

Chemical Bonds

Why do atoms stick together?



Objectives:

- Describe why chemical bonds are formed.
- Describe and model an ionic bond.
- Describe and model a covalent bond.
- Describe the difference between an ion and an atom.
- Describe the difference between a molecule and a compound.

Why do atoms bond together? Atoms bond together to fill up their "outermost" energy level.

Stability – an atom is stable if its "outermost" energy level is filled up.

THIS IS HYDROGEN'S
OUTERMOST LEVEL

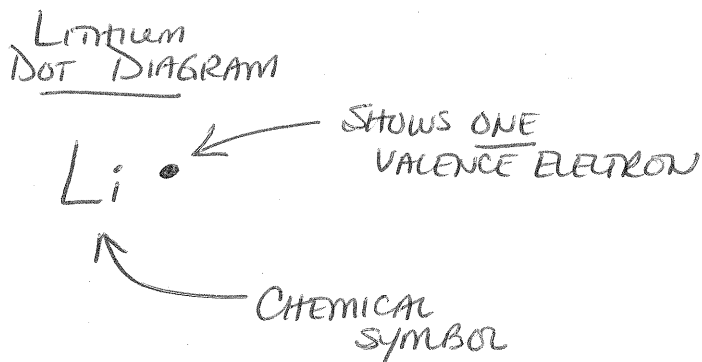
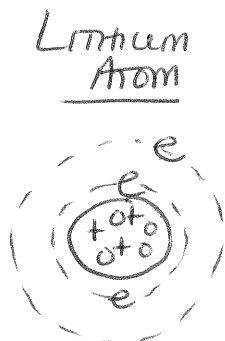
Atom	Protons	Neutrons	Electrons	1 st Energy Level	2 nd Energy Level	3 rd Energy Level	Stable?
Hydrogen	1	0	1	1			NO
Sodium	11	12	11	2	8	1	NO
Neon	10	10	10	2	8		YES
Chlorine	17	18	17	2	8	7	NO
Oxygen	8	8	8	2	6		NO

THIS IS SODIUM'S
OUTERMOST
LEVEL

Chemical Bond - THE ATTRACTIVE FORCE THAT HOLDS TWO OR MORE ATOMS TOGETHER; ATOMS BOND TO BECOME STABLE.

Valence Electrons - THE ELECTRONS IN THE OUTERMOST ENERGY LEVEL ONLY.

Dot Diagrams – a diagram that shows the chemical symbol and dots representing only valence electrons.



* USE BOOK PAGES FOR VOCAB WORDS.

To become stable, atoms can GAIN, LOSE, or SHARE electrons.

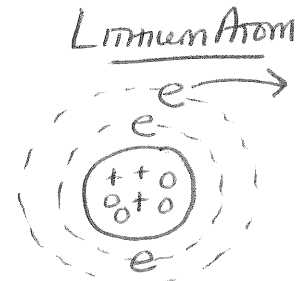
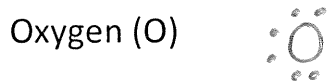
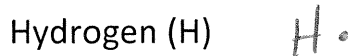
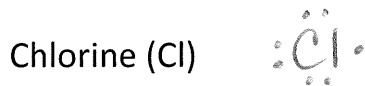
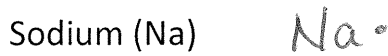
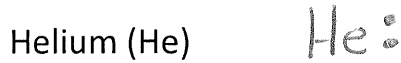
Types of Chemical Bonds

Covalent Bonds	Ionic Bonds
<ul style="list-style-type: none"> • FORMED WHEN BOTH ATOMS NEED ELECTRONS. • A SHARING OF VALENCE ELECTRONS. 	<ul style="list-style-type: none"> • FORMS WHEN ONE ATOM LOSES ELECTRONS (BECOMING A POSITIVE ION) AND ANOTHER ATOM GAINS ELECTRONS (BECOMING A NEGATIVE ION)

Ionic Bonds

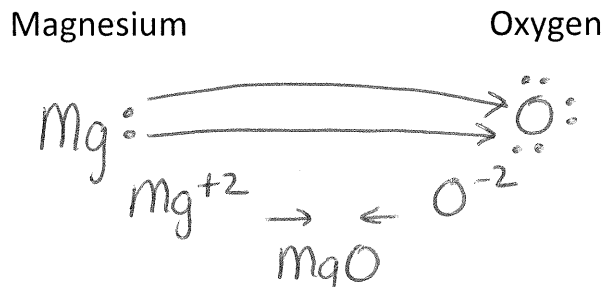
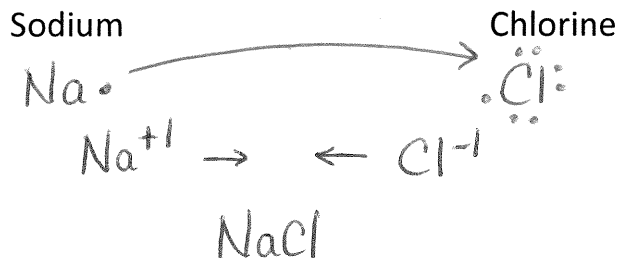
Ion - AN ATOM THAT HAS GAINED OR LOST ELECTRONS AND NOW HAS A POSITIVE OR NEGATIVE CHARGE.

Draw a Dot Diagram for the following atoms...



IF LITHIUM LOSES ONE ELECTRON TO BECOME STABLE, IT TURNS INTO A Li^{+1} ION.

Draw dot diagrams below the atoms then show how electrons are gained and lost.



What happens to an atom when it gains an electron? THE ATOM BECOMES MORE

What happens to an atom when it loses an electron? THE ATOM BECOMES MORE

Covalent Bonds

Molecule - TWO OR MORE ATOMS THAT ARE COVALENTLY BONDED; SHARING ELECTRONS.

Draw a dot diagram of the atoms below and show a sharing of electrons.

Hydrogen

Fluorine



HF

Oxygen

Oxygen

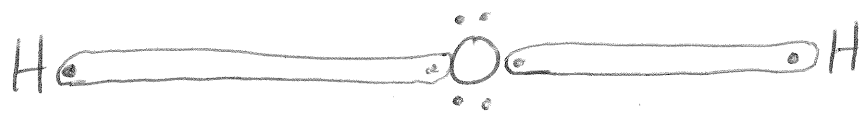


O₂

HYDROGEN

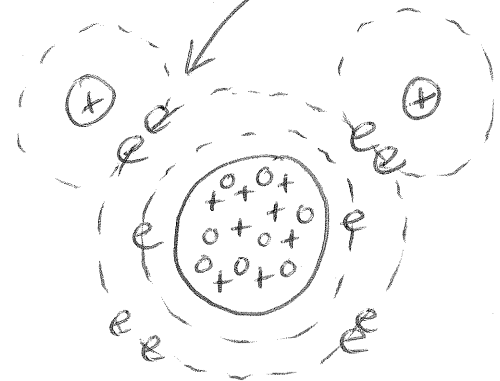
OXYGEN

HYDROGEN



SHARING ELECTRONS

THIS IS WHAT THE ACTUAL COVALENT BOND THAT FORMS WATER LOOKS LIKE →



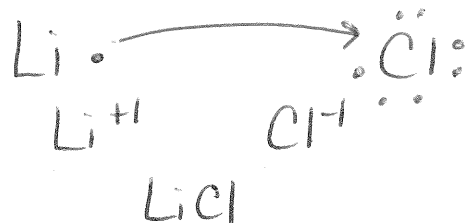
CHEMICAL BONDING

Element	Symbol	Dot Diagram showing valence electrons only (outer most energy level of electrons)	Stable or Unstable? (Is the outer most energy level completely filled with electrons?)	How many electrons does it need to gain or lose to become stable?
Hydrogen	H	H \cdot	UNSTABLE	GAIN OR SHARE 1
Helium	He	He $:\cdot$	STABLE	—
Lithium	Li	Li \cdot	UNSTABLE	LOSE 1
Carbon	C	$\cdot\overset{\cdot}{\underset{\cdot}{\text{C}}}\cdot$	UNSTABLE	GAIN 4 LOSE 4 SHARE 4
Aluminum	Al	Al $:\cdot$	UNSTABLE	LOSE 3
Sulfur	S	$:\overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{S}}}\cdot$	UNSTABLE	GAIN 2 SHARE 2
Chlorine	Cl	$:\overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{Cl}}}\cdot$	UNSTABLE	GAIN 1 SHARE 1
Argon	Ar	$:\overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{Ar}}}\cdot$	STABLE	—

TYPES OF BONDING: IONIC OR COVALENT

- A. Identify which type of bonding is happening in each situation below. (Ionic or Covalent)
 B. Explain your answer.

1.

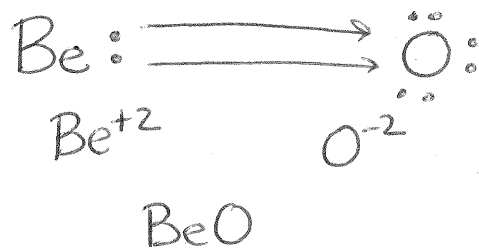


* TYPE OF BONDING: IONIC BOND

* EXPLANATION: LITHIUM IS LOSING ONE ELECTRON BECOMING POSITIVELY CHARGED. CHLORINE IS GAINING ONE ELECTRON BECOMING NEGATIVELY CHARGED. THESE TWO OPPOSITELY CHARGED IONS ATTRACT.

Go to back for more!

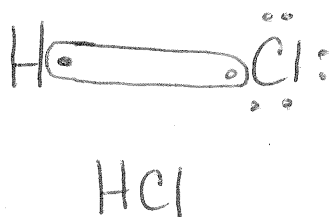
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* TYPE OF BONDING: Ionic Bond

* EXPLANATION: Beryllium is losing two electrons becoming positively charged. Oxygen is gaining two electrons becoming negatively charged. These two oppositely charged ions attract.

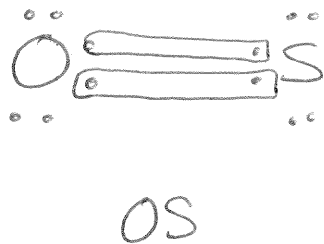
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* TYPE OF BONDING: Covalent Bond

* EXPLANATION: Hydrogen and Chlorine both need to gain one electron to become stable. They come close together overlapping their outermost levels and share one electron each.

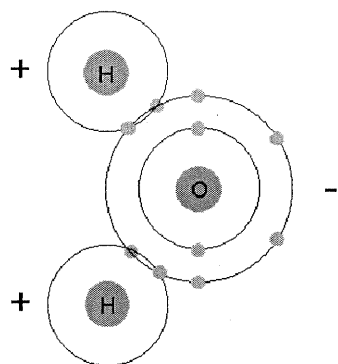
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* TYPE OF BONDING: Covalent Bond

* EXPLANATION: Oxygen and Sulfur both need two electrons to become stable. They overlap their outermost energy levels and share two electrons each.

Ions and Bonding Practice Quiz



1. In the box provided, write how many protons and electrons each **ion** contains.

Ion	# of protons	#of electrons
P^{3-}	15	18
Fe^{+2}	26	24
Rb^{+}	37	36
S^{-2}	16	18

2. In the box provided, write the ion that each element will form. *If the element is stable and will not form an ion, then in the ion box write "stable"*

Element	Dot Diagram	Number of electrons lost or gained	Ion formed
Lithium	Li•	LOST ONE	Li^{+1}
Argon	:Ar:	STABLE	—
Aluminum	Al•••	LOST THREE	Al^{+3}
Hydrogen	H•	LOST ONE GAINED ONE	H^{+1} H^{-1}
Oxygen	:O••	GAINED TWO	O^{-2}
Neon	:Ne:	STABLE	—
Iodine	:I••	GAIN ONE	I^{-1}