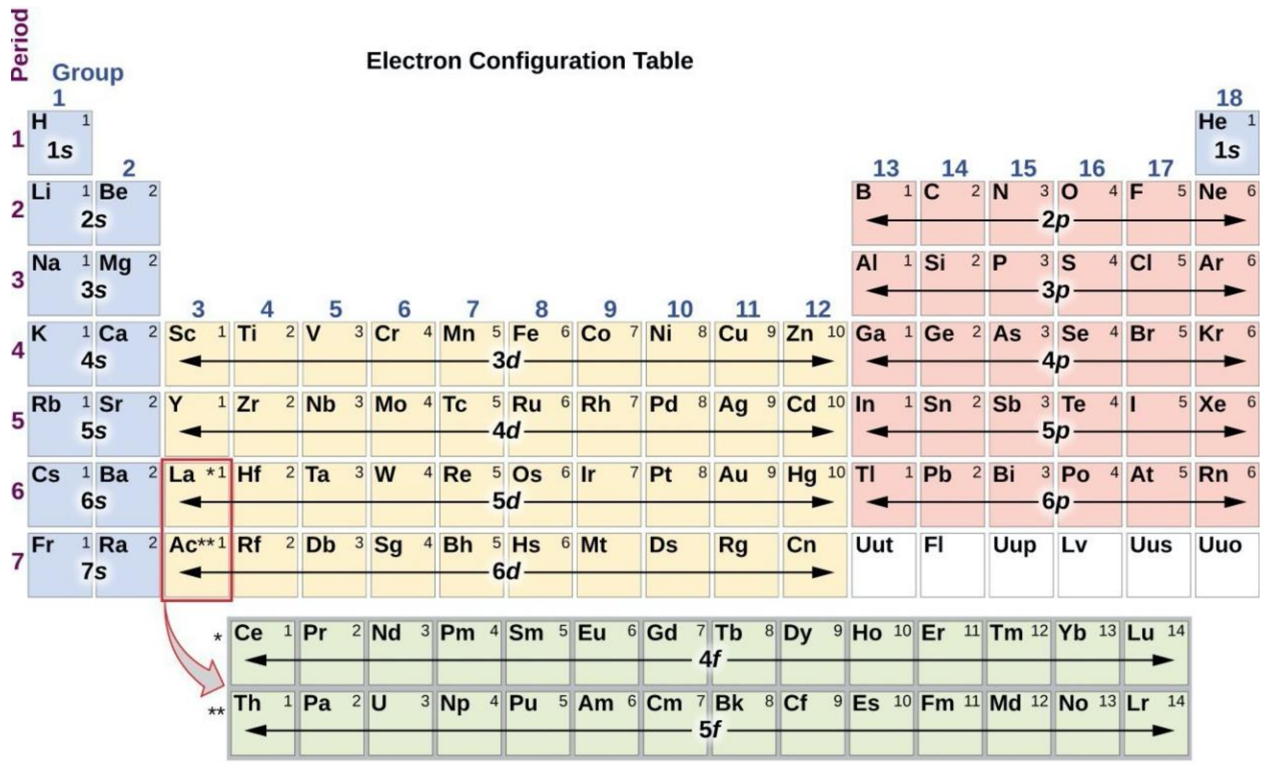
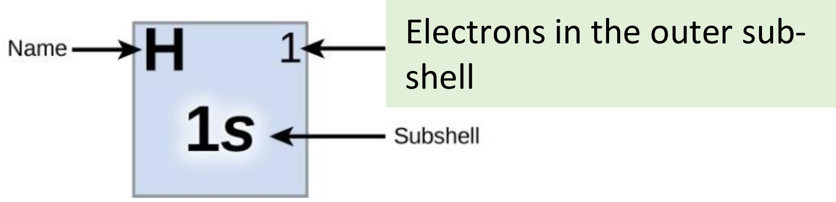
HW 5, periodic table





The periodic table is organized into rows (called periods) and columns (called groups).

- **Rows (Periods):** Each row corresponds to a main energy level (or shell; 1, 2, 3…7) of electrons. As you move down the table, the elements have electrons in higher energy levels.
- **Columns (Groups):** Elements in the same column have the same number of valence electrons (electrons in their outermost shell), which gives them similar chemical properties. For example, elements in Group 1 all have one valence electron, while elements in Group 17 have seven valence electrons.

This organization helps predict the chemical reactivity and bonding behavior of the elements.

Electrons in the outermost shell (the highest main energy level) of an atom are called VALENCE ELECTRONS. The outermost energy level corresponds to the highest principal quantum number (n) in the element's electron configuration. For example, in the electron configuration of sodium (Na): $1s^2\ 2s^2\ 2p^6\ 3s^1$, the $3s^1$ represents the outermost energy level (n=3). The elements in group 1 have 1 valence electron. The elements in group 2 have two valence electrons. The elements in groups 13 -18 have valence electrons = group number – 10.

The periodic table is divided into blocks according to the highest energy subshell (sub-level) occupied by electrons. Let's look at phosphorus electron configuration $1s^2 2s^2 2p^6 3s^2 3p^3$, the outermost shell $3s^2 3p^3$, the outermost subshell $3p^3$, the element belongs to p-block. The blue color in the table above represents the s block, all the elements in the s block have atoms with ns^1 or ns^2 outer shell electron configuration (n is the energy level number), the yellow color part is the d block (electrons in these elements occupy d sub-levels), the pink color is p block, in the p block it is the p subshell that is being filled. The green rows represent f elements.

What can we tell about Sulfur ($_{16}S$)?

This element is in period 3 and group 16, and so has three shells (we have to fill energy levels 1, 2, 3 with electrons, the highest occupied shell is the number 3) and the group 16 tells us that the element has 6 electrons (valence electrons) in the **outermost shell** (16-10=6) and we will write it as $\mathbf{3s^2 3p^4}$, *the outermost occupied subshell* is a p subshell $3p^4$.

Answer the following questions:

1. Give the full electron configurations of the following atoms

Si

As

2. What can we tell (Number of valence electrons? Energy level (shell)? Highest energy occupied subshell? Outer shell electron configuration?) about following elements: Ar, Br, K, Ba