Chemistry Instructions:

1. get out your notebook
2. Add Gas stoichiometry to your table of contents.
3. also add LT 8.3
4. Find the stoichiometry map you drew in your notebook from the previous unit.

Learning Target 8.2

I can solve problems involving gases using stoichiometry.

3 New Steps / Problems

1) vol A to Vol B

2) Vol to mass At STP (1 mol = 22.4 L)

3) Vol to mass Using (PV=nRT)

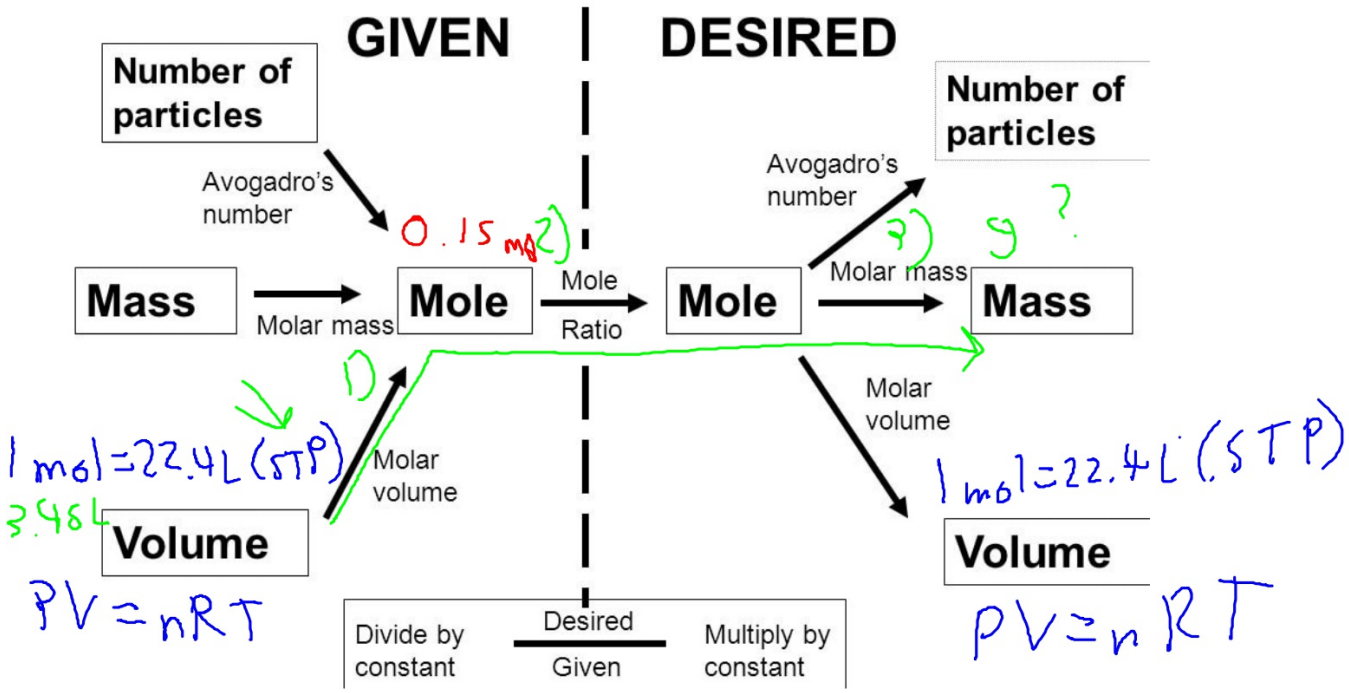
8.1

*Friday 2-28

Unit 8 Exam

L.T. 8.0, 8.1, 8.2

Mole Map


GIVEN
DESIRED
Number of particles
Avogadro's number
Mass
Molar mass
Mole
Mole Ratio
Mole
Molar mass
Mass
Number of particles
Avogadro's number
Molar volume
Molar volume
Volume
Volume
Divide by constant
Desired / Given
Multiply by constant
0.15 mol
1 mol = 22.4 L (STP)
3.48 L
1 mol = 22.4 L (STP)
PV = nRT
PV = nRT

$$CH_{4(g)} + O_{2(g)} \rightarrow CO_{2(g)} + H_2O_{(g)}$$

(l) or (ℓ) = Liquid

(aq) = aqueous (dissolved in H_2O)

(s) = solid

(g) = gas

$CH_{4(g)} + 2O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O_{(g)}$

12.35 L ? L

1) Vol A to Vol B

* same math as mol A - mol B

12.35 L of O_2 will produce how many liter of CO_2 if P, V and T are constant?

Vol Ratio

$$12.35\ L\ O_2 \left| \frac{1\ L\ CO_2}{2\ L\ O_2} \right. = 6.17\ L\ CO_2$$

$$CH_{4(g)} + 2O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O_{(g)}$$

21.25 g ? L

2) Vol to mass (STP, 22.4 L = 1 mol)

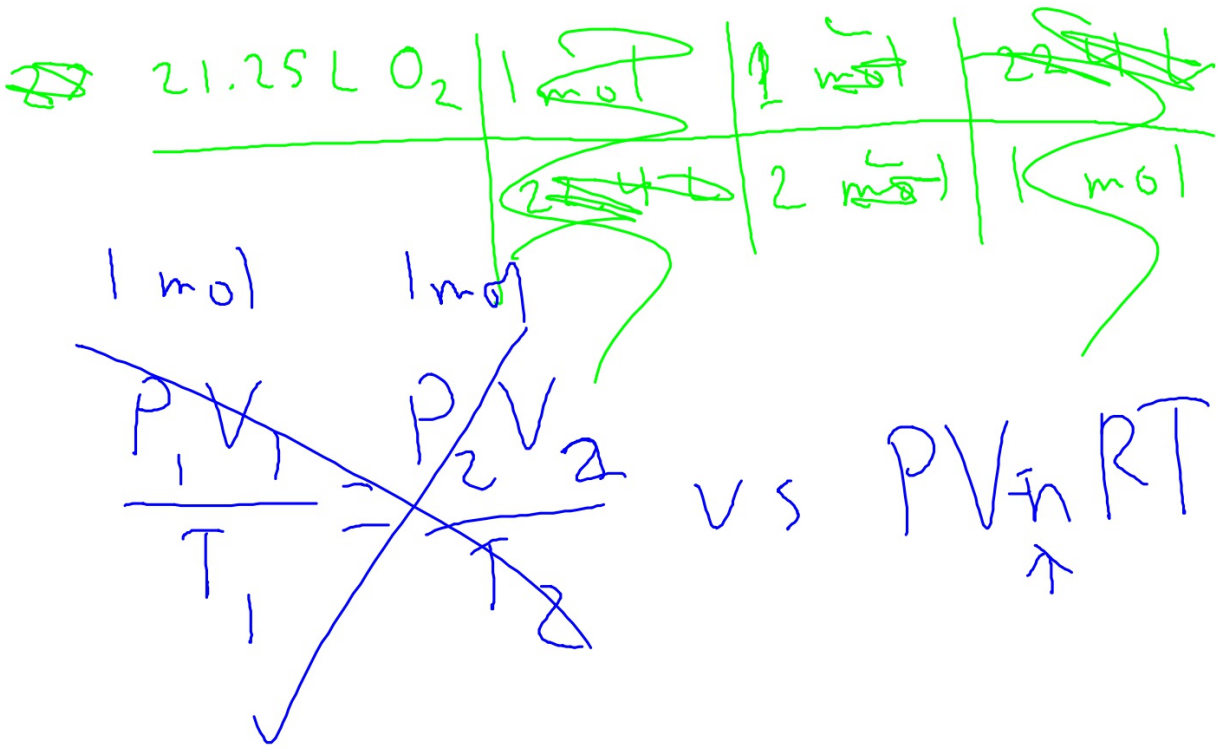
0 °C 1 atm

21.25 g of O_2 will produce how many liters of CO_2 at STP.

New Step

$$21.25\ g\ O_2 \left|\frac{1\ mol\ O_2}{32\ g\ O_2}\right| \frac{1\ mol\ CO_2}{2\ mol\ O_2} \left|\frac{22.4\ L\ CO_2}{1\ mol\ CO_2}\right.$$

$$= 7.4\ L\ CO_2$$


21.25 L O_2
1 mol
1 mol
2 mol
2 mol
1 mol
1 mol
1 mol
P_1V_1
T_1
P_2V_2
T_2
vs
$PV = nRT$

3) Vol to Mass (PV = nRT)

If 5 L of nitrogen reacts completely with hydrogen at pressure of 3 atm and temperature 298 K, how much ammonia (NH_3) in grams is produced.

$$N_2 + 3H_2 \longrightarrow 2NH_3$$

5 L ? g

(1) solve for (n) moles using $PV = nRT$

$P = 3$
$V = 5$
$n = ?$
$R = 0.0821$
$T = 298$

$3(5) = n\,0.0821(298)$

$$n = \frac{3(5)}{0.0821(298)}$$

$n = 0.61$ mol N_2

(2) mol A - mass B (LT 2.0)

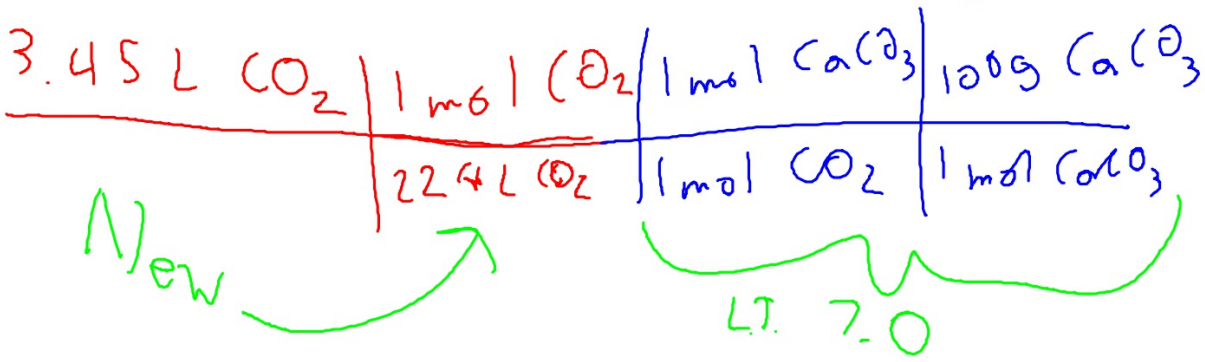
$$0.61 \text{ mol } N_2 \left| \frac{2 \text{ mol } NH_3}{1 \text{ mol } N_2} \right| \frac{17 \text{ g } NH_3}{1 \text{ mol } NH_3} = 20.74 \text{ g } NH_3$$

Calcium carbonate decomposes at high temperatures to form carbon dioxide and calcium oxide: Ans: 15.4 g

$CaCO_3(s) \rightarrow CO_2(g) + CaO(s)$

? g 3.45 L

How many grams of calcium carbonate will I need to form 3.45 liters of carbon dioxide at STP? 1 mol = 22.4 L

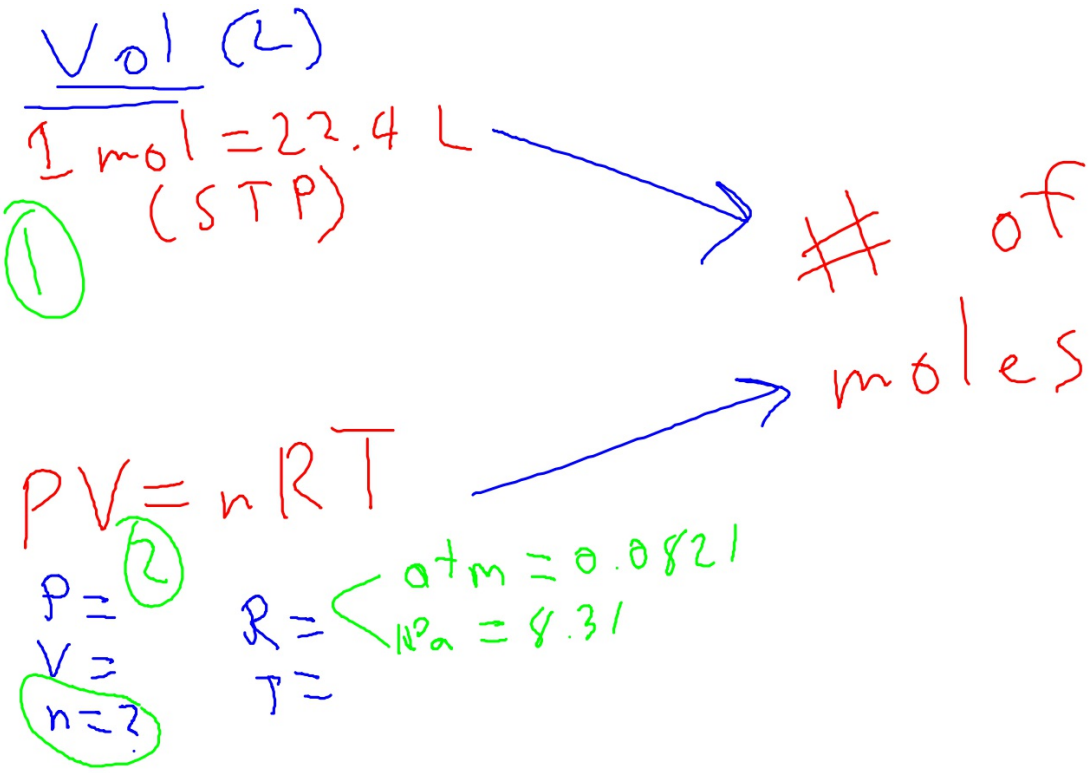


$$2C_3H_6 + 9O_2 \longrightarrow 6CO_2 + 6H_2O$$

? L 34 L 1 mol = 22.4 L

$$34\ L\ O_2 \left| \frac{2\ L\ C_3H_6}{9\ L\ O_2} \right. = 7.5\ L\ C_3H_6$$

$$34\ L\ O_2 \left| \frac{1\ mol\ O_2}{22.4\ L\ O_2} \right. \left| \frac{2\ mol\ C_3H_6}{9\ mol\ O_2} \right. \left| \frac{22.4\ L\ C_3H_6}{1\ mol\ C_3H_6} \right. =$$


Vol (L)
1 mol = 22.4 L
(STP)
1
# of moles
PV = nRT
2
P =
V =
n = ?
R =
T =
atm = 0.0821
kPa = 8.31