WP Exam 7 prep:

- Chemical formulas and naming (ionic, covalent, and acids)
- Concentration calculations
- Solution stoichiometry
- Making solutions (describe how to make a solution of desired concentration)
- Types of solutions (gas-gas, liquid-solid, etc.)

Solution Stoichiometry

How many mL of 0.125 M NaOH will react with 30.00 mL of 0.400 M $CuSO_4$ solution?

$$\underset{(?\,mL,\ 0.125M)}{2\,NaOH} + \underset{(30.0mL,\ 0.400M)}{CuSO_4} \longrightarrow Na_2SO_4 + Cu(OH)_2$$

$$30.0mL\ CuSO_4 \times \frac{1L}{1000mL} \times \frac{0.400mol}{1L} \times \frac{2\,mol\ NaOH}{1\,mol\ CuSO_4} \times \frac{1L}{0.125mol} \times \frac{1000mL}{1L} =$$

$$\boxed{192\,mL\ NaOH}$$

Solution Limiting Reactant

If 25.0 mL of 0.0500 M $FeCl_2$ solution are mixed with 5.00 mL of 0.200 M K_3PO_4 solution, how many grams of $Fe_3(PO_4)_2$ (molar mass = 357.5 g/mol) will form?

$$3\,FeCl_2 + 2\,K_3PO_4 \rightarrow Fe_3(PO_4)_2 + 6\,KCl$$

(25.0 mL, 0.0500 M) (5.00 mL, 0.200 M)

Least amount!

$$25.0\,mL\,FeCl_2 \times \frac{1\,L}{1000\,mL} \times \frac{0.0500\,mol}{1\,L} \times \frac{1\,mol\,Fe_3(PO_4)_2}{3\,mol\,FeCl_2} \times \frac{357.5\,g}{1\,mol} = \boxed{0.149\,g\ Fe_3(PO_4)_2}$$

$$5.00\,mL\,K_3PO_4 \times \frac{1\,L}{1000\,mL} \times \frac{0.200\,mol}{1\,L} \times \frac{1\,mol\,Fe_3(PO_4)_2}{2\,mol\,K_3PO_4} \times \frac{357.5\,g}{1\,mol} = 0.179\,g$$

Making Solutions

Describe how you would make a 0.50 M NaCl solution from solid NaCl.

1. Determine the mass of NaCl needed:

$$\frac{0.50\text{mol}}{1\text{L}} \times \frac{58.44\text{g}}{1\text{mol}} = 29\text{g/L}$$

2. Add 29 g NaCl to a 1 L volumetric flask
3. Fill the flask about 2/3 full with deionized (DI) water, stopper and swirl until NaCl is completely dissolved
4. Add water to the 1 L mark on the flask

Types of Solutions

Type of Solution (solute-solvent)	Example
solid-liquid	salt water (NaCl in water)
solid-solid	metal alloys: brass (zinc in copper)
liquid-solid	dental amalgam (mercury in silver)
liquid-liquid	vinegar (acetic acid in water)
gas-solid	hydrogen gas in palladium metal
gas-liquid	carbonated beverages (CO_2 in water)
gas-gas	air in the atmosphere