⑤ New Molar Parameters:

A gas at STP (standard temp & pressure)

1 mol = 22.4 L

$\frac{1\ mol}{22.4\ L}$

How many L of O_2 @ STP can be produced from 4.92 g H_2SO_4

$$5\ H_2O_2 + 2\ KMnO_4 + 3\ H_2SO_4 \rightarrow 5\ O_2 + 2\ MnSO_4 + K_2SO_4 + 8\ H_2O$$

$$4.92\ g\ H_2SO_4 \times \frac{1\ mol\ H_2SO_4}{98\ g\ H_2SO_4} \times \frac{5\ mol\ O_2}{3\ mol\ H_2SO_4} \times \frac{22.4\ L\ O_2}{1\ mol\ O_2} = 1.88\ L\ O_2$$

$$Bi_2S_3 + 8\,HNO_3 \longrightarrow 2\,Bi(NO_3)_3 + 2NO + 3S + 4H_2O$$

(A) How many grams of S is produced if we reacted 9 grams of Bi_2S_3 with 16 g HNO_3?

(i) Find Limiting Reactant

	Available Moles	Recipe Coefficient	# of runs of rxn
Bi_2S_3 =	$\frac{9\text{ g } Bi_2S_3}{370.9\text{ g } Bi_2S_3} = 0.0243\text{ mol } Bi_2S_3$	÷ 1 mol	0.0243
HNO_3 =	$\frac{16\text{ g } HNO_3}{63\text{ g } HNO_3} = 0.254\text{ mol } HNO_3$	÷ 8 mol	0.0318

LR = Bi_2S_3 is Limiting ER = HNO_3

ii - Solve the problem

$$0.0243\text{ mol } Bi_2S_3 \times \frac{3\text{ mol S}}{1\text{ mol } Bi_2S_3} \times \frac{32\text{ g S}}{1\text{ mol S}} = 2.3\text{ g S}$$

(B) How many Liters of NO @ STP is produced if you react 45.8 g Bi_2S_3 (0.1235 mol) with 50.3 g HNO_3 ? LR

Limiting Reactant	We Have	We Need	# Rxn Run
Bi_2S_3	$\frac{45.8\text{ g } Bi_2S_3}{370.9\text{ g}} = 0.1235\text{ mol}$	1	$0.1235\times$
HNO_3	$\frac{50.3\text{ g } HNO_3}{63\text{ g } HNO_3} = 0.7984\text{ mol}$	8	$0.0998\times$

Limiting Reactant

$$0.7984\text{ mol } HNO_3 \times \frac{2\text{ mol NO}}{8\text{ mol } HNO_3} \times \frac{22.4\text{ L NO}}{1\text{ mol NO}} = 4.5\text{ L NO}$$

(C) How many grams of unreacted Bi_2S_3 will remain when rxn is finished

$$0.7984\text{ mol } HNO_3 \times \frac{1\text{ mol } Bi_2S_3}{8\text{ mol } HNO_3} \times \frac{370.9\text{ g } Bi_2S_3}{1\text{ mol } Bi_2S_3} = 37.02\text{ g } Bi_2S_3 \text{ used in rxn}$$

Started 45.8 g Bi_2S_3

used − 37.02 g Bi_2S_3

8.78 g Bi_2S_3 remain

Limiting Reactant - Reactant that limits the amt of product formed in a reaction.
= STOPS REACTION

Excess Reactant - Reactant that is not used up completely = LEFTOVERS

Ex: $1\,C + 1\,O_2 \longrightarrow 1\,CO_2$

Mix 5 mol C + 10 mol O_2

C = Run 5x ↑ LimitingRxt

O_2 = Run 10x

% Yield – $\frac{\text{Actual Yield}}{\text{Theoretical Yield}} \times 100$

Ex: Produce a mass of 17.34g
Calculation produced 19.23g $= \frac{17.34}{19.23} \times 100$

$= 90.2\%$