

Big Question

Why do elements have different properties?

For instance why do some react explosively with water, while others simply dissolve?

<https://www.youtube.com/watch?v=sS3cIK9jIB8>

Atoms bond together

- Molecules are made up of atoms bonded together.
- The structure of an individual atom determines:
 - Whether the atom can form bonds.
 - How many other atoms it can bond to.



Atoms bond together

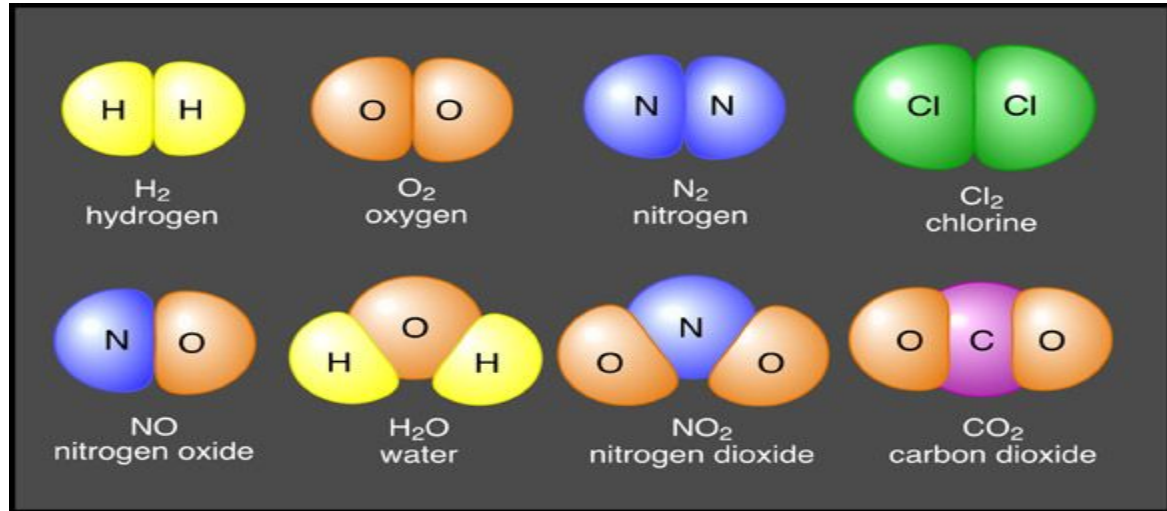
- **Compounds** are composed of atoms of *more than one element*. The ratios of atoms of each element in a particular compound is always the same.

Think about it:

- Are all molecules compounds?
- Are all compounds molecules?



Which are molecules? Which are compounds?



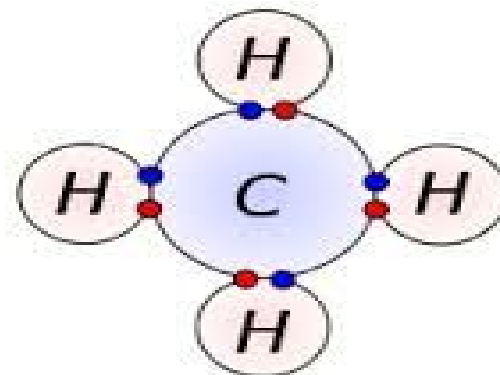
Examples...

- Molecular **hydrogen** (H_2), molecular **oxygen** (O_2) molecular **nitrogen** (N_2), and molecular chlorine (Cl_2) are not compounds because each is composed of a single element.
- Nitrogen Oxide (NO), Water (H_2O), nitrogen dioxide (N_2O), and carbon dioxide (CO_2) are compounds because each is made from more than one element.



To understand how elements make many different types of substances and why they have certain properties, we must first understand their electrons...

Electrons are the key to making molecules, through covalent and ionic bonds
(more to come)



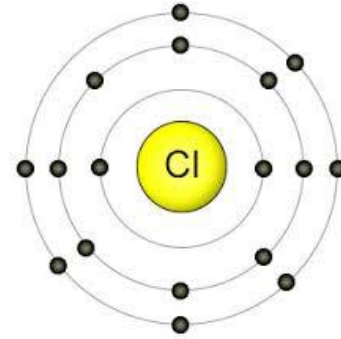
● Electron from hydrogen
● Electron from carbon

Electron “shells”

Electrons are in spaces that are different distances away from the nucleus. Farther away = higher energy level

The general formula is that the n th shell can hold up to $2(n^2)$ electrons (not always perfect).

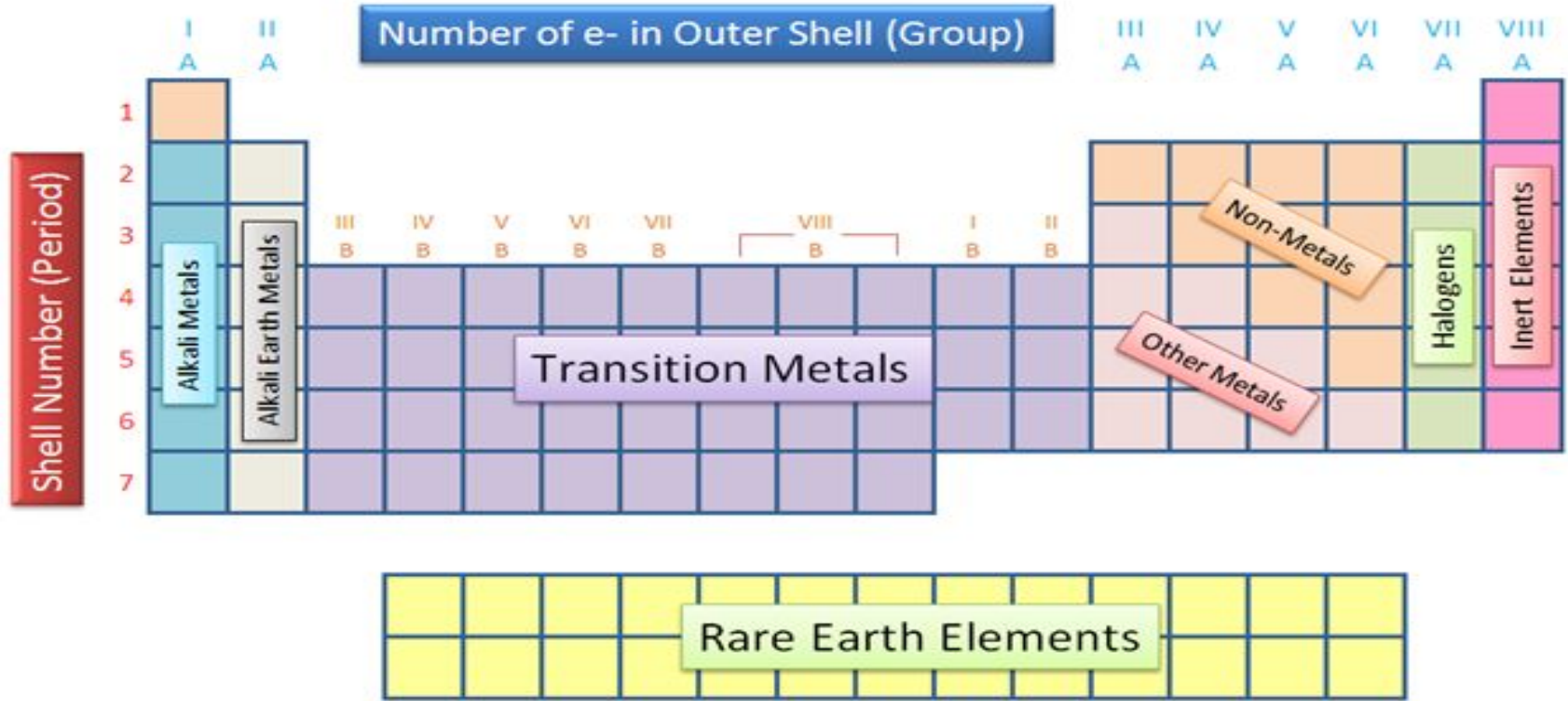
The electrons surround the nucleus in 3 dimensions but it is easier to show an energy level model in two dimensions like the model that looks like a target.



Valence Electrons!

Electrons in the outermost regions or shells are the valence electrons. **They are available to make bonds**

It turns out that each row has an additional electron shell



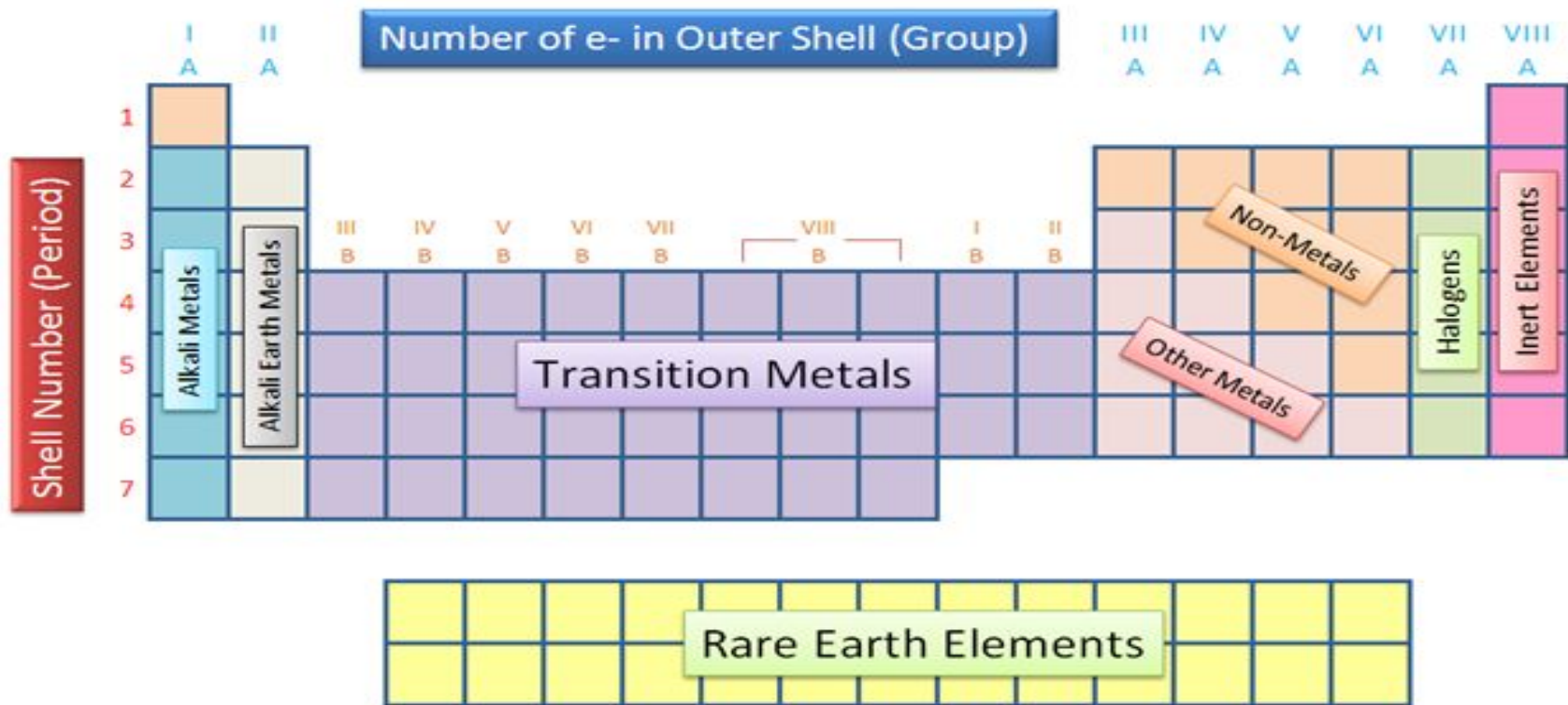
Discuss with Partner

Look at your graph of atomic radius.

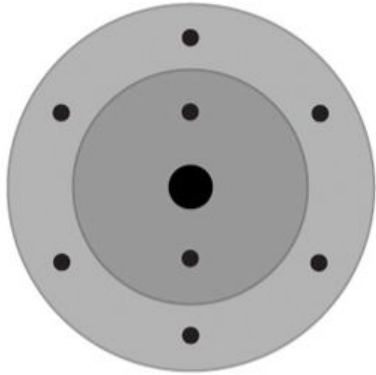
How is this evidence that each row has another electron shell?

What happens as you go across the row?

As you go across the row, the number of valence e⁻ increases



Discuss with Partner



Which row of the periodic table do you think this atom is in? Why?

Which column (family) of the periodic table do you think this atom is in? Why?

Lewis Dot Structures

<https://www.youtube.com/watch?v=ulyopnxjAZ8>