

AR Chemistry Review Notes 1

Positions in the table

H	He										H					He	
Li	Be	Transition Metals										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

Metals: To the LEFT and BELOW the STAIRCASE, not touching the sides

Exceptions: Al is a metal, H is a nonmetal

Nonmetals: To the RIGHT and ABOVE the STAIRCASE, not touching the sides (**and H**)

Semimetals / Metalloids: Touching the SIDES of the STAIRCASE (**exception: Al is a metal**)

Main Groups

Group Number	1	2	3	4	5	6	7	8
Top Member	Li	Be	B	C	N	O	F	He
Special Name	Alkali Metals	Alkaline Earth Metals	x	x	x	x	Halogens	Noble Gases
Types of Elements	Metals	Metals	Semimetal Metals	Nonmetals, Semi, Metal	Nonmetals, Semi, Metal	Semimetals Nonmetals	Nonmetals	Nonmetals
# Electrons For Bonding	1	2	3	4	3	2	1	0
Ionic Charges	+1	+2	+3	xxxxxx	-3	-2	-1	xxxx
Covalent Bonding ??	NO	NO	NO	Yes: non- and semi's	Yes: non- and semi's	Yes: non- and semi's	Yes: non- and semi's	xxxx

Types of Bonding

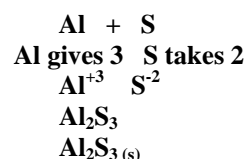
IONIC: Metal + Nonmetal

Metal Gives electron(s) Nonmetal Takes electron(s)

Get Charges

Shoot 'em Down and Simplify

All Ionic Compounds Are Solids At Room Temperature

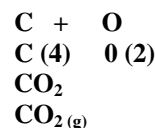


COVALENT: Semimetals / Nonmetals or Nonmetals / Nonmetals

Determine number of bonds they "want" [= ionic charge]

Fit them together

Gases, Liquids, Low Melting Solids At Room Temperature



Physical States of Elements

Meister HOFBrINCl drinks two rootbeers:

Has GAS from eating stinky BrI cheese:

He cries (liquid), friends give him Bear Hug

All the other elements are Solids

He drinks lots of soda and has to P₄ a long time

He is content, or satiated

Gets hit in head with a graphite soccer ball

Diatomic Molecules H₂ O₂ F₂ Br₂ I₂ N₂ Cl₂

Remove Cheese, Gases = H₂ O₂ F₂ N₂ Cl₂

Br_{2(l)} Hg_(l)

I_{2(s)} and everything else except **noble gases**

P₄

S₈

C₆₀

Relative Sizes of Atoms and Ions By Analogy (Same Period)

Atoms Metals⁰ **big** (want to give away electrons)

Nonmetals⁰ **small** (want more electrons)

Ions Metals⁺⁺ **small** (lost electrons)

Nonmetals⁻ **big** (gained electrons)

Periodic Trends

Ionization Energy: Energy to knock electron away

Electronegativity: Attraction to gain more electrons

Atomic Radius: Avg distance between two nuclei

Ionic Size: Avg distance between two nuclei of ions

Increases Right and Up: He is largest

Increase Right and Up: F is largest

Increases Left and Down: Fr is largest

Increases Right and Down

Atomic Information

99% of atom is empty space -- nucleus contains protons and neutrons in the middle

P⁺¹ and N⁰ in nucleus, have about the same mass [1 atomic mass unit]

e⁻¹ is about 1860 times smaller than P⁺¹ and N⁰ [0 atomic mass unit]

ISOTOPEs: same element, different mass [# N⁰], same chemical properties

³⁹K⁰ 19 Protons (P⁺¹) [At #] 20 Neutrons (N⁰) [subtract] 19 electrons (e⁻¹) [neutral]

⁴⁰K⁺¹ 19 Protons (P⁺¹) [At #] 21 Neutrons (N⁰) [subtract] 18 electrons (e⁻¹) [+1 charge]

Types of Bonding

Type	Element Types	Bond Type	Crystal Pattern	Physical States	Conduct Electricity
Ionic	Metal + Nonmetal	Give / Take e ⁻¹	3d + / - Lattice	All Are Solids	liquid or aqueous
Covalent	Nonmetals (semi-)	Orbital Overlap	IMA pattern	Sol, Liq, Gas	NO (except acids)
Metallic	Neutral Metals	Ions and loose e ⁻¹	ions and e ⁻¹ cloud	Solids (Hg liquid)	Always
Covalent Network	Non, Semi	3d Orbital Overlap	3d Bonding	Sol [sand, diamond]	NO

Intermolecular Attraction

Not Bonds, but due to electron movements and polarity

Solids: particles 1 unit apart, high IMA, can't move out of crystal pattern

Liquids: particles 1 1/8 unit apart, medium IMA, can move around each other

Gases: particles 1000 units apart, **no IMA**, move randomly to fill up area

IMA, Ea (activation energy), and VP

High IMA

High Ea

low VP

low evaporation rate

low IMA

low Ea

High VP

High evaporation rate

Lewis Dot Structures

Steps:

1. Count the electrons (group number)

CO₂ = 4 + 6 + 6 = 16

2. Draw Skeleton and subtract 2 e⁻¹ for bonds

O - C - O 16 - 4 = 12

3. Place e⁻¹ in pairs until you run out

xx xx
xxO - C - Oxx
xx xx

4. Make multiple bonds as necessary

xx xx
xxO = C = Oxx