9/17/2018

Chemical formulas + Molecular Models

Chemical formula: indicates # atoms of each element.

ex:  ⇝ H_2O_2

subscript #

element symbol

 ⇝ H_2O

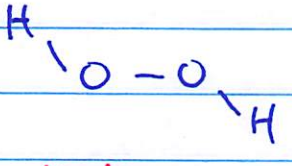
omit #1 in general.

- Molecular formulas ~ shows count of #atoms in molecule
- Empirical formulas ~ shows simplest whole # ratios

	Molecular formula		Empirical formula	
ex:	H_2O_2	$\xrightarrow{\div 2}$	HO	($\div$ greatest common factor, 2)
	2:2			
ex:	C_3H_6	$\longrightarrow$	CH_2	($\div 3$)
	3:6		1:2	
ex:	H_2O	$\longrightarrow$	H_2O	($\div 1$)
	2:1		2:1	

Structural formula ~ draw lines between atoms to show covalent bonds.

ex: $H-O-O-H$ (OK)

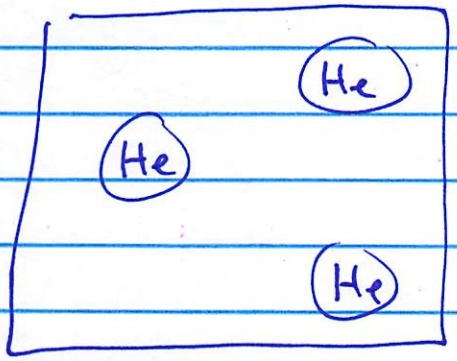


(better, shows approx geom)

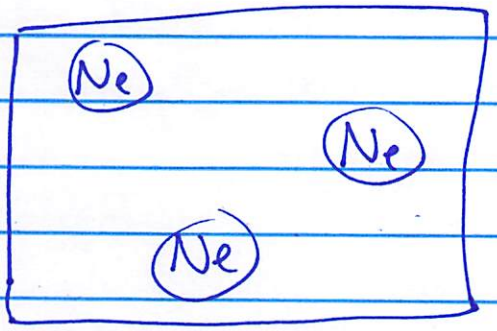
An atomic-level view of elements

- some elements exist in nature as single atoms in their basic units.

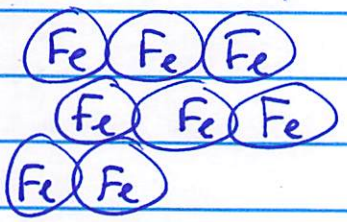
ex: Helium



Neon



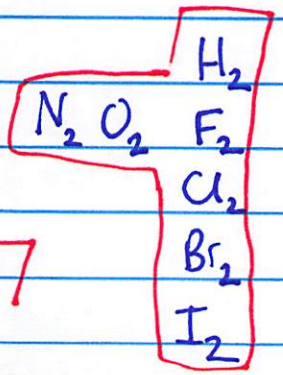
Iron:



etc.

Some elements exist as molecules : 2 or more atoms bonded together.

7 diatomic elements
2 atoms

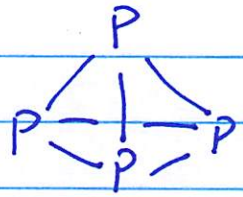


Memorize

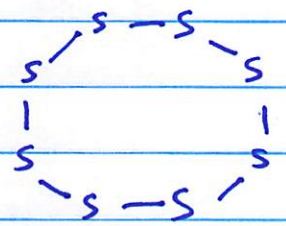
Brinclhof

A few elements are polyatomic ex Phosphorus

many atoms



P_4

sulfur,  S_8

Ionic compounds, formulas, and names

Golden rule: need as many ⊕ as ⊖.

ex: Sodium + Chlorine } metal + non-metal

Na^+ Cl^- (Color deduce from pos^n on PT)

1:1

↓

NaCl (note: do not write charges in cpd)

~ cancel out

Calcium + Chlorine } Metal + Non-metal

Ca^{2+} Cl^- ⇒ Ionic!

1:2

↓

$CaCl_2$

Q: What is the chemical formula of the compound formed when the following two elements react?

Hint: start w/ ions + charges

i) Calcium + Sulfur.

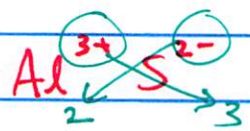
Ca^{2+} S^{2-} (1:1) → $\boxed{CaS}$

ii) Aluminum + Sulfur.

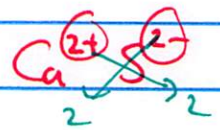
Al^{3+} S^{2-} (2:3) → $\boxed{Al_2S_3}$

"trick"

but must use simplest ratio



Al_2S_3



Ca_2S_2 2:2 → 1:1

$\boxed{CaS}$

Naming ionic compounds

Name ⊕ cation 1st (metal), then ⊖ anion 2nd (non-metal)

Cation name:

1) If metal only ever takes one charge, just use element name.

(group IA, IIA, Al^{3+}, Zn^{2+}, Ag^{+})

ex: Na^+ = sodium, Ca^{2+} = calcium, Al^{3+} = aluminum.