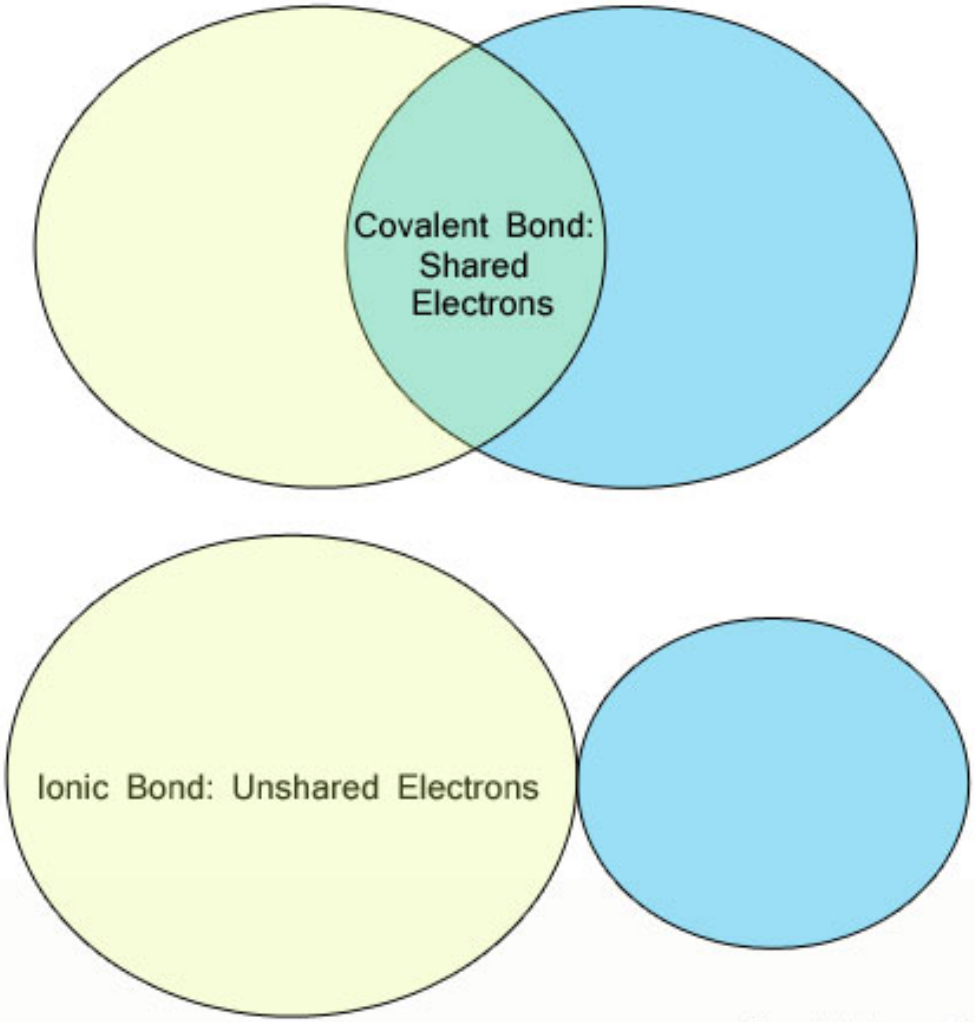
Covalent vs. Ionic Bonds in Chemistry

Yes... It Really Is This Simple.



Read More @DecodedScience.com

Major Bond Types

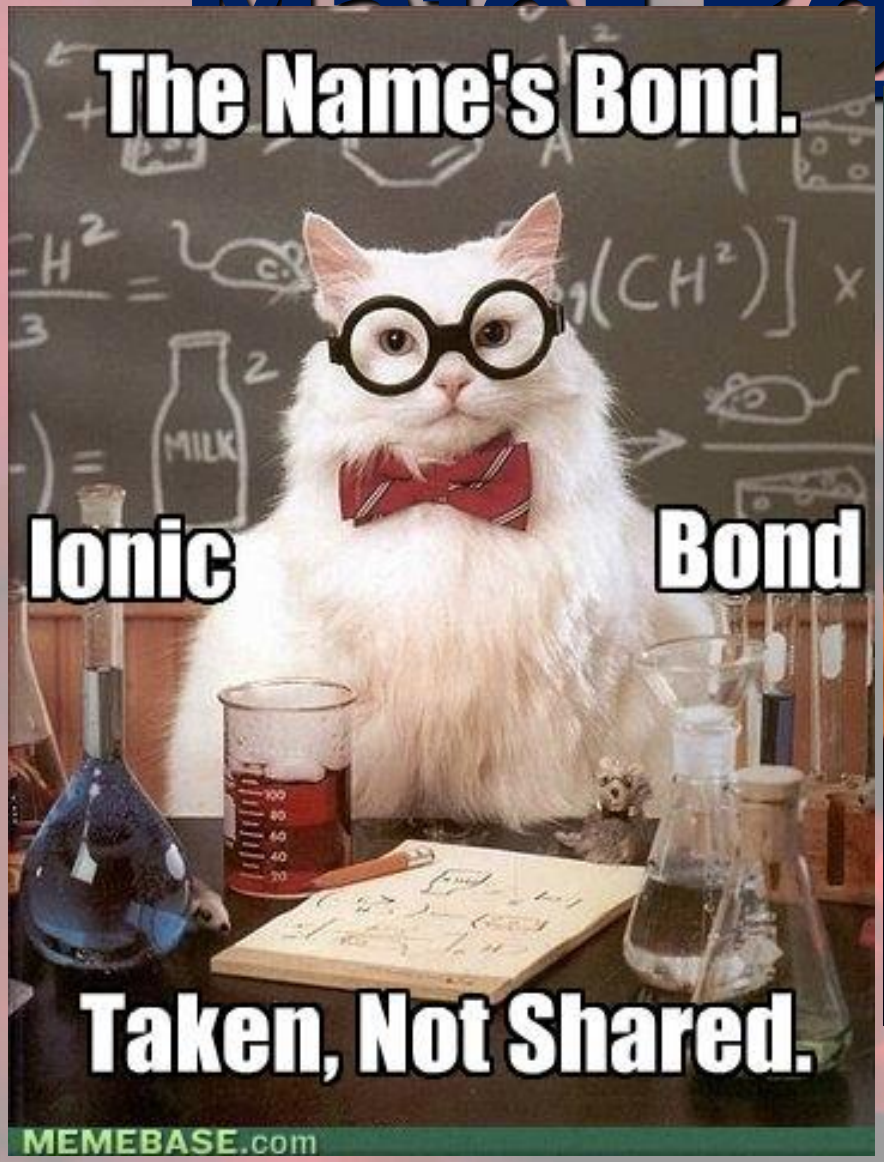
IONIC

e- are **transferred** from one atom to another

COVALENT

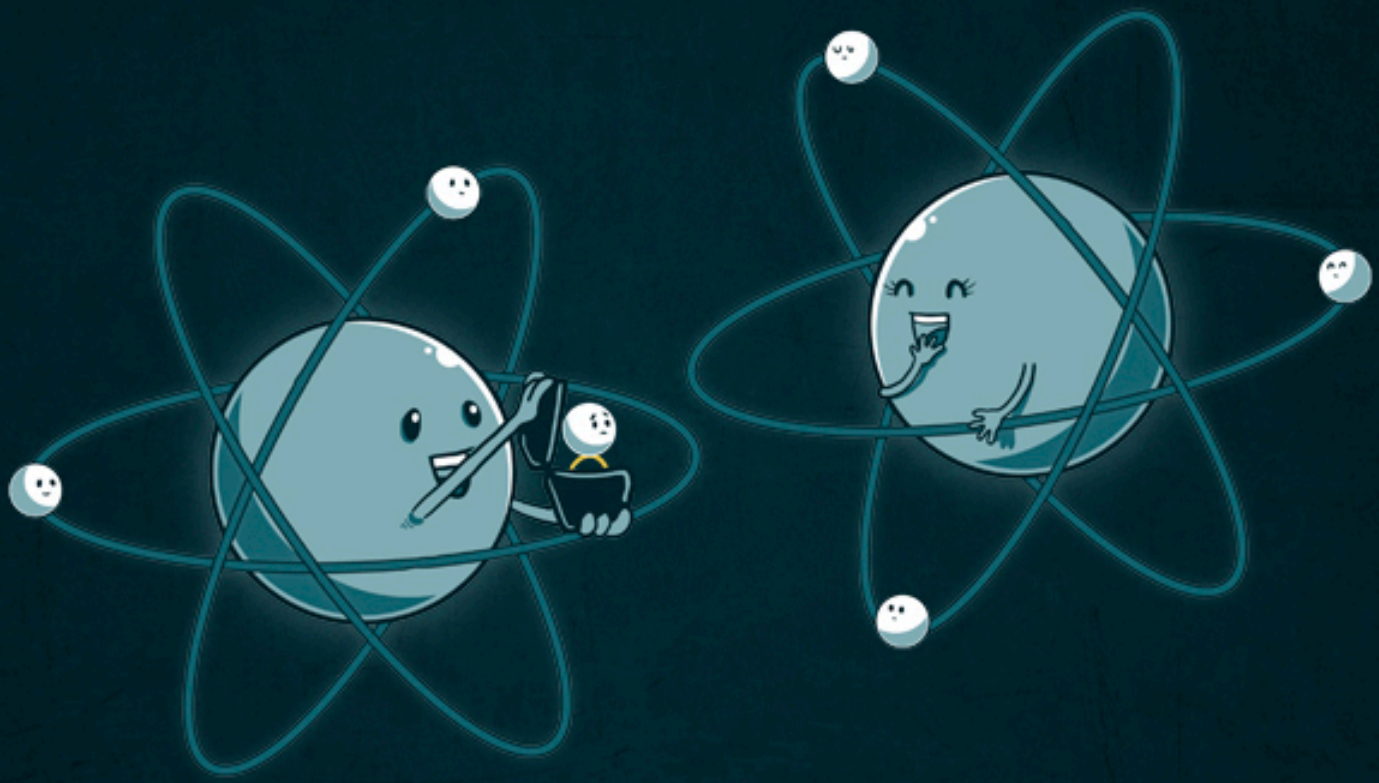
e- are **shared** between 2 atoms

Major Bond Types



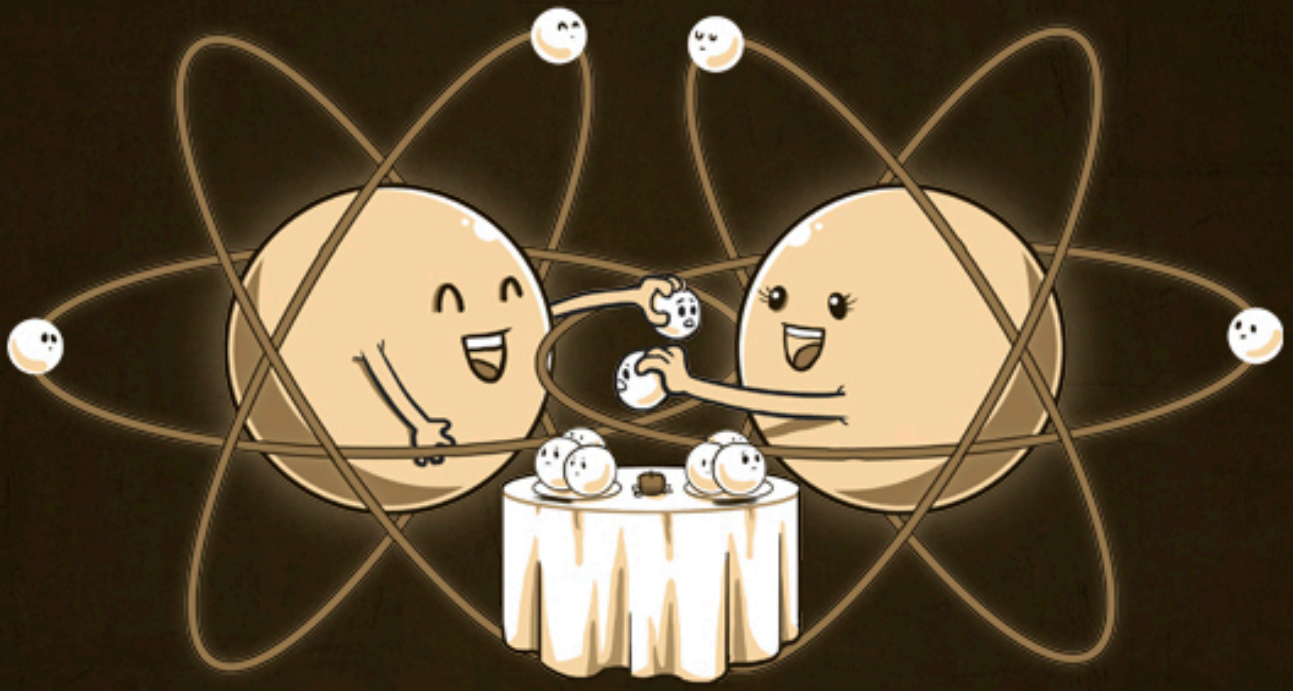
WHEN 7 IS NOT ENOUGH

TYPES OF CHEMICAL BONDS



#1: IONIC

TYPES OF CHEMICAL BONDS



#2: COVALENT

When does it occur?

IONIC

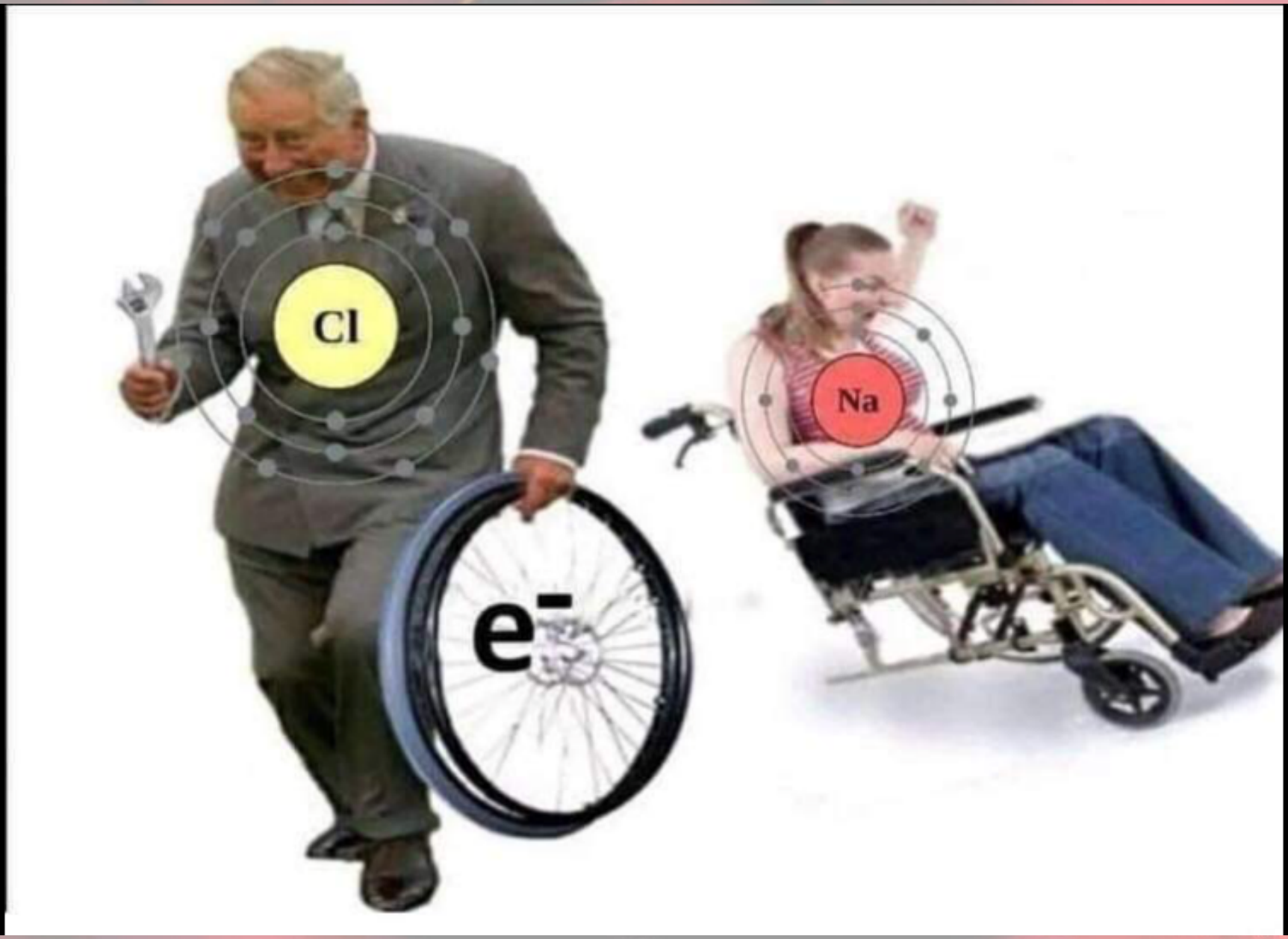
Formed between a **metal** and **non-metal**

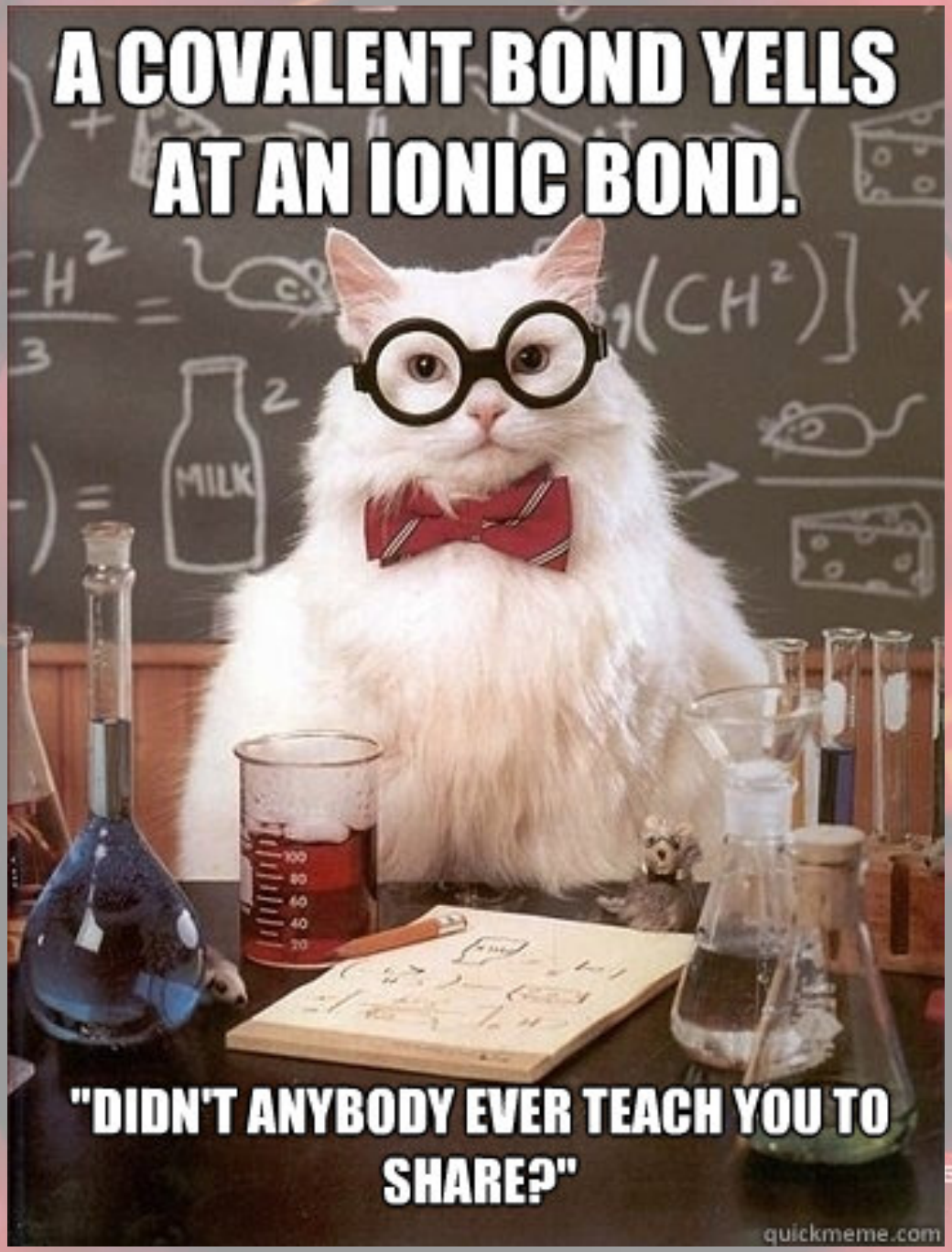
COVALENT

Formed between **2 non-metals**

Ionic Compounds (salts)

- Made up of
  - **positive** and **negative** ions
  - **cations** and **anions**
  - a **metal** and a **nonmetal**
- Smallest repeating unit- formula unit





THE COUNTDOWN HAS BEGUN

008

EN 7 IS NOT ENOUGH

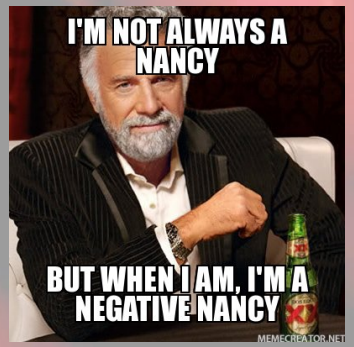
What holds atoms together?

IONIC

Electromagnetic forces;

cation/ anion

(opposites attract)



COVALENT

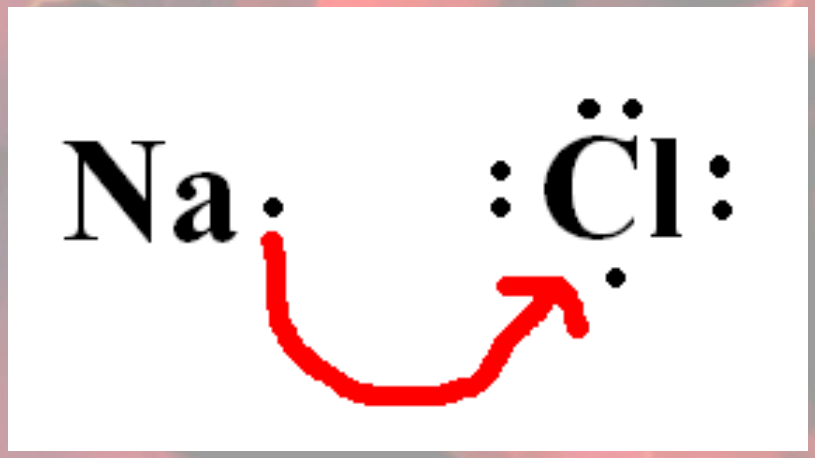
Shared attraction for same e-

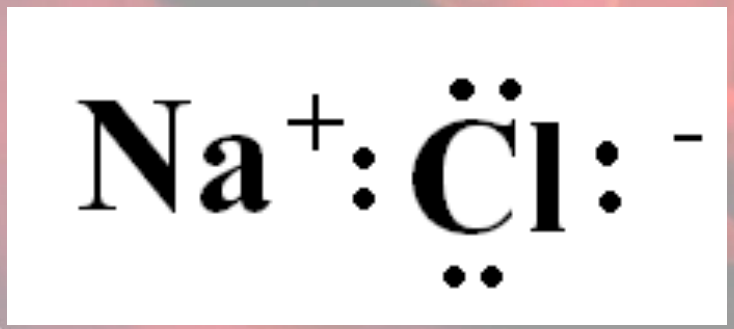
(+nucleus pulls on e-)

Polar: doesn't share equally

Nonpolar: shares equally

Lewis Dot of Ionic Bond





Cl "STEALS" Na's only e^- (dropping Na down to the next E level)

and brings Na along for the ride

Drawing Lewis Structures Covalent Molecules

1. Add up the **valence e⁻s** from **all** atoms in the formula *(if there's a charge, add e⁻ (anion) or subtract e⁻ (cation))*

2. Draw the **molecular skeleton**

- Place the **least EN** atom(s) in the **center**

*(More than one? Connect them 1st w/ a **single bond**)*

***NOTE: H is NEVER a central atom**

- Place other elements around the **center** and connect them with a **single bond**

- *In doubt? Put the element written **FIRST** in the formula in the **center** of the molecule*

Drawing Lewis Structures Covalent Molecules

3. Complete the **octets** of the **outer** (*MORE **EN**)* atoms **first**

4. Place **leftover e⁻s** on the **central** atom, *even if it violates the octet rule (as long as elelment is period 3 and above)*

5. If the central atom **does not** have an octet, create **multiple bonds** by **sharing** e⁻s with **outer** atoms

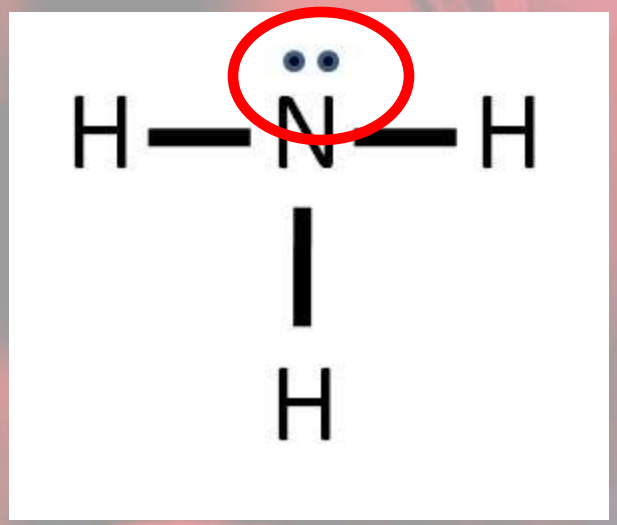
Example: PCl_3

Example: CO_2

Example: HCN

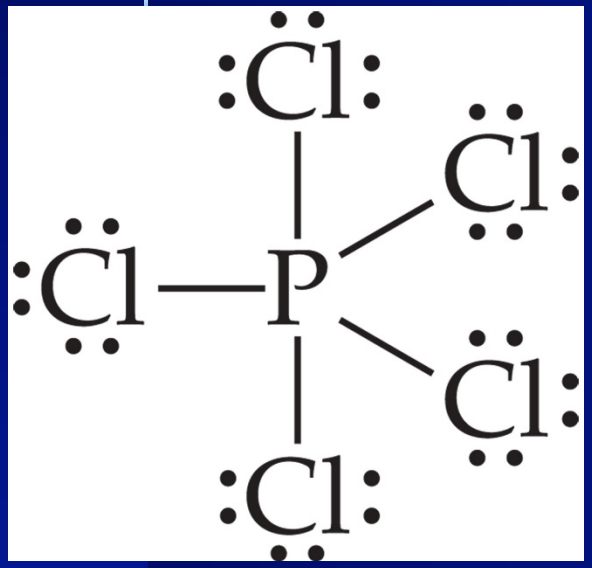
COVALENT BONDS

In **covalent bonds**, e^- are **shared** between 2 atoms. *(Remember the octet rule)*



Notice the 2 e^- on top of N? *(The ones NOT shared with a H)* These are called an **unshared pair or lone pair**. The e^- between N and H are called a **shared pair or bonded pair**.

Exceptions??? Expanded Octet



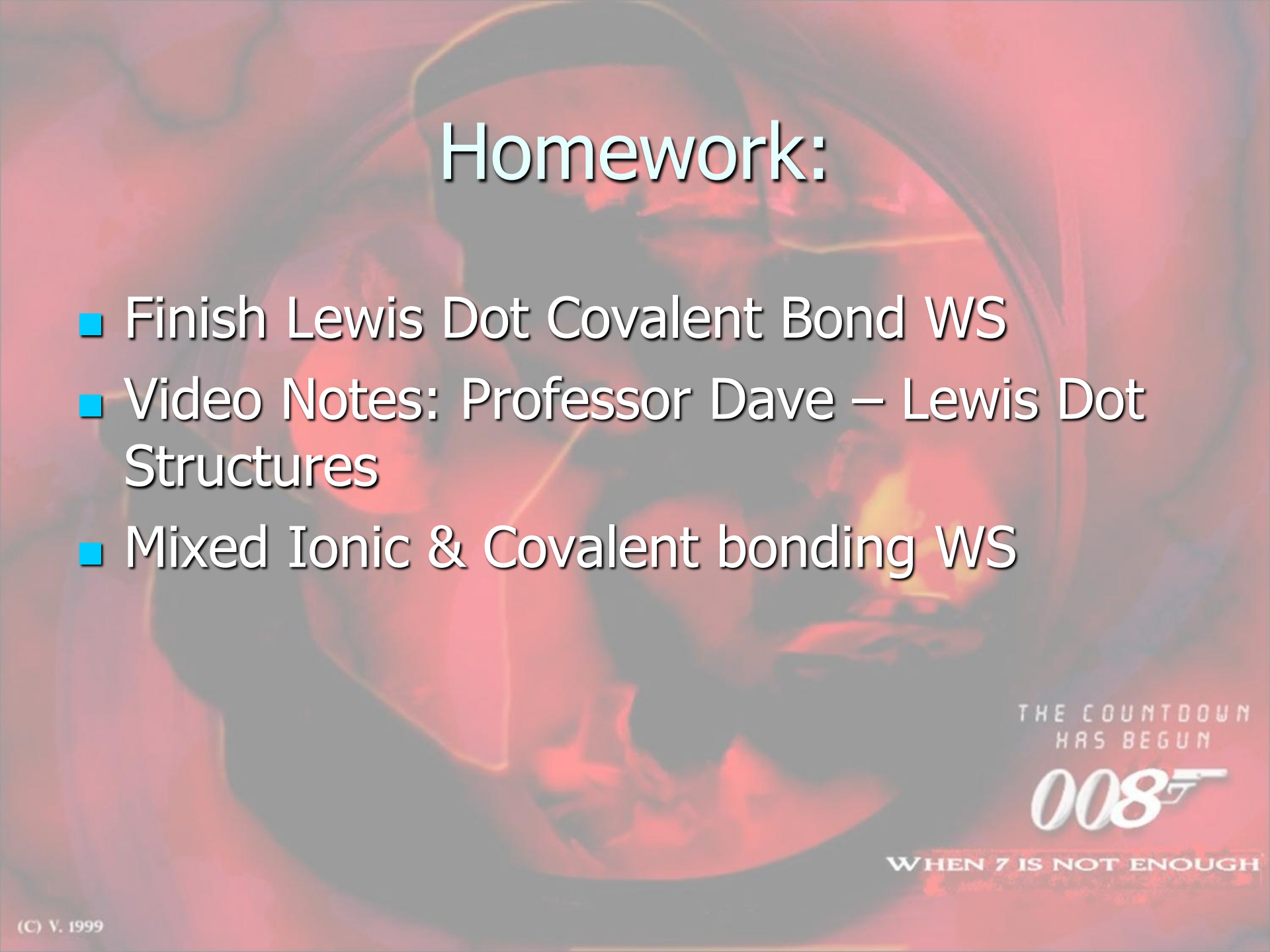
- An expanded octet (can have more than 8 to be fulfilled)
- Only for elements in 3rd row or below
  - *d* orbitals in these atoms participate in bonding

Dogs Teaching Chemistry

- https://www.youtube.com/watch?v=_M9khs87xQ8

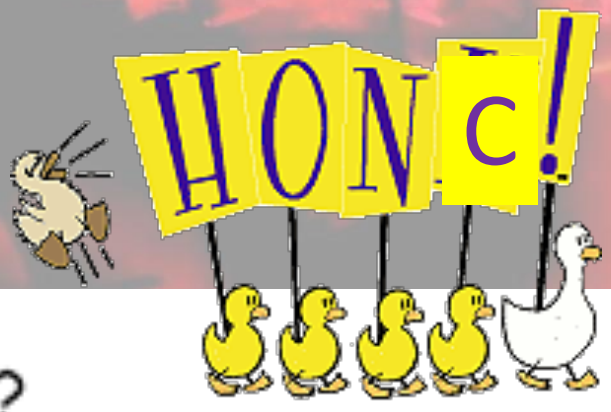
Homework:

- Finish Lewis Dot Covalent Bond WS
- Video Notes: Professor Dave – Lewis Dot Structures
- Mixed Ionic & Covalent bonding WS



Funny Little Thing About Covalents….

They like to

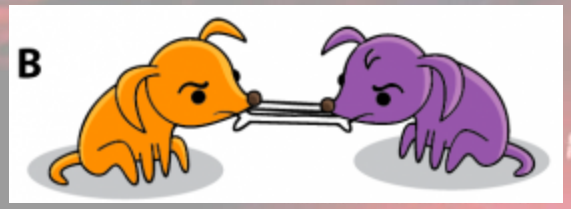


Why HONC?

	H	O	N	C
Valence electrons	1	6	5	4
# e- needed to have full valence shell	1	2	3	4
Covalent Bonds Formed	1	2	3	4

- Ionic bonds are the **strongest** bonds, so these compounds have **high melting points**

- Covalent bonds are **not as strong** as ionic because they **SHARE**,
  - **When atoms share e^-, they don't always share equally.**



Covalent Bonds	Ionic Bonds
Low melting and boiling points 	High melting and boiling points 
Softer and squishier 	Harder and inflexible 
More flammable 	Less flammable 
Not soluble in water 	Soluble in water 
Doesn't conduct electricity in water 	Conducts electricity in water 

Properties of Covalent Bonds

*(Recall: an atom's **electronegativity** is the measure of an atom's **attraction for e⁻** in a chemical bond)*

When atoms with **different** electronegativities form a covalent bond, the shared e- are **pulled towards** the atom that is **more electronegative.**