

STEPS

- know ions
- write formulas
- cross over
- find conversion factors
- Dim. Analysis
- units

The Mole Ratio & Stoichiometry

How much do I have, need or make?

the mole ratio!

1 mol H₂O = 2 mol H = 1 mol O
 2 mol H₂O = 4 mol H = 2 mol O
 3 mol H₂O = 6 mol H = 3 mol O
 2.5 mol H₂O = 5 mol H = 2.5 mol O

1:2:1
 2:4:2
 3:6:3
 2.5:5:2.5

The ratio never changes!

conversion factors!

$$\frac{1 \text{ mol H}_2\text{O}}{2 \text{ mol H}}$$

$$\frac{1 \text{ mol H}_2\text{O}}{1 \text{ mol O}}$$

$$\frac{2 \text{ mol H}}{1 \text{ mol O}}$$

moles A : moles B

$\frac{\text{moles A}}{\text{moles B}}$	$\frac{\text{moles B}}{\text{moles A}}$
---	---

mole ratios are the key to stoichiometry!

Q: Find all the mole ratios for B₂(CO₃)₃

$$\frac{2 \text{ mol B}}{1 \text{ mol B}_2(\text{CO}_3)_3}$$

$$\frac{3 \text{ mol C}}{1 \text{ mol B}_2(\text{CO}_3)_3}$$

$$\frac{9 \text{ mol O}}{1 \text{ mol B}_2(\text{CO}_3)_3}$$

$$\frac{2 \text{ mol B}}{3 \text{ mol C}}$$

$$\frac{2 \text{ mol B}}{9 \text{ mol O}}$$

$$\frac{3 \text{ mol C}}{9 \text{ mol O}}$$

NEVER reduce a mole ratio!

Q: Find all the mole ratios for $\text{Ca}(\text{NO}_3)_2$

$$\frac{1 \text{ mol Ca}}{1 \text{ mol Ca}(\text{NO}_3)_2}$$

$$\frac{2 \text{ mol N}}{1 \text{ mol Ca}(\text{NO}_3)_2}$$

$$\frac{6 \text{ mol O}}{1 \text{ mol Ca}(\text{NO}_3)_2}$$

$$\frac{1 \text{ mol Ca}}{2 \text{ mol N}}$$

$$\frac{2 \text{ mol N}}{6 \text{ mol O}}$$

$$\frac{1 \text{ mol Ca}}{6 \text{ mol O}}$$

mole ratios using reactions



① How many moles of water can you make if you start with 12.7 moles of C_2H_2 ?

A = known

B = unknown

mol A \rightarrow mol B

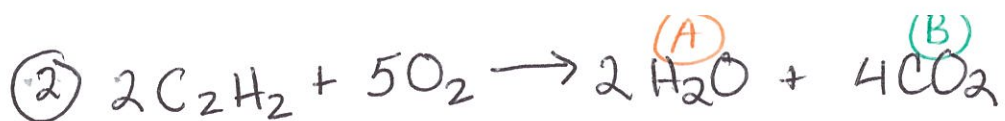
mole ratio = conversion factor

$$\frac{12.7 \text{ mol } \cancel{\text{C}_2\text{H}_2}}{\cancel{2} \text{ mol } \text{C}_2\text{H}_2} \times \frac{2 \text{ mol H}_2\text{O}}{2 \text{ mol } \cancel{\text{C}_2\text{H}_2}} = \boxed{12.7 \text{ mol H}_2\text{O}}$$

$\frac{\# \text{ mol B}}{\# \text{ mol A}}$ } #'s are always the coefficients

-OR-

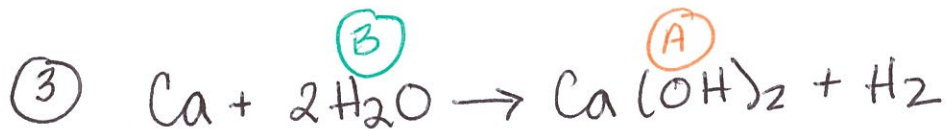
$$\frac{12.7 \text{ mol } \cancel{\text{A}}}{\cancel{2} \text{ mol } \cancel{\text{A}}} \times \frac{2 \text{ mol B}}{2 \text{ mol } \cancel{\text{A}}} = \boxed{12.7 \text{ mol H}_2\text{O}}$$



you made 17.3 moles of water. How many moles of carbon dioxide did you make?

$$\frac{17.3 \text{ moles } \cancel{\text{A}}}{2 \text{ mole } \cancel{\text{A}}} \left| \frac{4 \text{ mole } \text{B}}{1 \text{ mole } \cancel{\text{A}}} \right. = 34.6 \text{ mol B}$$

$$= \boxed{34.6 \text{ mol CO}_2}$$



15 mol $\text{Ca(OH)}_2 \rightarrow ? \text{ mol H}_2\text{O}$

$$\text{mole ratio} = \frac{2 \text{ mol B}}{1 \text{ mol A}}$$

$$\frac{15 \text{ mol } \cancel{\text{A}}}{1 \text{ mol } \cancel{\text{A}}} \left| \frac{2 \text{ mol } \text{B}}{1 \text{ mol } \cancel{\text{A}}} \right. = 30 \text{ mol B}$$

$$= \boxed{30 \text{ mol H}_2\text{O}}$$