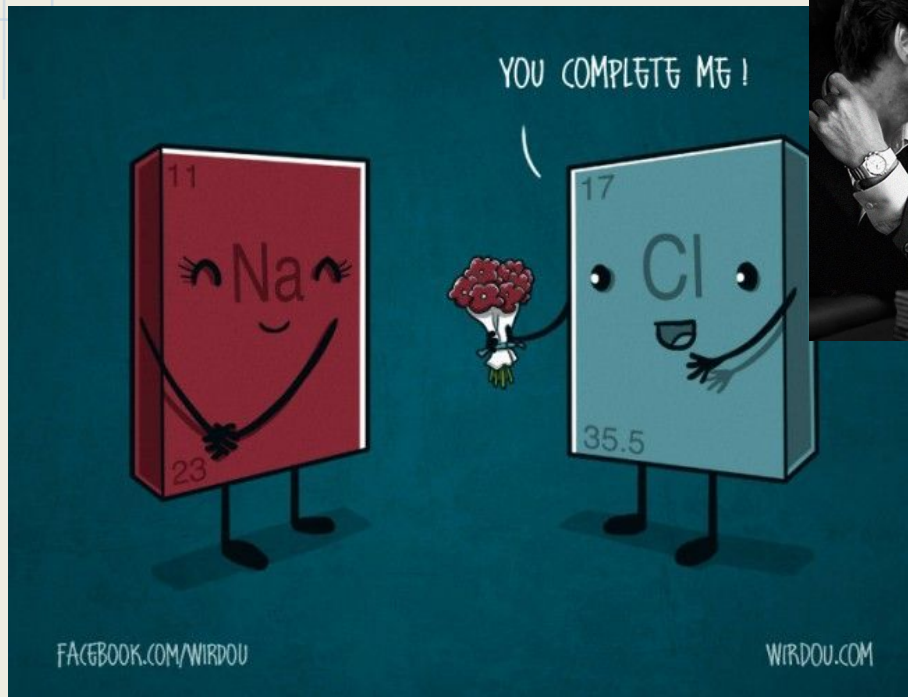


# Bonds. Chemical Bonds.



adapted from:

[http://www.chem4kids.com/files/atom\\_bonds.html](http://www.chem4kids.com/files/atom_bonds.html)  
[http://www.bbc.co.uk/schools/gcse/bitesize/science/add\\_aqa\\_pre\\_2011/atomic/differentsubrev1.shtml](http://www.bbc.co.uk/schools/gcse/bitesize/science/add_aqa_pre_2011/atomic/differentsubrev1.shtml)  
[http://chemwiki.ucdavis.edu/Theoretical\\_Chemistry/Chemical\\_Bonding/General\\_Principles\\_of\\_Chemical\\_Bonding/Covalent\\_Bonds](http://chemwiki.ucdavis.edu/Theoretical_Chemistry/Chemical_Bonding/General_Principles_of_Chemical_Bonding/Covalent_Bonds)

This Week's 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>

# Why do atoms bond?

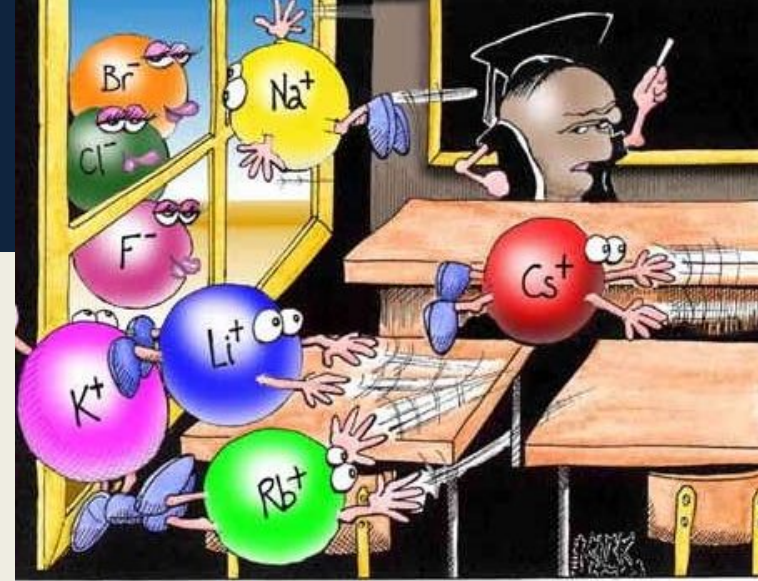
- Atomic shells like to be full.\* They are more stable.

\*for the elements we're going to be concerned with...the first 20 or so

- The first shell can hold 2 e<sup>-</sup>
- The next 2 shells can hold 8 e<sup>-</sup>

-Some atoms have few (1 or 2) in their outermost shell. These tend to give up their electrons, emptying their outermost shell.

-Some atoms are really close to having a full shell. Those atoms look for other atoms who can donate or share an electron.



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

# Let's look at an example

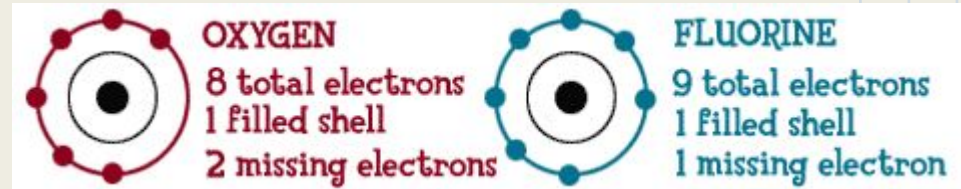
Sodium and Magnesium both have only one or two electrons in their outer shells! That's not happy...

-atoms tend to give these up



Oxygen has 6 and Fluorine have 7 electrons in their outer shells! So close to full!

-these atoms tend to fill up to 8



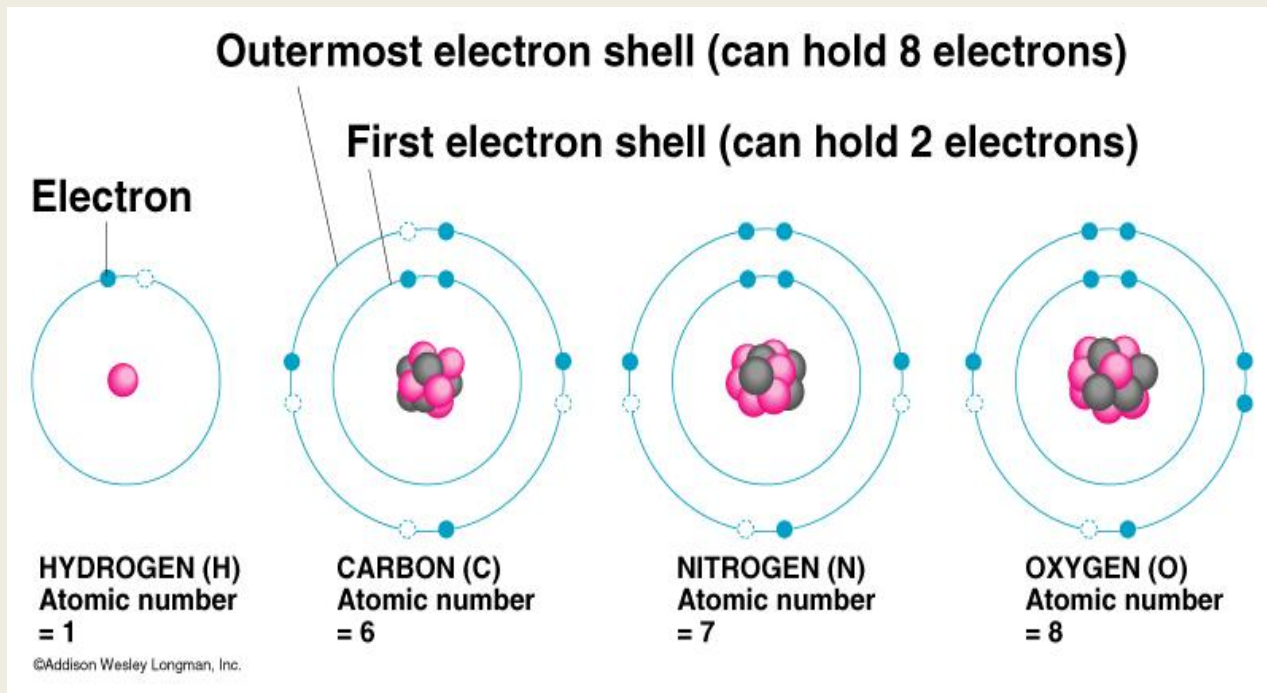
# Atoms “want” to have full valence (outer) shells

Octet Rule = atoms tend to gain, lose or share electrons so as to have 8 valence electrons (except for H and He)

✓ C would like to:

✓ N would like to:

✓ O would like to:



# Atoms want to have full valence (outer) shells!

Octet Rule = atoms tend to gain, lose or share electrons so as to have 8 valence electrons

✓ C would like to

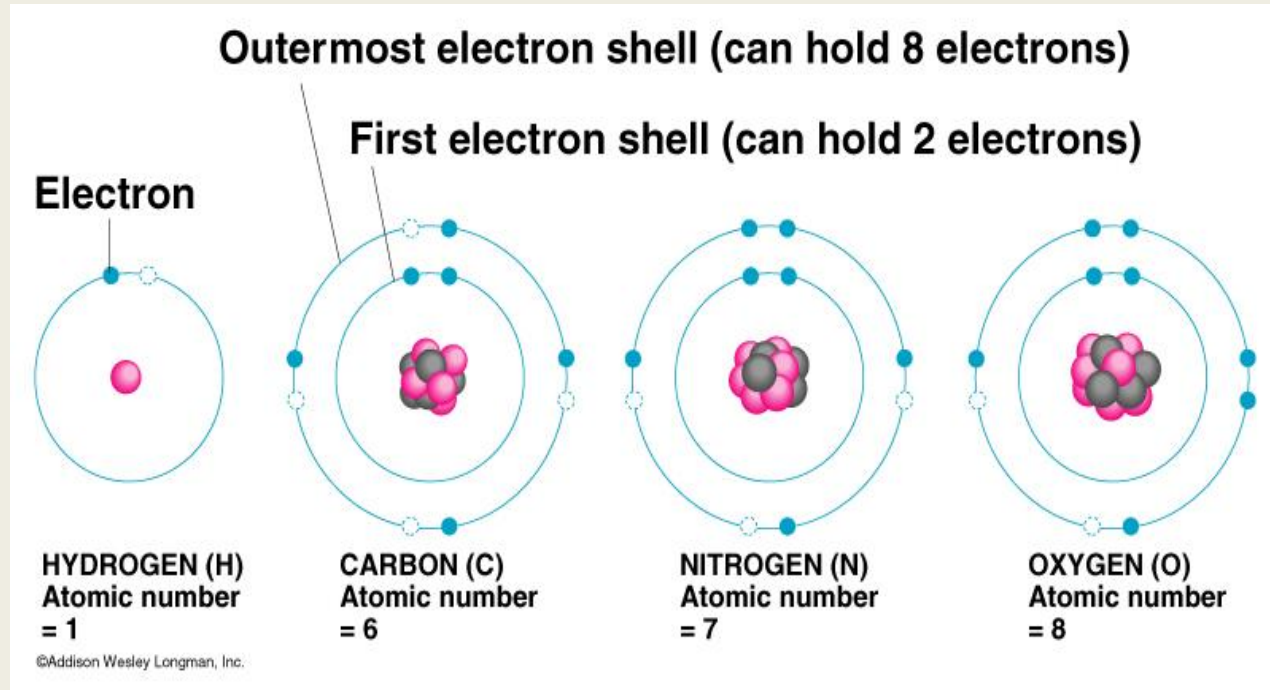
Gain 4 electrons

✓ N would like to

Gain 3 electrons

✓ O would like to

Gain 2 electrons



# What happens when the valence shells are not full?

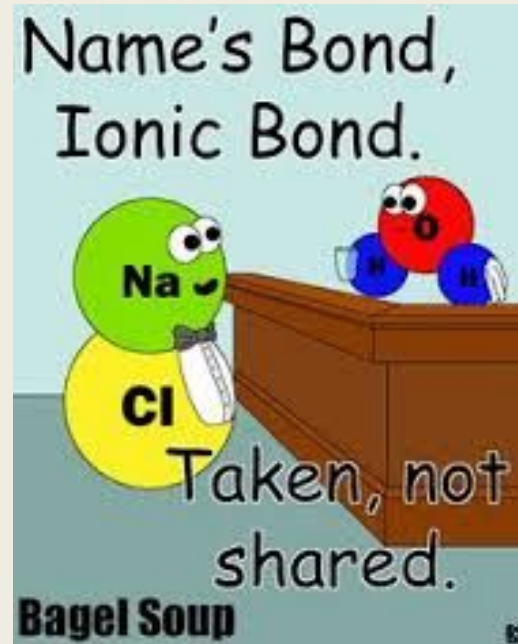
If the shells are not full, chemical bonds can occur in an attempt to fill them!

There are two main types of bonds

1. Ionic Bonds
2. Covalent Bonds

# IONIC BOND

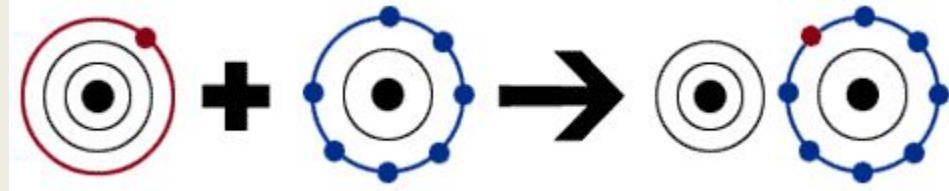
bond formed  
between two ions  
by the *transfer* of  
electrons





# What is an Ionic Bond?

So, let's say we've got a sodium atom that has an extra electron. We've also got a fluorine atom that is looking for one.



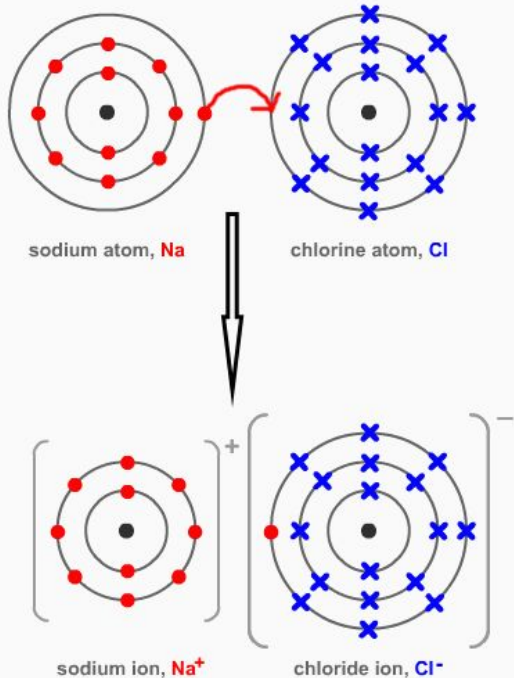
If an atom **loses** an electron becomes **positively** charged, like the sodium ion ( $\text{Na}^+$ ).

If an atom **gains** an extra electron, it becomes **negatively** charged like the fluorine ion ( $\text{F}^-$ ).

They then create an ionic bond

# What are Ionic Bonds?

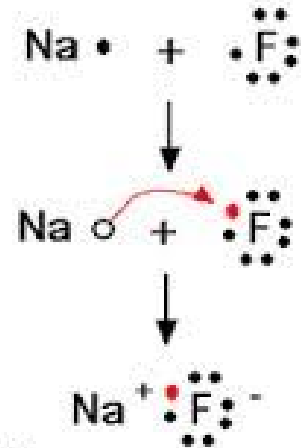
ionic bonding in sodium chloride



Positive and negative ions attract each other like magnets. This bonds them together.

The attraction of opposite charges is the way they form and maintain the bond.

Formation of an Ionic Compound  
Sodium Fluoride, NaF





# Shade in on your table

**Metals, Nonmetals, and Metalloids**

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Uub	—	Uuq	—	—	—	—

**metals**

**metalloids**

**nonmetals**

Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

# Discuss with Partner

- What type of elements do ionic bonds form between?
- Explain how a chemical bond would form between sodium and chlorine—which will be positive? Which will be negative?