

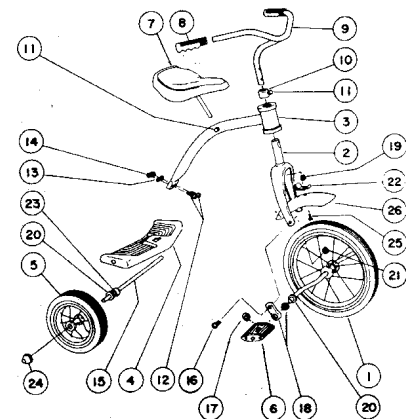
Follow along as you view the video, "Stoichiometry & Mole Ratios" on edpuzzle.com (sign in with your Google School account) and fill in the blanks as you go. (Also available at <http://youtu.be/fd2ZQmKevS8>)

- **Stoichiometry:** *Calculations involving the quantities of substances (reactants and products) in chemical equations.*

- Calculations will always begin with an amount of one substance in a chemical equation and ask you to determine an amount of another substance in the same reaction.

- Use familiar example: Making a tricycle

- 1 frame, 1 seat, 3 wheels, 1 handlebar, 2 pedals:
 - $F+S+3W+H+2P \rightarrow FSW_3HP_2$
- Note: this does not indicate the arrangement of the parts.
- How many pedals are needed for 100 tricycles? [200] How did you know?
- How many wheels are needed for 200 pedals? [300] How did you know?
- Ratios: number of one item to number of another item, like conversion factors!



- E.g. $\frac{2 P}{1 FSW_3HP_2}$ and $\frac{3 W}{2 P}$ — Indicate 2 pedals/trike and 3 wheels/every 2 pedals

- Mole ratios in chemical equations

- Coefficients in **balanced equation** have different meanings:

$N_2(g)$	+	$3 H_2(g)$		$2 NH_3(g)$
1 molec N_2	+	3 molec H_2		2 molec NH_3
1 mol N_2	+	3 mol H_2		2 mol NH_3
28.02 g N_2	+	6.06 g H_2		34.08 g NH_3
34.08 g reactants				34.08 g prod
1 L N_2	+	3 L H_2		2 L NH_3

- We will focus on the mole ratios: 1 mole N_2 : 3 moles H_2 : 2 moles NH_3 give 6 ratios:

- $\frac{1 \text{ mol } N_2}{3 \text{ mol } H_2}$ & $\frac{3 \text{ mol } H_2}{1 \text{ mol } N_2}$, $\frac{1 \text{ mol } N_2}{2 \text{ mol } NH_3}$ & $\frac{2 \text{ mol } NH_3}{1 \text{ mol } N_2}$, $\frac{3 \text{ mol } H_2}{2 \text{ mol } NH_3}$ & $\frac{2 \text{ mol } NH_3}{3 \text{ mol } H_2}$

- one ratio for each combination and its reciprocal
- will use the ratio to connect wanted to given (next lesson)

- Find the mole ratios for the following reactions:

- $4 Al(s) + 3 O_2(g) \rightarrow 2 Al_2O_3(s)$

$$\frac{4 \text{ mol } Al}{3 \text{ mol } O_2} \text{ \& } \frac{3 \text{ mol } O_2}{4 \text{ mol } Al}, \frac{4 \text{ mol } Al}{2 \text{ mol } Al_2O_3} \text{ \& } \frac{2 \text{ mol } Al_2O_3}{4 \text{ mol } Al}, \frac{3 \text{ mol } O_2}{2 \text{ mol } Al_2O_3} \text{ \& } \frac{2 \text{ mol } Al_2O_3}{3 \text{ mol } O_2}$$

- $3 Fe(s) + 4 H_2O(l) \rightarrow Fe_3O_4(s) + 4 H_2(g)$

$$\frac{3 \text{ mol } Fe}{4 \text{ mol } H_2O} \text{ \& } \frac{4 \text{ mol } H_2O}{3 \text{ mol } Fe}, \frac{3 \text{ mol } Fe}{1 \text{ mol } Fe_3O_4} \text{ \& } \frac{1 \text{ mol } Fe_3O_4}{3 \text{ mol } Fe}, \frac{3 \text{ mol } Fe}{4 \text{ mol } H_2} \text{ \& } \frac{4 \text{ mol } H_2}{3 \text{ mol } Fe},$$

$$\frac{4 \text{ mol } H_2O}{1 \text{ mol } Fe_3O_4} \text{ \& } \frac{1 \text{ mol } Fe_3O_4}{4 \text{ mol } H_2O}, \frac{4 \text{ mol } H_2O}{4 \text{ mol } H_2} \text{ \& } \frac{4 \text{ mol } H_2}{4 \text{ mol } H_2O}, \frac{1 \text{ mol } Fe_3O_4}{4 \text{ mol } H_2} \text{ \& } \frac{4 \text{ mol } H_2}{1 \text{ mol } Fe_3O_4}$$

- Read Section 12.1, pp. 352-357 in textbook.