

# C11 - 0.0 - Methods 11

## Attach Prefix Exponent to the Base Unit!

Proportions (=Fractions) Unit Conversions!

$$\frac{?}{400m} = \frac{100cm}{1m} \times 400m \times \frac{100cm}{1m} = 40000cm$$

*Given units* ×  $\frac{\text{desired units}}{\text{given units}}$

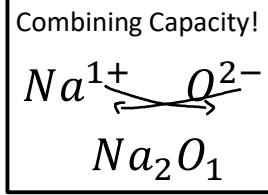
Calculator Scientific Notation  
 (2 + 3) 5 × 10<sup>3</sup> = 5E3 = 5000  
 (4 + 6) 5 2nd EE 3  
 Brackets Above 7

Sig Figs  
 123 3 Sig Figs  
 0.4 1 Sig Fig  
 505 3 Sig Figs  
 0.40 2 Sig Figs  
 10 1 Sig Fig  
 10. 2 Sig Figs  
 1.0E2 2 Sig Figs  
 Add: Round to least # of decimal places.  
 Multiply: Round to least # of sig figs.

Giga = 10 <sup>9</sup> = 1000000000	
Mega = 10 <sup>6</sup> = 1000000	
Kilo = 10 <sup>3</sup> = 1000	$\frac{1L}{1kg}$ Water
Base = 10 <sup>0</sup> = 1	
deci = 10 <sup>-1</sup> = $\frac{1}{10}$	
centi = 10 <sup>-2</sup> = $\frac{1}{100}$ = 0.01	
milli = 10 <sup>-3</sup> = $\frac{1}{1000}$ = 0.001	
micro = 10 <sup>-6</sup> = $\frac{1}{1,000,000}$	$\frac{1mL}{1cm^3}$ Fluid
nano = 10 <sup>-9</sup> = $\frac{1}{1,000,000,000}$	
pico = 10 <sup>-12</sup> = $\frac{1}{1,000,000,000,000}$	

Periodic Table Key  
 Families/Metal/Nonmetal States (s),(l),(g),(aq)  
 Atomic #/Mass/Charge  
 #e<sup>-</sup> = #p<sup>+</sup> - charge  
 #n = GMM - #p  
 Bohr/Lewis/Vespr/Polarity

atoms	molecule(s)
molecule	molecule(s)



Naming Compounds Acids/Bases

Balancing/Predicting Equations

Types: S/D/SR/DR/C/N  
 Radioactivity/Fus/Fission

Metals Trade
Non-Metals

Mono 1 Meth  
 Di 2 Eth  
 Tri 3 Prop  
 Tetra 4 But  
 Penta 5 Pent  
 Hexa 6 Hex  
 Hepta 7 Hept  
 Octa 8 Oct  
 Nona 9 Non  
 Deca 10 Dec

Radioactive Decay, α, β, γ  
 Fission/Fusion

Read Scale  
 Round to half small increment\* (Bottom Meniscus)

Accuracy vs Precision

Nucleus (p&n) Valence Shells  
 Atoms vs Ions 2,8,8,18,18 ...  
 Charge: p<sup>+</sup>/e<sup>-</sup>/n<sup>0</sup>  
 Compound/Molecule Noble gases  
 No valence electrons  
 Hence, Not reactive

### Phases

(s) = solid (l) = liquid  
 (g) = gas (aq) = aqueous  
 $H_{2(g)} + O_{2(g)} \rightarrow 2H_2O_{(l)}$

Diatomic

N <sub>2</sub>	O <sub>2</sub>	F <sub>2</sub>
H <sub>2</sub>	Cl <sub>2</sub>	Br <sub>2</sub>
	I <sub>2</sub>	

Only (g)  
 "HOF-BrINC-I"

Ionic Metals/Non-metals  
 Transfer Electrons  
 Combining Capacity (Switch!)  
 Multivalent Fe<sup>+2</sup> (II) Fe<sup>+3</sup> (III)  
 Polyatomic (NH<sub>4</sub>)<sup>+</sup> (Brackets)

Bonding Covalent  
 Non-metals/non-metals  
 Share Electrons  
 Prefixes

$\alpha, \beta, \gamma, n, e^+$

Energy Δ: Change  
 ΔH > 0, Endothermic (Gives Heat)  
 ΔH < 0, Endothermic (Takes Heat)

Rutherford - Father of nuclear physics (atom).  
 Thompson - Plum pudding model

Isotope: Element with a different number of neutrons → different atomic mass.

Percent Composition (by mass) CH<sub>4</sub> 75%C, 25%H

Assume 1 mole  
 Assume 100g

$$\% = \frac{\text{Part}}{\text{Total}} \times 100\%$$

Molecular Formula C<sub>2</sub>H<sub>8</sub>  
 Empirical Formula CH<sub>4</sub>  
 Molar Ratio 1 : 2 : 1

% Yield  
 % Purity

$$N = \frac{\text{Molecular Mass}}{\text{Empirical Mass}}$$

Conservation Laws :  
 Mass/Matter cannot be created or destroyed.  
 Energy cannot be created or destroyed.

$$Q = mc\Delta T$$

$$\Delta Q = -\Delta Q$$

$$Q = mH_{f/v}$$

Labs Steps  
 Title/Intro  
 Procedure  
 Results  
 Discussion  
 Conclusion

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Equal moles of different elements contains the same number of particles.

$$\text{Avagadro's \# : } 6.02 \times 10^{23}$$

$$\text{Dozen Pairs*} = 24$$

mass <-> moles <-> particles/atoms/molecules

**mol** <-> Volume <-> Density  
<-> Molarity <->

Molar Mass  $\frac{g}{mol}$  Mole Ratio  $\frac{mol(s)}{mol(s)}$

$$GMM: \frac{g}{mol}$$

$$STP: \frac{22.4L}{mol}$$

$$1 atm$$

$$0^{\circ}C$$

$$D = \frac{m}{V}$$

1 AMU =  $1.67 \times 10^{-27} kg$  (Atomic Mass Unit)

$$\text{Mass } p/n = 1AMU, \text{ Mass } e = \frac{1AMU}{1850}$$

$$\frac{6.02E23 \text{ particles/atoms/molecules}}{mol}$$

$$\frac{12 \text{ eggs}}{\text{dozen}}$$

Concentration  $c = \frac{n}{V}$

$$c_1 v_1 = c_2 v_2$$

$$c_1 v_1 + c_2 v_2 = c_2 v_3$$

Stoichiometry: Relationship between amount of reactants/products of a chemical reaction.

Limiting/Excess!!!

Excess is smaller ratio of moles to coefficients

Theoretical/Actual Mole Ratio

Periodic Trends

Properties

Notation/Core

Hund/Aufbau/Pauli

Energy Levels/Orbitals

Electronegativity

Ionization Energy

Electron Affinity

Size Atoms/Ions

Hybridization

Opposite charges attract.

Like charges repel.

-proportional to charge.

-inversely proportional to distant.

Electrostatic Force: the force between two charged particles.

$$F = \frac{kqq}{r^2}$$

Double distance  
Quarter Force

Avagadro's Hypothesis:

= V's of gas @STP

= # particles

Gas Laws (R\*)

$$K = C^{\circ} + 273.15$$

Atm/torr/kPa/mmHg

## Gas Laws

$$\frac{P_{pA}}{n_A} = \frac{P_{pB}}{n_B} = \frac{P_T}{n_T}$$

$$P_{Total} = P_{pA} + P_{pB} + \dots$$

$P_p$  : Partial Pressure

$$1 atm = 101.3 kPa$$

$$= 760 mmHg$$

$$1 bar = 100 kPa$$

$$1 psi = 51.7 mmHg$$

$$1 Torr = 1 mmHg$$

$$760 Torr = 1 atm$$

## Combined Gas Laws

$$\frac{PV}{T} = k \quad \frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$\frac{V_1}{n_1} = \frac{V_2}{n_2}$$

Lassuc/Boyle/Charles/Dalton/Ideal/Comb

$$R = 8.314 \frac{kPaL}{molK} = \frac{101.3 kPa \times 22.4 L}{1 mol \times 273 K}$$

$$R = 0.0821 \frac{atmL}{molK} = \frac{1 atm \times 22.4 L}{1 mol \times 273 K}$$

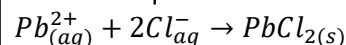
## Ideal Gas Law\* (K)

$$PV = nRT$$

Reactions  
Dissociation  
Dissolution  
Precipitation  
Titration  
Crystallization

Solution Types  
"Like dissolves like"  
Solubility Chart

Net Ionic Equation\*



## Electron Configurations (Full/Core)

### Organic Chemistry:

Condensed/Full/Line Structure

Naming

1) Alphabetical

2) Smallest #

1) Longest Alkane Chain

2) Attached Alkyl

2) # - Location of attached Alkyl/@

Count from before the double/triple bond

Double/Triple Bond Overrides Alphabetical!

Group (last) Overrides Ethyl

Count Away from Group

Right to Left\*

Organic Chemistry:  $CH_4$   
Alkanes/Ethyls  $R - CH_3$   
(Linear/Branched/cyclo)  
alkene: = (diene) alkyne:  $\equiv$   
Isomers (Structural/cis/trans)  
alkyl halides - Halogens  
alcohol (di,triol)  
aldehyde = O at end  
Ketones = O Not at end  
carboxylic acid  $R - COOH$   
amine  $R - NH_2$   
amide  $R - CONH_2$   
ester oxy  $R - O - R$   
ether oate  $R - COO - R$   
Aromatics (Benzenes)

@, < #, < 2,3, > 1 > @

Group < yl, R -> L

Away From Group

Sec 1/Iso 2/Tert 3