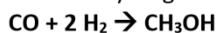


Limiting Reactant Notes and Example

5. Methanol, CH_3OH , is formed by the reaction of hydrogen and carbon monoxide.



a) If 5.0 moles CO and 8.0 moles H_2 are present, how many moles of CH_3OH are formed?

	CO 5 mol	+ 2H_2 8 mol	\rightarrow	CH_3OH \emptyset
B	LR -5	$-5 \left(\frac{2}{1}\right)$ $= -10$ NOT ENOUGH!		$+5 ()$
C	$-8 \left(\frac{1}{2}\right)$ $= -4$	LR -8		$+8 \left(\frac{1}{2}\right)$ $= +4$
A	$5 - 4$ $= 1 \text{ mol}$ Excess	$8 - 8$ $= \emptyset$ LIMITING		$\emptyset + 4$ $= 4 \text{ mol}$

b) What is the limiting reactant (reagent)?

H_2

c) What is the excess reactant (reagent)?

CO

d) How many moles of the excess react remain unchanged (unreacted/left over)?

1 mol CO

- e) The same reaction is performed using different amounts of reactants. 15 grams of carbon monoxide and 5.1 grams of hydrogen are combined and allowed to react. *2 sig figs*
- What is the limiting reactant?
 - How many grams of product are formed?
 - How many grams of excess reactant are left over unreacted?

$$\frac{15 \text{ g CO} \mid 1 \text{ mol CO}}{28.01 \text{ g CO}} = 0.5355 \text{ mol CO} \checkmark$$

BEFORE

$$\frac{5.1 \text{ g H}_2 \mid 1 \text{ mol H}_2}{2.02 \text{ g H}_2} = 2.5248 \text{ mol H}_2 \checkmark$$

BEFORE

	① CO	+ 2 H ₂	→	CH ₃ OH
B	0.5355 mol	2.5248 mol		∅
C	LR ✓ -0.5355	-0.5355 ($\frac{2}{1}$) = -1.071		+0.5355 ($\frac{1}{1}$) = +0.5355
A	0.5355 -0.5355 = ∅	2.5248 - 1.071 = 1.4538 mol H ₂ Excess		∅ + 0.5355 = 0.5355 mol CH ₃ OH MADE

Limiting

i) LR = CO

$$\text{ii) } \frac{0.5355 \text{ mol CH}_3\text{OH}}{1 \text{ mol CH}_3\text{OH}} \left| \frac{32.05 \text{ g CH}_3\text{OH}}{1 \text{ mol CH}_3\text{OH}} \right.$$

$$= \underline{\underline{17.16}} = \boxed{17 \text{ g CH}_3\text{OH}}$$

2 sig figs

$$\text{iii) } \frac{1.4538 \text{ mol H}_2}{1 \text{ mol H}_2} \left| \frac{2.02 \text{ g H}_2}{1 \text{ mol H}_2} \right.$$

$$= \underline{\underline{2.9366}} = \boxed{2.9 \text{ g H}_2}$$

2 sig figs