

# Chemistry 210 – Stoichiometry Practice 3

1. Complete the following table. *You must consider the limiting reagent.*

$$\text{N}_2(\text{g}) + 3 \text{H}_2(\text{g}) \rightarrow 2 \text{NH}_3(\text{g})$$

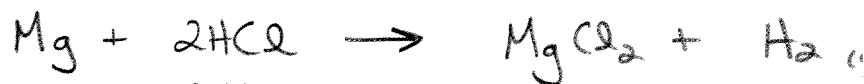
Mass at START	112 g	18 g	0 (none present)
molar mass	28.0 g/mol	2.0 g/mol	17.0 g/mol
Moles at the START	4	9	0
Moles REACTING	-3	-9	+6
Moles at the END	1	0	6
Mass at the END	28.0 g	0 g	102 g

$$\frac{9 \text{ mol H}_2}{3 \text{ mol H}_2} \left| \frac{1 \text{ mol N}_2}{1 \text{ mol N}_2} \right. = 3 \text{ mol N}_2 \text{ needed to react, } \therefore \text{N}_2 \text{ is in excess and H}_2 \text{ is the L.R.}$$

2)

Consider the reaction of 1.50 g of magnesium metal with 2.00 g of aqueous hydrochloric acid.

A. What is the balanced chemical equation?



B. What is the limiting reagent?

$$\frac{1.50 \text{ g}}{24.31 \text{ g/mol}} \quad \frac{2.00 \text{ g}}{36.46 \text{ g/mol}} \quad \frac{2.00 \text{ g}}{2.00 \text{ g/mol}}$$

$$\frac{1.50 \text{ g Mg}}{24.31 \text{ g/mol}} \left| \frac{1 \text{ mol Mg}}{1 \text{ mol Mg}} \right| \frac{1 \text{ mol H}_2}{1 \text{ mol H}_2} \left| \frac{2.00 \text{ g H}_2}{2.00 \text{ g/mol}} \right. = 0.125 \text{ g H}_2$$

$$\frac{2.00 \text{ g HCl}}{36.46 \text{ g/mol}} \left| \frac{1 \text{ mol HCl}}{2 \text{ mol HCl}} \right| \frac{1 \text{ mol H}_2}{1 \text{ mol H}_2} \left| \frac{2.00 \text{ g H}_2}{2.00 \text{ g/mol}} \right. = 0.0554 \text{ g H}_2$$

∴ HCl is the L.R.

C. What is the theoretical yield (in grams) of H<sub>2</sub> gas?

0.0554 g H<sub>2</sub> could be produced

D. What mass of the excess reagent remains?

$$\frac{2.00 \text{ g HCl}}{36.46 \text{ g/mol}} \left| \frac{1 \text{ mol HCl}}{2 \text{ mol HCl}} \right| \frac{1 \text{ mol Mg}}{1 \text{ mol Mg}} \left| \frac{24.31 \text{ g Mg}}{24.31 \text{ g/mol}} \right. = 0.667 \text{ g Mg used}$$

$$\text{Mass Mg remaining} = \underset{\text{start}}{1.50 \text{ g}} - \underset{\text{used}}{0.667 \text{ g}} = 0.833 \text{ g Mg remain}$$