H Hydrogen 1.0079																		2 He Helium 4.00260
3 Li Lithium 6.941	4 Be Beryllium 9.01218											5 B Boron 10.811	6 C Carbon 12.011	7 N Nitrogen 14.00674	8 O Oxygen 15.9994	9 F Fluorine 18.998403	10 Ne Neon 20.1797	
11 Na Sodium 22.989768	12 Mg Magnesium 24.305	3 IIIB 3B	4 IVB 4B	5 VB 5B	6 VIB 6B	7 VIIB 7B	8 VIII 8	9 VIII 8	10 VIII 8	11 IB 1B	12 IIB 2B	13 Al Aluminum 26.981539	14 Si Silicon 28.0855	15 P Phosphorus 30.973762	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 44.95591	22 Ti Titanium 47.88	23 V Vanadium 50.9415	24 Cr Chromium 51.9961	25 Mn Manganese 54.938	26 Fe Iron 55.847	27 Co Cobalt 58.9332	28 Ni Nickel 58.6934	29 Cu Copper 63.546	30 Zn Zinc 65.39	31 Ga Gallium 69.723	32 Ge Germanium 72.64	33 As Arsenic 74.92159	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 98.9072	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.9055	46 Pd Palladium 106.42	47 Ag Silver 107.8682	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.71	51 Sb Antimony 121.760	52 Te Tellurium 127.6	53 I Iodine 126.90447	54 Xe Xenon 131.29	
55 Cs Cesium 132.90545	56 Ba Barium 137.327	57-71 Lanthanide Series	72 Hf Hafnium 178.49	73 Ta Tantalum 180.9479	74 W Tungsten 183.85	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.22	78 Pt Platinum 195.08	79 Au Gold 196.9665	80 Hg Mercury 200.59	81 Tl Thallium 204.3853	82 Pb Lead 207.2	83 Bi Bismuth 208.98037	84 Po Polonium [209]	85 At Astatine 209	86 Rn Radon 222.0175	
87 Fr Francium 223	88 Ra Radium 226	89-103 Actinide Series	104 Rf Rutherfordium [261]	105 Db Dubnium [262]	106 Sg Seaborgium [266]	107 Bh Bohrium [264]	108 Hs Hassium [265]	109 Mt Meitnerium [268]	110 Ds Darmstadtium [289]	111 Rg Roentgenium [272]	112 Cn Copernicium [277]	113 Uut Ununtrium unknown	114 Uuq Ununquadium [289]	115 Uup Ununpentium unknown	116 Uuh Ununhexium [288]	117 Uus Ununseptium unknown	118 Uuo Ununoctium unknown	
		57 La Lanthanum 138.9055	58 Ce Cerium 140.115	59 Pr Praseodymium 140.90765	60 Nd Neodymium 144.24	61 Pm Promethium 144.9127	62 Sm Samarium 150.36	63 Eu Europium 151.9655	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		
		89 Ac Actinium 227.0278	90 Th Thorium 232.0381	91 Pa Protactinium 231.03688	92 U Uranium 238.0289	93 Np Neptunium 237.0482	94 Pu Plutonium 244.0642	95 Am Americium 243.0614	96 Cm Curium 247.0753	97 Bk Berkelium 247.0753	98 Cf Californium 251.0796	99 Es Einsteinium [254]	100 Fm Fermium 257.0961	101 Md Mendelevium 258.1	102 No Nobelium 259.1009	103 Lr Lawrencium [262]		
		Alkali Metal	Alkaline Earth	Transition Metal	Basic Metal	Semimetals	Nonmetals	Halogens	Noble Gas	Lanthanides	Actinides							

## The Big Question: Why does the periodic table look the way it does?

### In this activity we will examine the Next Generation Science Standards 2.3-2.4

2.3-2.4

Construct and revise an explanation of trends in the periodic table and knowledge of the patterns of chemical properties.

#### Your goal with this assignment:

Determine the logic and reasoning as to why the periodic table takes on its current arrangement and shape by identifying trends in the properties of the elements.

The periodic table is probably the least interesting thing to talk about for most of you high schoolers. Nonetheless, I'm sure some of you have pondered why the elements are placed the way they are. In eighth grade science, you learned where metals, non-metals, halogens, and noble gases can be found on the table. You may think that you can group metals in one place in whatever order, and the truth is you could - there just wouldn't be any logic to it. The elements' atomic numbers increase chronologically over a span of different types and properties, yet similar elements are still grouped together. How? On what basis did

scientists achieve this? They can't change the elements - at least not very easily. That's the question you will endeavour to answer as you discover the various trends in the periodic table.

### Treasure Hunt Questions

1. As we go across the table from left to right, what happens to the number of protons, neutrons and electrons?
2. What change would have a greater effect on an atom, in terms of size: adding one proton or adding one electron?
3. As we go across the table from left to right, what happens to the atomic radius? What about from top to bottom?
4. Where do the most electronegative atoms lie on the periodic table? What does this tell you about the trend of electronegativity for all atoms going from left to right and top to bottom?
5. What does the trend above tell you about the electron affinity for atoms across the periodic table?
6. Describe ionization energy. Which group of elements have the lowest ionization energies and which one has the highest? Can you point out the trends in the groups and periods of the table?
7. Describe the basic properties of metals in terms of electronegativity and ionization energy. Does metallic character increase or decrease as we go from right to left? What about from top to bottom?
8. In general, do metals have high or low melting points? What about non-metals? Which element has the highest melting point?
9. Chlorine bonds to potassium and sodium easily; however potassium and sodium do not bond at all. Why?
10. Given the compounds  $\text{CH}_3\text{F}$  and  $\text{CH}_3\text{I}$ , in which of the two is the carbon-halogen bond the strongest? Hint: think about the nature of covalent bonds.

### Internet Resources

Use the following sites to help answer the questions above:

1. [UC Davis Chem Wiki](#)
2. [Spark Notes](#)
3. [Neil Schore, PhD Testimony](#)
4. [Chem4Kids](#)
5. [Creative Chemistry](#)

## Directions

1. I encourage you guys to work together on this in a group no larger than three people. However, it is not mandatory.
2. Each person is required to do their own unique write up, regardless if you decide to work in a group.
3. You must visit all sites.
4. You must answer the questions using your own words. Copying and pasting verbatim from the sources is not permitted. If you decide to quote a source, you must provide the appropriate citation using an APA format with works cited; failure to do so is a violation of digital citizenship standards.
5. Use either microsoft word or google docs for your write up. The latter is preferred.
6. Under no circumstances will late work be accepted.
7. HAVE FUN!