

Review

Concentration

- Concentration is the amount of molecules dissolved in solute
- Formula

$$c = n/v \quad \text{where} \quad \begin{array}{l} c \text{ is concentration of liquid (mol/L)} \\ n \text{ is the amount of moles (mol)} \\ v \text{ is the volume of liquid (L)} \end{array}$$

- Example: What volume of water is required to make a 1.05 mol/L salt-water solution when there is 5.00g of salt(NaCl)?

$$V = ?$$

$$C = 1.05 \text{ mol/L}$$

$$M = 5.00 \text{ g}$$

$$n = \frac{m}{M} = \frac{5.00 \text{ g}}{58.44 \text{ g/mol}}$$

$$n = 0.0855578 \text{ mol}$$

$$M = 22.99 + 35.45 \\ = 58.44 \text{ g/mol}$$

$$C = \frac{n}{V}$$

$$V = \frac{n}{C}$$

$$V = \frac{0.0855578 \text{ mol}}{1.05 \text{ mol/L}}$$

$$V = 0.08148 \text{ L or } 81.5 \text{ mL}$$

Practice Problems

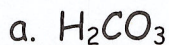
1. Complete the table

Formula	Name
CaO	calcium oxide
MgCl ₂	magnesium chloride
Al ₂ O ₃	aluminum oxide
KCl	potassium chloride
SrO	strontium oxide
Na ₃ N	sodium nitride

Formula	Name
Ca ₃ N ₂	calcium nitride
ZnCl ₂	zinc chloride
AgF	silver fluoride
P ₄ O ₁₀	tetra phosphorus decaoxide
K ₃ N	potassium nitride
AlCl ₃	aluminum chloride

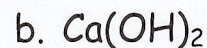
Review

2. Calculate the molecular mass of



$$= 2(1.01) + 1(12.01) + 3(16.00)$$

$$= 62.03 \text{ g/mol}$$



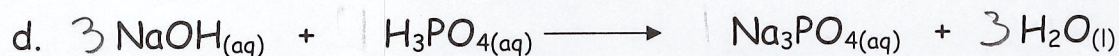
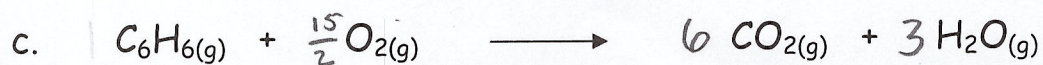
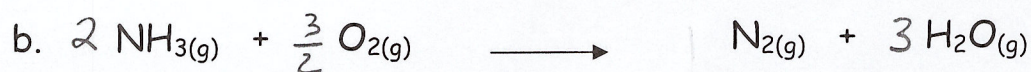
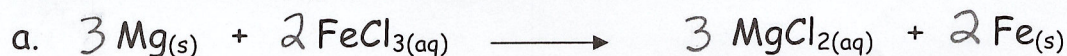
$$= 1(40.08) + 2(16.00) + 2(1.01)$$

$$= 74.10 \text{ g/mol}$$

3. Complete the following table

Name	Formula	Molar Mass (g/mol)	# of Moles	Mass (g)
calcium carbonate	CaCO_3	100.09	0.300	30.0
aluminum chloride	AlCl_3	133.33	0.488	65.0
magnesium hydroxide	$\text{Mg}(\text{OH})_2$	58.33	1.45	84.6
methanol	CH_3OH	32.05	2.87	92.0

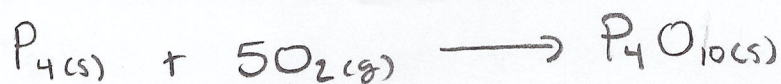
4. Balance the following reactions:



Review

5. Phosphorus burns in air to form the oxide $P_4O_{10(s)}$.

a. Write a balanced equation for the reaction.



b. If 2.00 mol of phosphorus react, how many moles of oxygen will be required?

$$n_{O_2} = 2.00 \text{ mol} \times \left(\frac{5}{1} \right)$$

"want over have"

$$n_{O_2} = 10.0 \text{ mol}$$

c. If 2.00 mol of phosphorus are burned, how many grams of $P_4O_{10(s)}$ are produced?

$$M_{P_4O_{10}} = 4(30.97) + 10(16.00) = 283.88 \text{ g/mol}$$

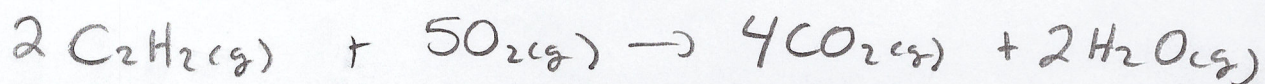
$$n_{P_4O_{10}} = 2.00 \text{ mol} \left(\frac{1}{1} \right) = 2.00 \text{ mol}$$

$$m = Mn = (283.88 \text{ g/mol}) \times (2.00 \text{ mol})$$

$$m = 568 \text{ g}$$

6. Acetylene ($C_2H_2(g)$) burns to produce carbon dioxide and water vapour.

a. Write the balance equation for this reaction.



Review

b. If 0.50 mol of $C_2H_2(g)$ are burned, how many moles of each product are formed?

$$n_{CO_2} = 0.50 \text{ mol} \times \left(\frac{4}{2}\right) = 1.0 \text{ mol}$$

$$\boxed{n_{CO_2} = 1.0 \text{ mol}}$$

$$n_{H_2O} = 0.50 \text{ mol} \times \left(\frac{2}{2}\right)$$

$$\boxed{n_{H_2O} = 0.50 \text{ mol}}$$

c. How many moles of gaseous O_2 will react with 1.00 kg of $C_2H_2(g)$?

$$n_{C_2H_2} = \frac{m}{M} = \frac{1000 \text{ g}}{26.04 \text{ g/mol}}$$

$$\begin{aligned} M &= 2(12.01) + 2(1.01) \\ &= 26.04 \text{ g/mol} \end{aligned}$$

$$n_{C_2H_2} = 38.402 \text{ mol}$$

* watch units!! *

$$n_{O_2} = 38.402 \text{ mol} \times \left(\frac{5}{2}\right)$$

$$\boxed{n_{O_2} = 96.0 \text{ mol}}$$

Review

$$\begin{aligned} M &= 22.99 + 35.45 \\ &= 58.44 \text{ g/mol} \end{aligned}$$

7. If 1.02g of salt (NaCl) is dissolved in 575mL of water, what is the concentration of the solution?

* watch units!! *

$$C = ?$$

$$m = 1.02 \text{ g}$$

$$V = 0.575 \text{ L}$$

$$C = \frac{n}{V}$$

$$n = \frac{m}{M} = \frac{1.02 \text{ g}}{58.44 \text{ g/mol}} = 0.01745 \text{ mol}$$

$$C = \frac{n}{V} = \frac{0.01745 \text{ mol}}{0.575 \text{ L}}$$

$$C = 0.0304 \text{ mol/L}$$