

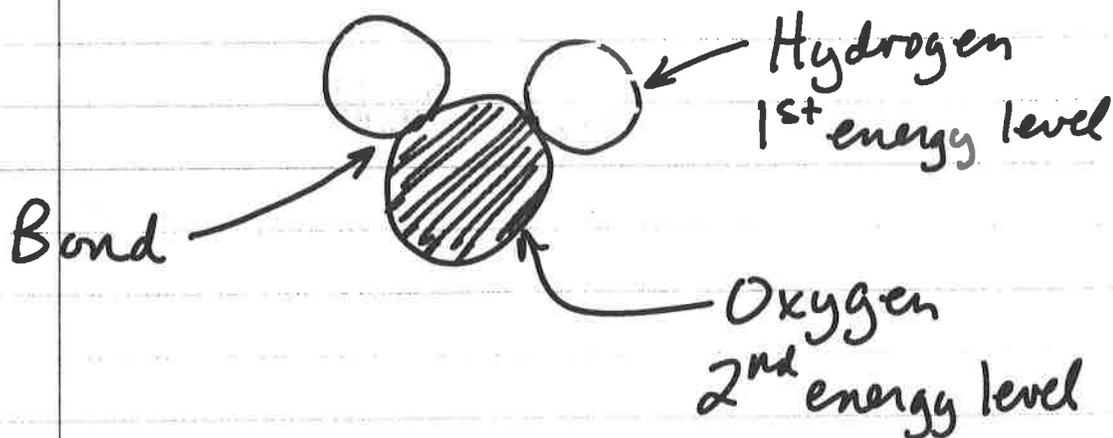
Pre-lab 5.1 Chemical Bonds

Note Title

3/31/2008

A chemical bond is the force that holds atoms together in a molecule.

Ex. in Water " H_2O "



Three things to understand about bonds:

1. Bonds form between the valence electrons of each atom

"the outermost electrons"

2. Bonds are electric attraction

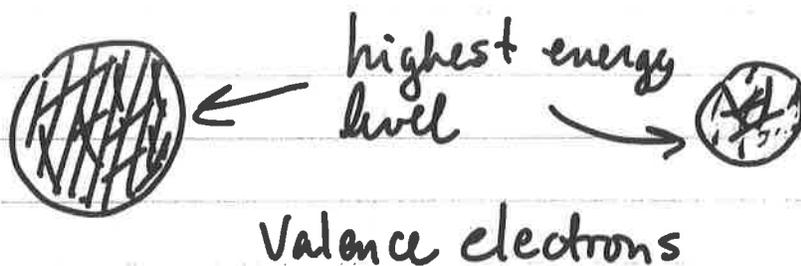
"+ nucleus to - electron"

3. There is potential Energy in a bond.

"It takes Work to make a bond"

Let's look at how water " H_2O " is made

1. Oxygen Atom Hydrogen Atom



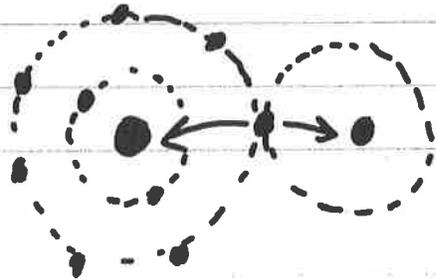
When they Bond



they touch here

Why do they stay together?

2. Oxygen Hydrogen Hydrogen

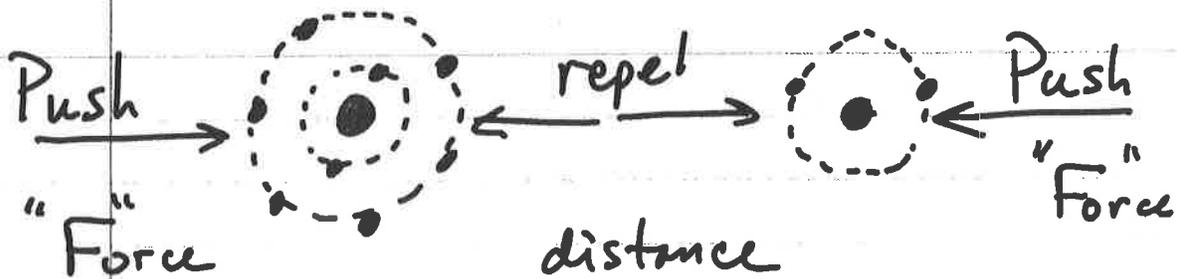


The electron they share is equally attracted to both nuclei

3. Energy in the bond:

I takes work to push the two atoms together - they repel

Oxygen Hydrogen



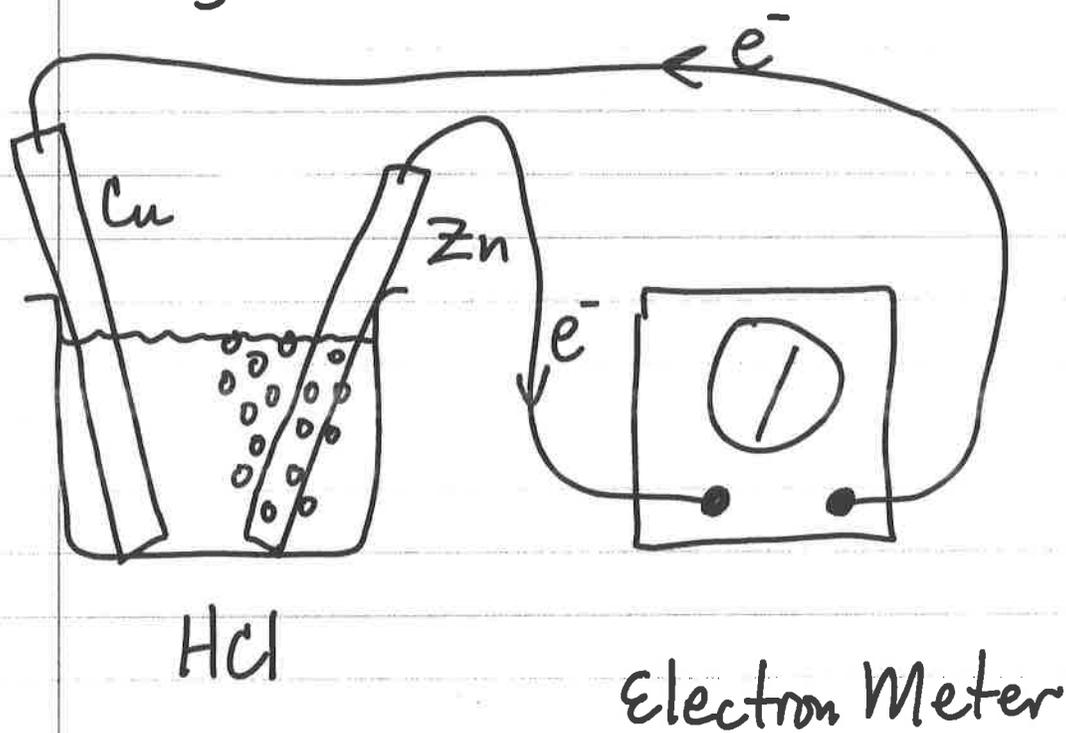
$$\text{Work} = \text{Force} \times \text{distance}$$

When they bond, this work is Potential Energy!

If the bond is released it's Kinetic E.

Bonds happen in chemical Reactions

Battery Demo:



In the beaker HCl is "eating away" the Zinc making:

- H_2 gas

- Zinc Chloride " $ZnCl_2$ "

- electric current

- heat

This is a chemical reaction

3 things that always happen in a chemical reaction:

1. New substances

2. Flow of Valence Electrons "current"

3. Energy "Heat, Light or Sound"

Identifying Metals						
	Ni	Fe	Cu	Mg	Zn	Pb
Magnetism	yes	yes	no	no	no	no
Color	silver	black	red	silver	silver	black
Hydrochloric Acid	no	yes "weak"	no	yes "strong"	yes "med."	no
Nitric Acid	yes "green"	yes "orange"	yes "blue"	yes "clear"	yes "clear"	yes "white"

Post-lab 5.1

Ionization: the process of creating ions

What's an ion?

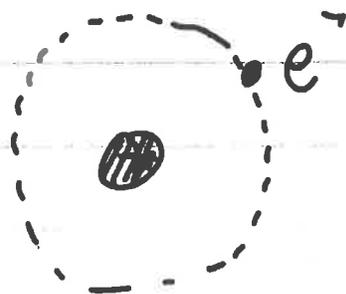
Ions are charged particles
can be atoms or molecules

How do you make an ion?

"Add" or "Remove" electrons

Use Hydrogen as an example:

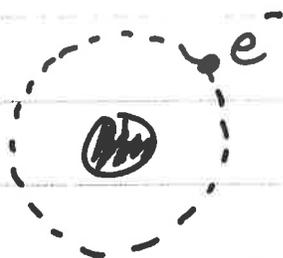
Normally



1 proton "+1" 1 electron "-1"

Atom is neutral because "+1" + "-1"
= 0

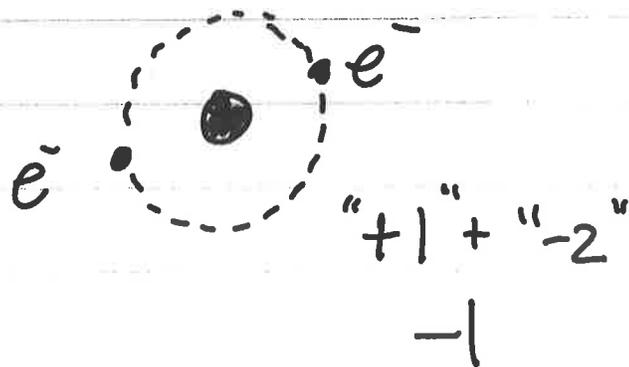
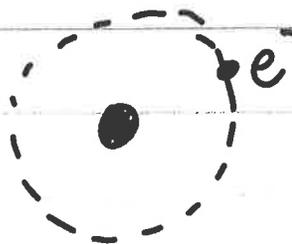
What if the electron is removed?



the charge is now "+1"

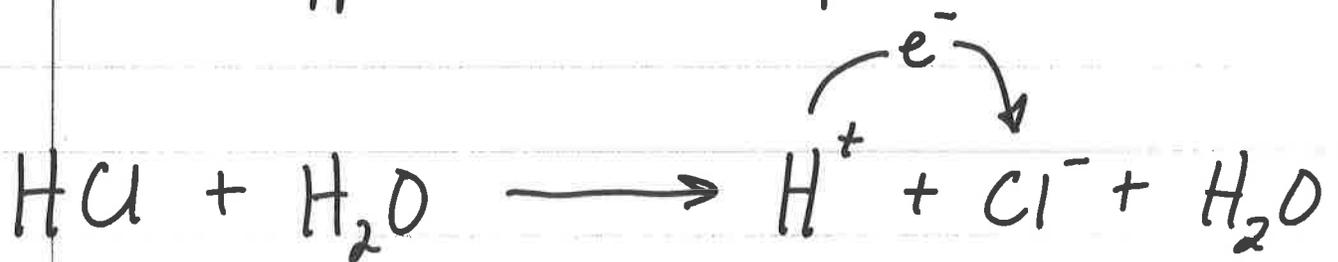
Written: H^+ Positive Hydrogen Ion

What if an electron is added?



Written: H^- negative Hydrogen Ion

What happens when I put HCl in water?



2. Physical & Chemical Properties

Physical: I can observe it without changing the substance.

Color, Magnetism, Density

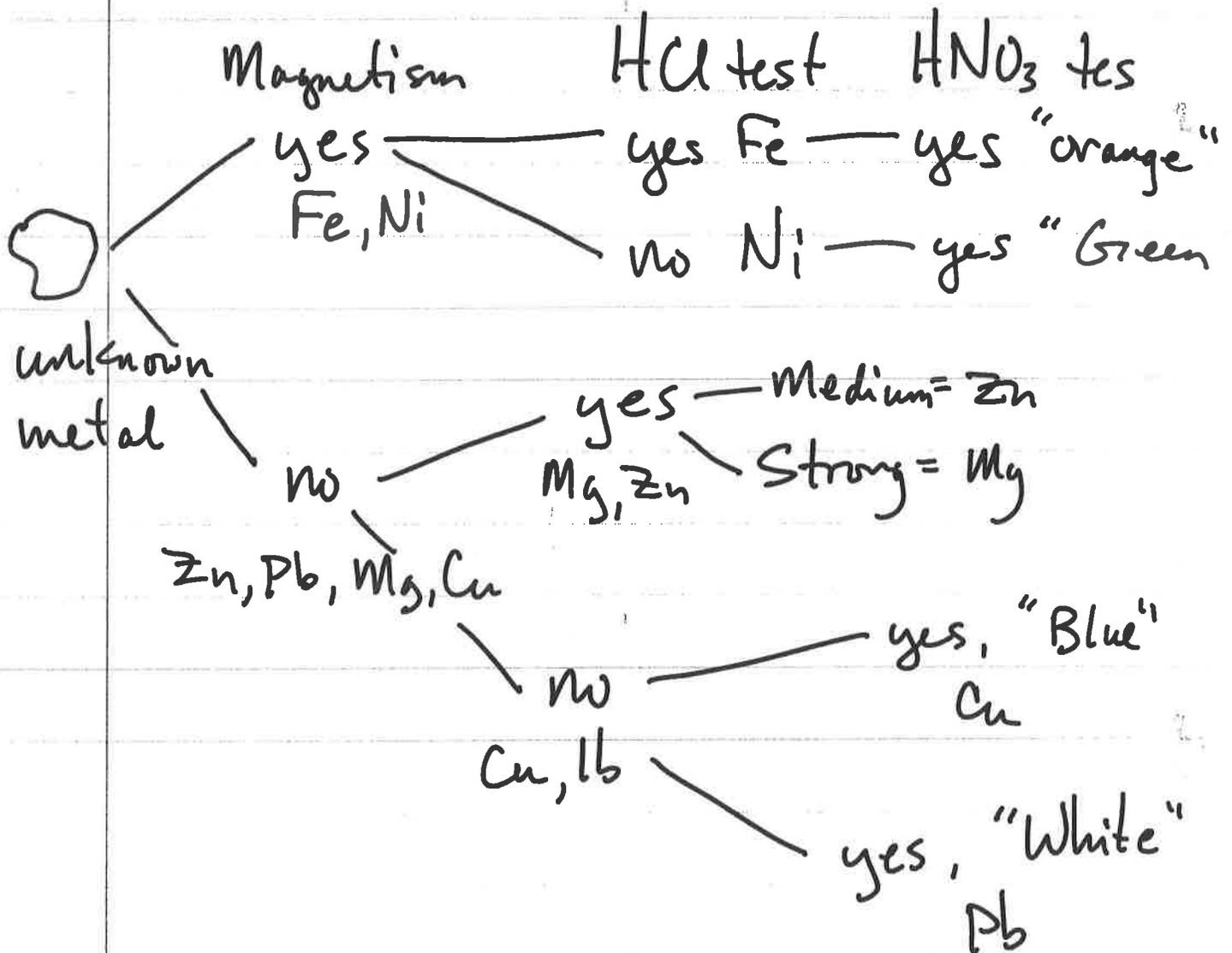
Chemical: I can only observe it by a chemical reaction

Reactivity, Flame Test, Calorie Content

Flow Chart to Identify:

Fe, Ni, Mg, Cu, Zn, Pb

Nitric Acid



Pre-lab 5.2 Chemical Bonds

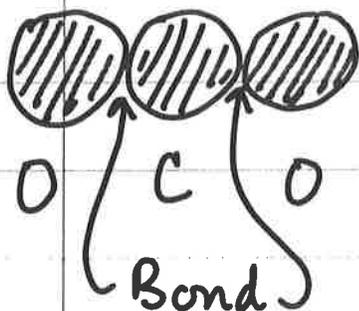
Note Title

3/21/2011

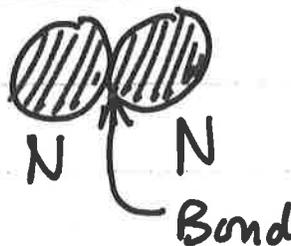
Chemical Bonds:

* Force holding atoms together in a molecule.

Carbon Dioxide "CO₂"



Nitrogen "N₂"



* Bond always occurs where the highest energy levels meet.

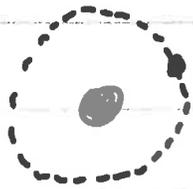
These are the valence electrons

Electron Dot Diagram shows the valence electrons

" EDD "

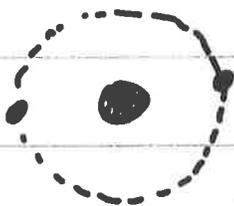
Watch for a pattern

H



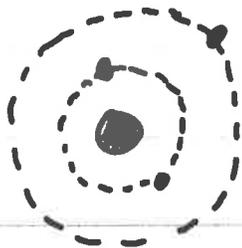
H•

He



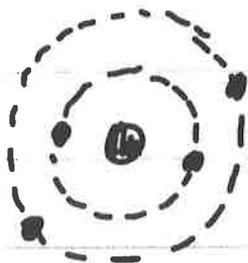
He••

Li



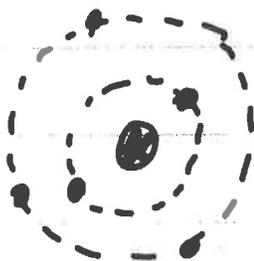
Li•

Be



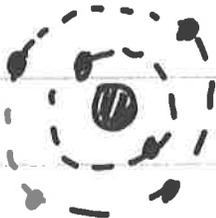
Be••

B



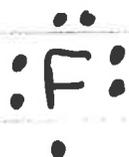
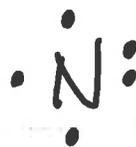
•B•

C



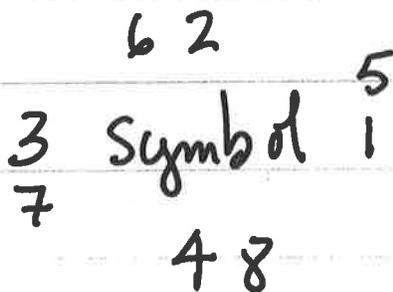
•C•

N



* only show valence electrons

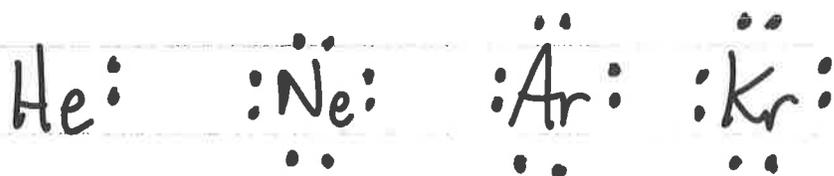
* arranged like this:



* 1 exception: $\text{He} \cdot$

you can't make a bond where there's a pair, so Helium is inert

Note: Column 8 elements:



all "full" so they're inert

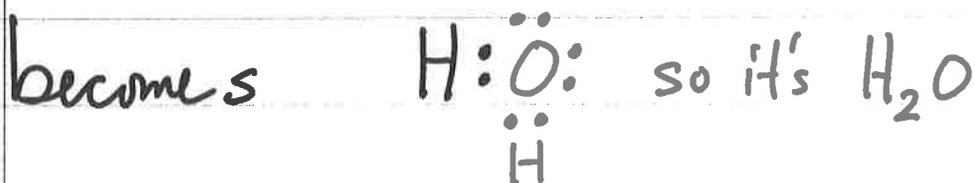
Column 1 elements:



all have the same "E D D"

so they all bond the same way!

How's this going to be used?



For tomorrow's Lab:

Bring: 1 pre-1980 Penny
"all copper"

the newest, cleanest nickel,
dime, or quarter you can
find.

Current Used During Electroplating	
Amps to Nickel	0.46 Amps

0.46 coulombs/sec

These coulombs are flowing valence electrons!

Post-lab 5.2 Bonding

Two pieces of data:

- copper-plated coin "taped in"
- Data Table with your current

* In this lab there was a chemical reaction:

- electric current ✓
- new substance ✓ "copper"
- solution got warm "heat" ✓

Take a closer look at Electrical Current:

Continuity Tester:

Tests a solution to see if it conducts electricity.

Post-lab 6.2

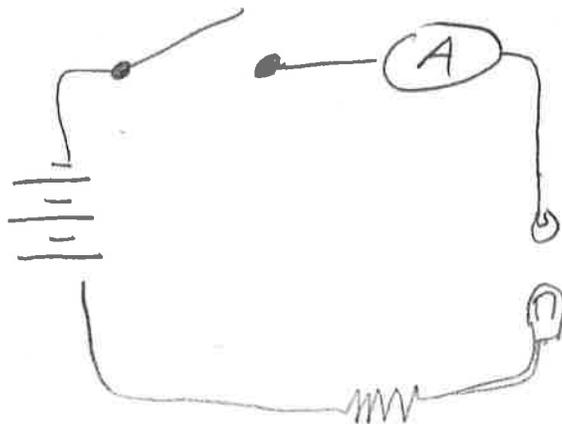


Demo: Test solutions for continuity

Pure water does not conduct

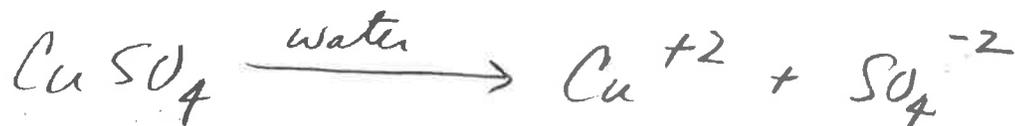
Water and HCl does conduct

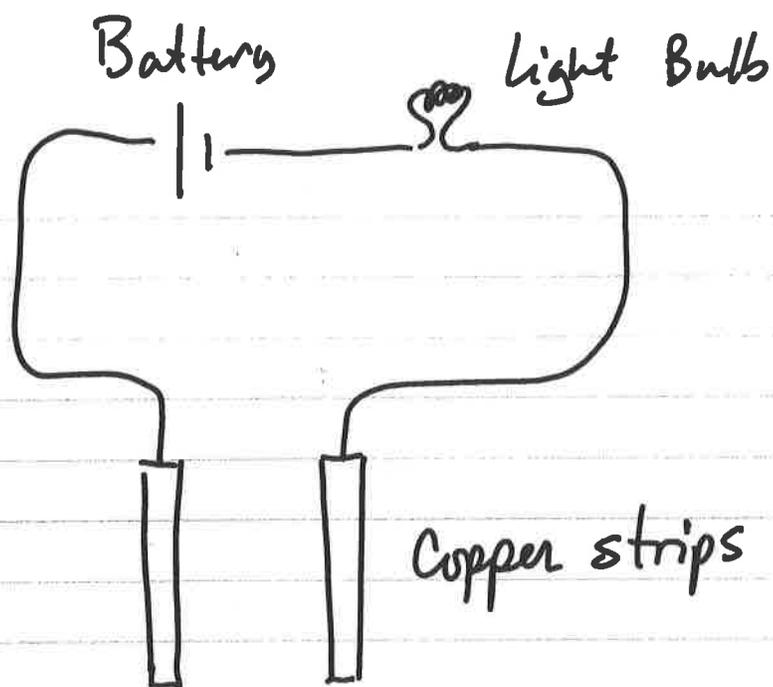
Water and sugar does not conduct



If there are ions in water, it conducts electricity!

Copper Sulfate in water conducts electricity, so





Tested water: not a conductor

HCl in water is a conductor Why?

Hydrochloric Acid ionizes in water



ions conduct electricity

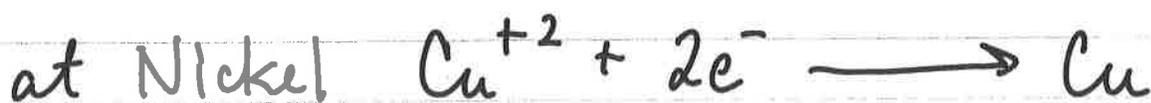
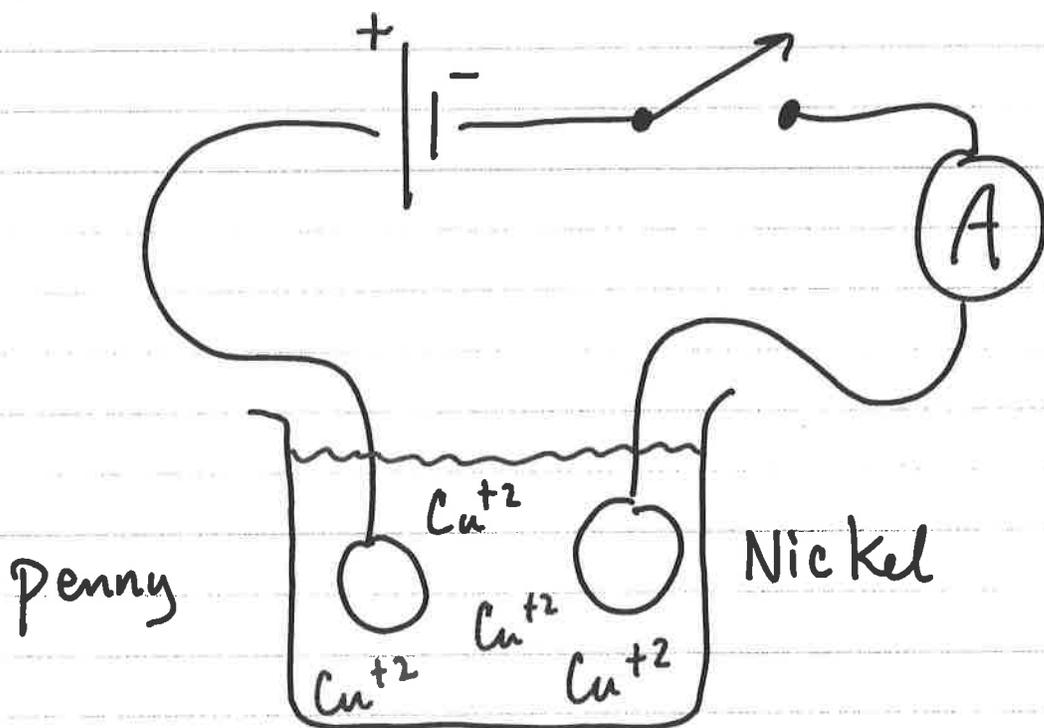
Copper Sulfate does conduct electricity

so it ionizes



Copper ion: "lost 2 electrons"

Our Lab:



Penny loses electrons ξ copper ions

Nickel gains electrons ξ copper ions

Cu ions bond to the nickel

So a bond is:

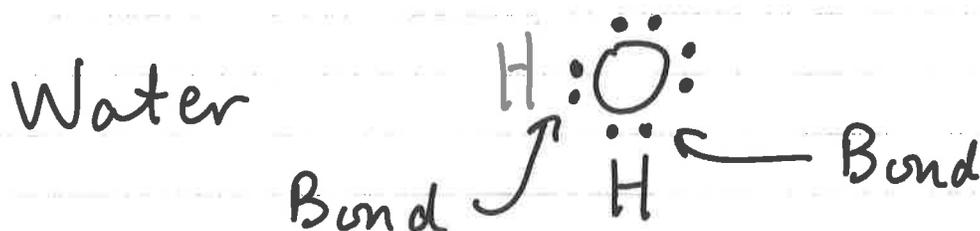
- The Force holding atoms together
- A pair of valence electrons

What happens when Hydrogen meets Oxygen?

H• Can form
one bond
each

••••
•Ö•• Can form
two bonds

H• "Boom" new substance



Notice all highest Energy levels are full, can't react anymore

The inert gases are inert because their valence electrons are already pairs

Can't make bonds: can't "react"



