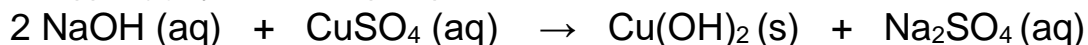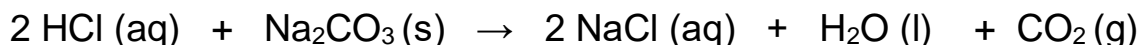Practice 3: Solve each of the following solution stoichiometry problems:
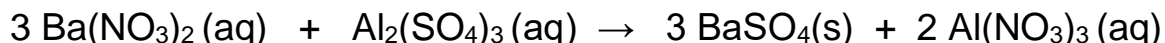1. If 25.0 mL of 0.350 M NaOH are added to a copper (II) sulfate solution, how many grams of copper (II) hydroxide will precipitate?

$$2 \text{ NaOH (aq)} + \text{CuSO}_4 \text{ (aq)} \rightarrow \text{Cu(OH)}_2 \text{ (s)} + \text{Na}_2\text{SO}_4 \text{ (aq)}$$

2. How many mL of 0.715 M HCl is required to completely react with 1.25 grams of sodium carbonate?

$$2 \text{ HCl (aq)} + \text{Na}_2\text{CO}_3 \text{ (s)} \rightarrow 2 \text{ NaCl (aq)} + \text{H}_2\text{O (l)} + \text{CO}_2 \text{ (g)}$$

3. How many mL of 0.280 M barium nitrate are required to completely react with 25.0 mL of 0.350 M aluminum sulfate?

$$3 \text{ Ba(NO}_3)_2 \text{ (aq)} + \text{Al}_2(\text{SO}_4)_3 \text{ (aq)} \rightarrow 3 \text{ BaSO}_4\text{(s)} + 2 \text{ Al(NO}_3)_3 \text{ (aq)}$$

Answers:

1. Start with given substance:	Convert the volume to moles, using the molarity as a conversion factor:	Relate moles of reactant to product with coefficients:	Convert the moles to volume, using concentration:	**To calculate the volume of solution required!**
25.0 mL	$\dfrac{0.350 \text{ mol NaOH}}{1000 \text{ mL}}$	$\dfrac{1 \text{ mol Cu(OH)}_2}{2 \text{ mol NaOH}}$	$\dfrac{97.56 \text{ g Cu(OH)}_2}{1 \text{ mol Cu(OH)}_2}$	= 0.427 g Cu(OH)$_2$

2. Start with given substance:	Convert the mass to moles, using the molar mass as a conversion factor:	Relate moles of reactants to each other with coefficients:	Convert the moles to volume, using concentration:	**To calculate the volume of solution required!**
1.25 g Na$_2$CO$_3$	$\dfrac{1 \text{ mol Na}_2\text{CO}_3}{105.99 \text{ g Na}_2\text{CO}_3}$	$\dfrac{2 \text{ mol HCl}}{1 \text{ mol Na}_2\text{CO}_3}$	$\dfrac{1000 \text{ mL}}{0.715 \text{ mol HCl}}$	= 33.0 mL

3. Start with given substance:	Convert the volume to moles, using the molarity as a conversion factor:	Relate moles of reactants to each other with coefficients:	Convert the moles to volume, using concentration:	**To calculate the volume of solution required!**
25.0 mL	$\dfrac{0.35 \text{ mol Al}_2(\text{SO}_4)_3}{1000 \text{ mL}}$	$\dfrac{3 \text{ mol Ba(NO}_3)_2}{1 \text{ mol Al}_2(\text{SO}_4)_3}$	$\dfrac{1000 \text{ mL}}{0.280 \text{ mol Ba(NO}_3)_2}$	= 93.75 mL