# ADD TO IT NOTES

1) Go through the following PowerPoint

2) TAKE NOTES in BLACK PEN. And ONLY black pen.

3) LEAVE SPACE around your notes! VERY important

4) The next day in class we will go over the PowerPoint with more details added, and I will point out the key information

5) During step #4 you will ADD TO YOUR NOTES using a GREEN PEN that I will give you.

# Introduction to Types of Bonds

# Types of Chemical Bonds

Ionic (Metal - Nonmetal)

Covalent (Nonmetal - Nonmetal)

Metallic (Metal - Metal)

# Chemical Reactions

- They do this by transferring or sharing electrons in order to make "bonds"

- Ionic – electrons transferred
- Covalent – electons shared
- Metallic – free flowing electrons

# Why bother making bonds?

Atoms want to have a full outer shell like the noble gases have:

Ne: $1s^2\underline{2s^2 2p^6}$

Ar: $1s^2 2s^2 2p^6 \underline{3s^2 3p^6}$

*NOTICE: A full outer shell = 8 $e^-$

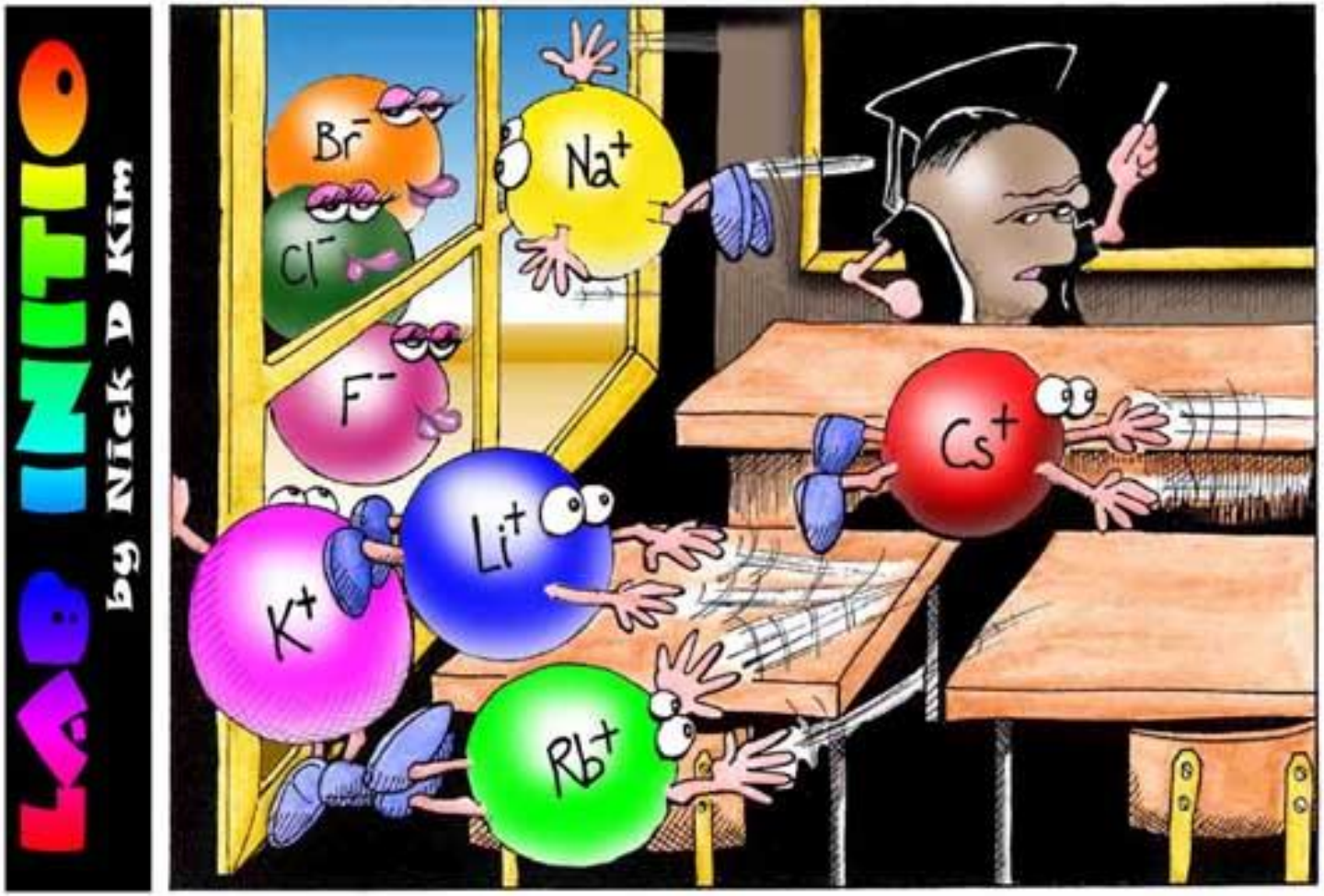
# Which electrons are involved in bonding?

- **Valence Electrons:** The e- in the highest occupied energy level of an atom

# IONIC BONDS

## Transferring Electrons

# Ionic Bonds




"Perhaps one of you gentlemen would mind telling me just what it is outside the window that you find so attractive...?"

# Ionic Bonds

"The name is Bond.  James Bond.

Shaken not stirred"

"The name is Bond.  Ionic Bond.

Taken not shared"

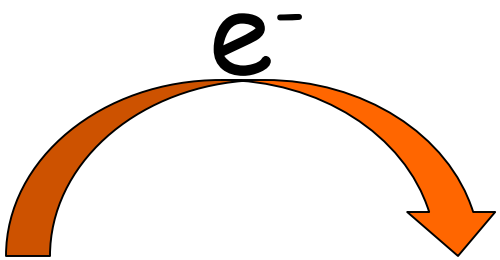
# Ionic Bonds

metal + nonmetal

<u>low ionization energy</u>
Wants to get rid of an electron

<u>high $e^-$ affinity</u>
Wants to gain an electron

Therefore:




Metal + Nonmetal

Cation (positive) + Anion (negative)

# Example: Na & Cl…

Sodium (Na) has 11 electrons

$1s^2 2s^2 2p^6 3s^1$

One valence electron

By losing this electron $Na^+$ becomes

$1s^2 2s^2 2p^6$

Which has a full outer electron level.

Chlorine (Cl) has 17 electrons

$1s^2 2s^2 2p^6 3s^2 3p^5$

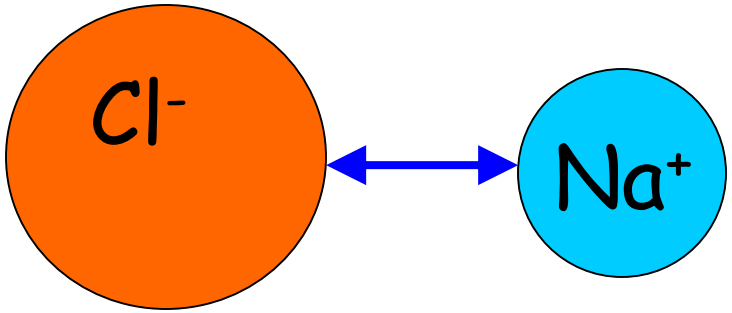
By gaining an electron it becomes...

$Cl^-$ $1s^2 2s^2 2p^6 3s^2 3p^6$

Which also has a filled outer energy level.

# NaCl – opposites attract!

The two "happy" ions now attract each other electrically. The resulting attraction is an ionic bond. A bond between ions.



# COVALENT BONDS

## Sharing Electrons

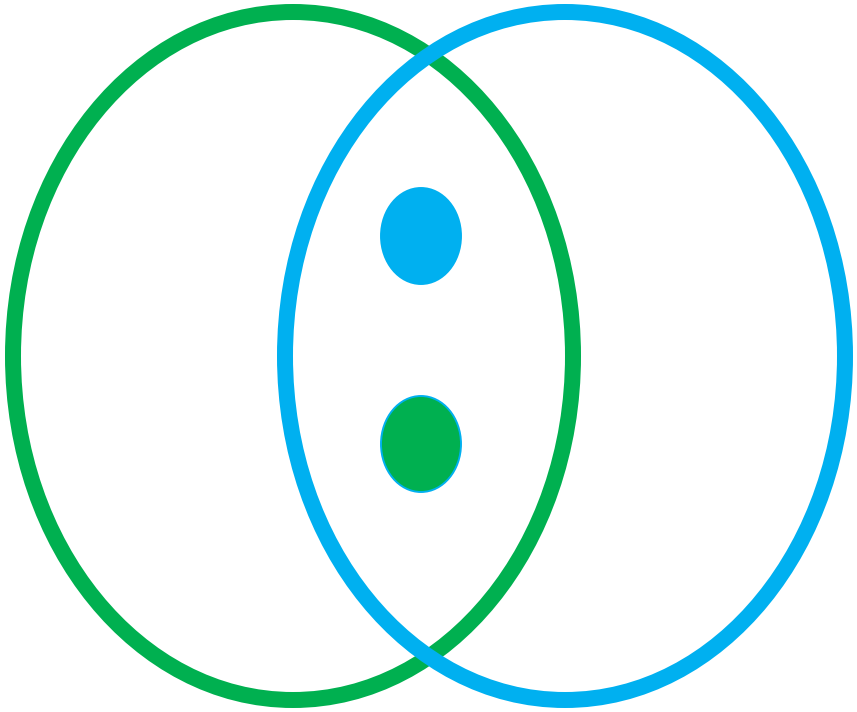
# Nonmetal - Nonmetal

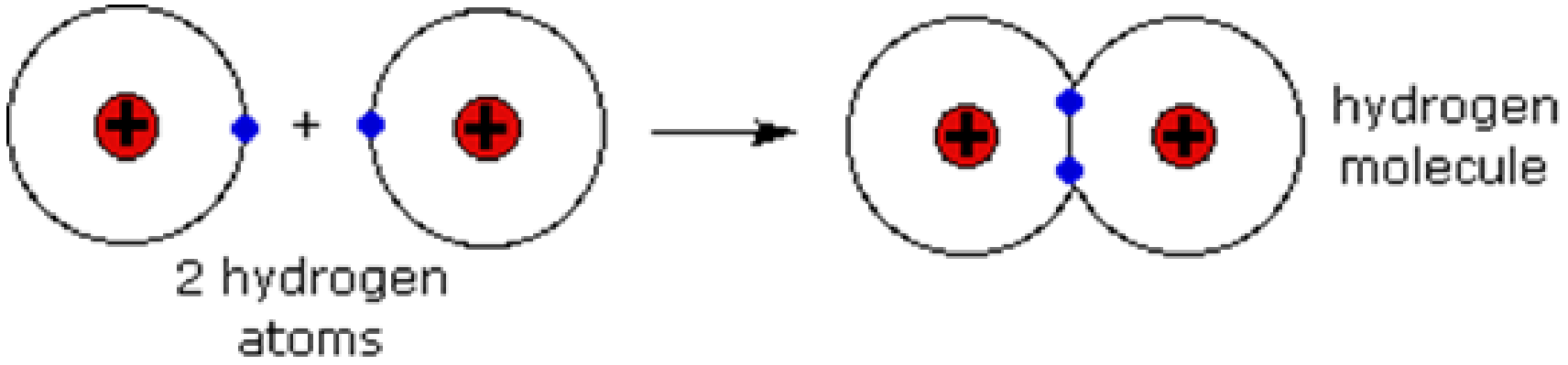
Sharing electrons tricks each element into thinking it has 8

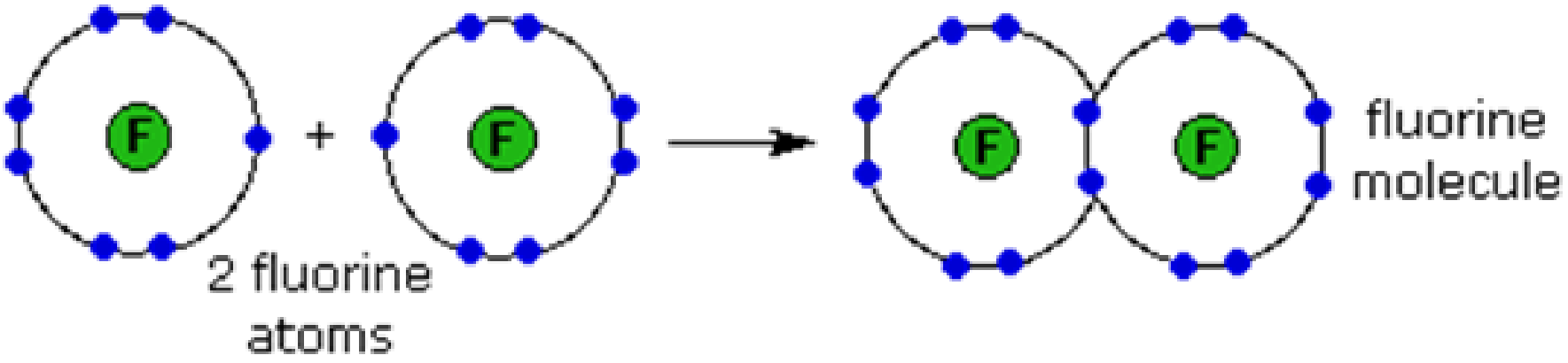
# Each atom THINKS it owns both electrons…

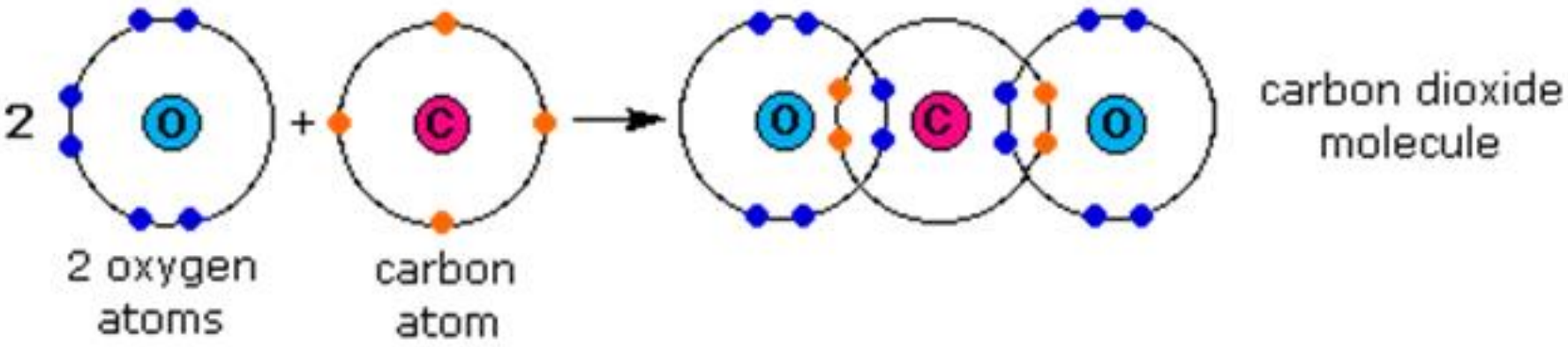
**Even though they are sharing!**

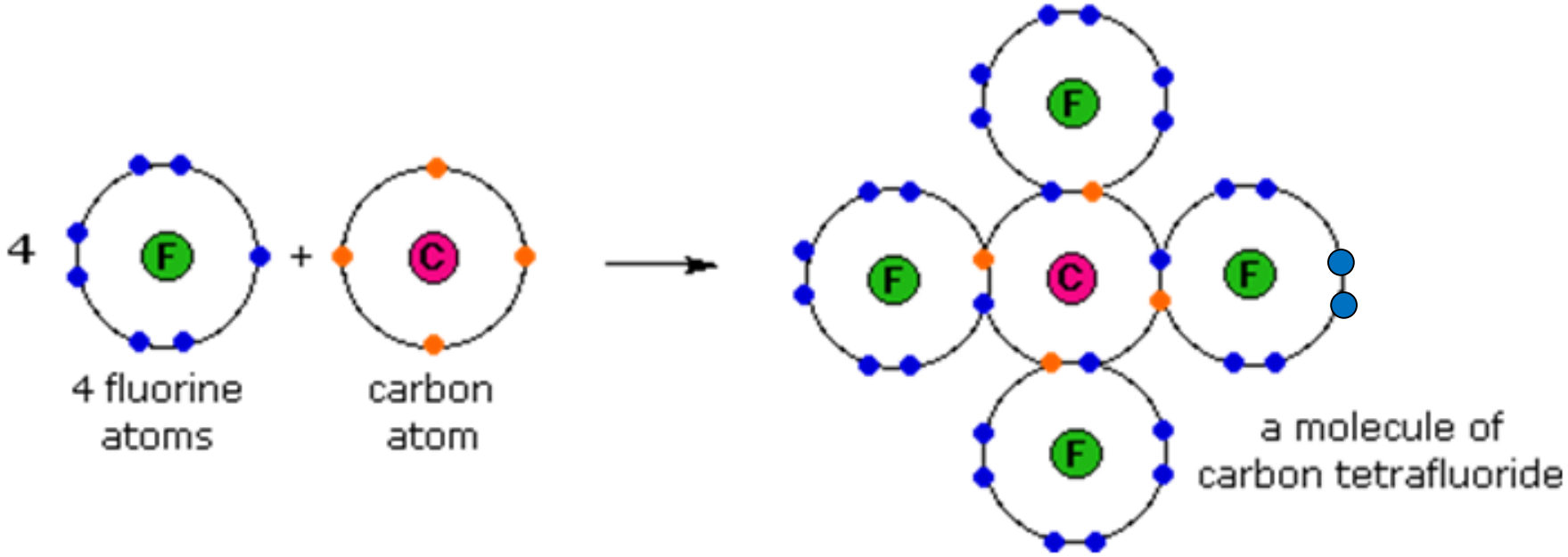
**They each "donate" what they can to the bond**




+
2 hydrogen atoms
hydrogen molecule


F
+
F
2 fluorine atoms
F
F
fluorine molecule


2
O
+
C
O
C
O
carbon dioxide molecule
2 oxygen atoms
carbon atom


4
F
+
C
4 fluorine atoms
carbon atom
F
F
C
F
F
a molecule of carbon tetrafluoride

# Properties of Covalent Bonds

- Don't Conduct Electricity
- Low melting points
- Usually not soluble in water

# METALLIC BONDS

**Free Flowing Electrons**

# Metal – Metal

Electrons are able to flow freely through the metal in a "SEA OF ELECTRONS"

Watch this video clip:

https://www.youtube.com/watch?v=V5tj-xADB1c

# Properties of Metals

- Solid at room temperature (except for mercury…it is a liquid!)
- Conduct electricity
- Malleable
- Ductile
- Have a wide range of melting points.