

## 11.1 Notes - What is stoichiometry?

- Stoichiometry - study of how amounts of reactants are used to produce different amounts of products by chem. rxns
  - based on conservation of matter  
(mass of reactants must equal mass of all products)

- Let's show this using the following eqn:  $2 \text{H}_2\text{O}_2(l) \rightarrow 2 \text{H}_2\text{O}(l) + \text{O}_2(g)$

- we can see that the coefficients tell us that, for this rxn, it takes 2 molecules of  $\text{H}_2\text{O}_2$  to produce 2 molecules  $\text{H}_2\text{O}$  & 1 molecule  $\text{O}_2$

\* This also means that 2 mol  $\text{H}_2\text{O}_2 \rightarrow$  2 mol  $\text{H}_2\text{O}$  & 1 mol  $\text{O}_2$

Let's convert to mass to show conservation of mass (use mole units)

$$2 \text{ mol } \text{H}_2\text{O}_2 \times \frac{34.0 \text{ g}}{1 \text{ mol}} = 68.0 \text{ g } \text{H}_2\text{O}_2 \quad \left( \begin{array}{l} \text{H} - 2 \times 1.0 \\ \text{O} - 2 \times 16.0 \\ \hline 34.0 \text{ g/mol} \end{array} \right)$$

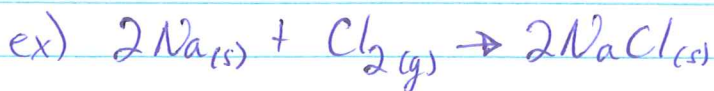
$$2 \text{ mol } \text{H}_2\text{O} \times \frac{18.0 \text{ g}}{1 \text{ mol}} = 36.0 \text{ g } \text{H}_2\text{O} \quad \left( \begin{array}{l} \text{H} - 2 \times 1.0 \\ \text{O} - 1 \times 16.0 \\ \hline 18.0 \text{ g/mol} \end{array} \right)$$

$$1 \text{ mol } \text{O}_2 \times \frac{32.0 \text{ g}}{1 \text{ mol}} = 32.0 \text{ g } \text{O}_2 \quad (16 - 2 \times 16 = 32.0 \text{ g/mol})$$

- Let's check  $68.0 = 36.0 + 32.0$  ✓ Follows Cons of Mass

### Mole Ratios

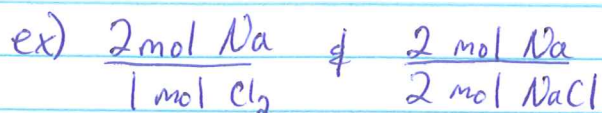
- Ratio between # of moles of any 2 substances in a balanced equation



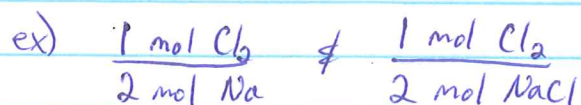
\* What are some mole ratios that we can write?

(2)

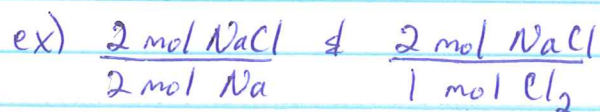
- compare Na to all other substances in eqn:



- compare Cl<sub>2</sub> to all other substances in eqn:



- compare NaCl to all other substances in eqn:



\* These 6 ratios describe all relationships in equation

This process can be done in all equations to show ratios of all substances in equations - and are important later

\* To determine how many mole ratios exist for a chem. equation that has n total substances in it =  $\boxed{(n)(n-1)}$

ex) A rxn that has 4 substances (like NaCl + LiBr → NaBr + LiCl)

$$= (4)(4-1) = (4)(3) = \underline{\underline{12 \text{ mole ratios}}}$$