

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

**Periodic Table of the Elements**

The periodic table is organized into groups and periods. The groups are labeled at the top and bottom of the table. The elements are color-coded according to their categories: Alkali Metal (purple), Alkaline Earth (pink), Transition Metal (light blue), Basic Metal (orange), Semimetals (green), Nonmetals (dark blue), Halogens (yellow), Noble Gas (light yellow), Lanthanides (light green), and Actinides (red).

**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!