

## Station 1

Write the complete balanced chemical reactions for the following:

- a) Potassium hydroxide and hydrogen are produced when potassium metal reacts with water.



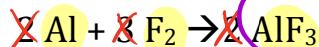
- b) The reaction between magnesium metal and copper(II) sulphate.



- c) Decomposition of mercury(II) oxide to its elements.



## Station 2



a) What is the molar mass of each of the compounds in the reaction above?

$$\text{Al} : \boxed{27.0 \text{ g/mol}}$$

$$\text{F}_2 : 19.0 \times 2 = \boxed{38.0 \text{ g/mol}}$$

$$\text{AlF}_3 : 27.0 + (19.0 \times 3) = \boxed{84.0 \text{ g/mol}}$$

b) Fluorine has a purity of 78%. How many grams of the product will be formed from 56.0 g of fluorine?

↳ sample

$$\% \text{ purity} = \frac{\text{pure}}{\text{sample}} \times 100\%$$

$$\frac{78\%}{100\%} = \frac{x}{56.0} \times \frac{100\%}{100\%}$$

$$0.78 = \frac{x}{56.0}$$

$$x = 43.7 \text{ g F}_2 \text{ pure}$$

$$43.7 \text{ g F}_2 \times \frac{1 \text{ mol}}{38.0 \text{ g F}_2} \times \frac{2 \text{ mol AlF}_3}{3 \text{ mol F}_2} \times \frac{84.0 \text{ g AlF}_3}{1 \text{ mol AlF}_3}$$

$$= \boxed{64 \text{ g AlF}_3}$$

### Station 3

$M = \frac{\text{mol}}{\text{L}}$  200.0 g of NaCl are dissolved in 100. mL of water. Calculate the molarity of the solution.

$$\frac{200.0 \text{ g}}{100. \text{ mL}} \times \frac{1 \text{ mol}}{58.5 \text{ g}} \times \frac{1000 \text{ mL}}{1 \text{ L}}$$

$$= \frac{34.2 \text{ mol}}{\text{L}} = \boxed{34.2 \text{ M}}$$

g How many grams of AgCl are required to prepare 150.0 mL of 0.200 M solution?

→ 0.150 L

← x (mol)

←

$$0.1500 \cancel{\text{ L}} \times \frac{0.200 \cancel{\text{ mol}}}{1 \cancel{\text{ L}}} \times \frac{143.4 \text{ g}}{1 \text{ mol}}$$

$$= \boxed{4.30 \text{ g}}$$

## Station 4

Aluminum and hydrochloric acid react together to form hydrogen gas and aluminum chloride. What mass of  $\text{AlCl}_3$  is produced when 24.5 g of Al reacts with 90.0 g of HCl?



Excess

$$24.5 \text{ g Al} \times \frac{1 \text{ mol Al}}{27.0 \text{ g Al}} \times \frac{2 \text{ mol AlCl}_3}{2 \text{ mol Al}} \times \frac{133.5 \text{ g AlCl}_3}{1 \text{ mol AlCl}_3} = 121 \text{ g AlCl}_3$$

Limiting

$$90.0 \text{ g HCl} \times \frac{1 \text{ mol HCl}}{36.5 \text{ g HCl}} \times \frac{2 \text{ mol AlCl}_3}{6 \text{ mol HCl}} \times \frac{133.5 \text{ g AlCl}_3}{1 \text{ mol AlCl}_3} = \boxed{110. \text{ g AlCl}_3}$$

## Station 5

Standard  
Solution

In three trials of a titration, 36.9 mL, 34.4 mL, and 34.3 mL of 0.200 M NaOH were used to neutralize a 25.0 mL sample of H<sub>2</sub>SO<sub>4</sub>.

- a) Write a balanced chemical reaction for this neutralization.



- b) What was the average volume of NaOH used?

$$\frac{36.9 + 34.4 + 34.3}{3} = 35.2 \text{ mL NaOH}$$

↓

$$0.0352 \text{ L}$$

- c) Calculate the molarity of the acid.

Start w/ standard solution

$$0.0352 \text{ L NaOH} \times \frac{0.200 \text{ mol NaOH}}{1 \text{ L NaOH}} \times \frac{1 \text{ mol H}_2\text{SO}_4}{2 \text{ mol NaOH}} \times \frac{1}{0.0250 \text{ L H}_2\text{SO}_4}$$
$$= 0.141 \text{ M H}_2\text{SO}_4$$

## Station 6

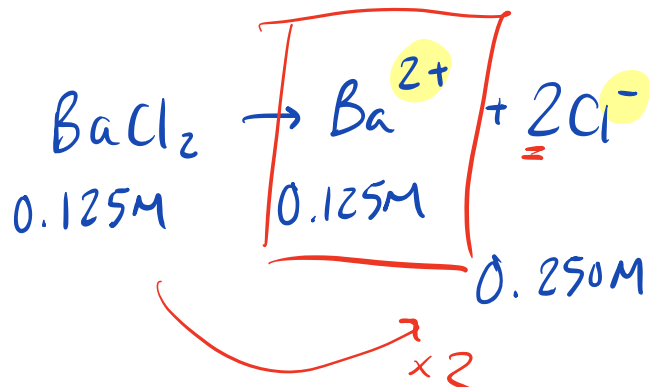
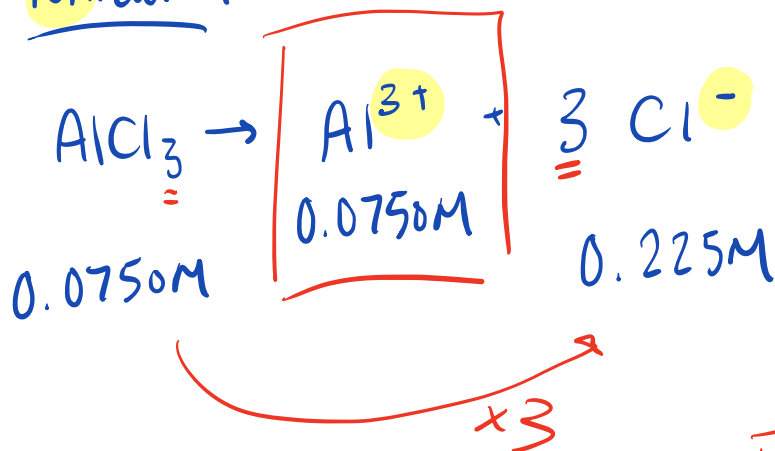
200.0 mL of 0.150 M  $\text{AlCl}_3$  is added to 200.0 mL 0.250 M  $\text{BaCl}_2$ . Calculate the  $[\text{Ba}^{2+}]$ ,  $[\text{Al}^{3+}]$  and the  $[\text{Cl}^-]$  immediately after mixing the two solutions.

Dilution

$$\begin{aligned} & [\text{AlCl}_3] \\ & C_1 V_1 = C_2 V_2 \\ & (0.150\text{M})(200.0\text{mL}) = C_2 (400.0\text{mL}) \\ & [\text{AlCl}_3] = 0.0750\text{M} \end{aligned}$$

$$\begin{aligned} & [\text{BaCl}_2] \\ & (0.250\text{M})(200.0\text{mL}) = C_2 (400.0\text{mL}) \\ & [\text{BaCl}_2] = 0.125\text{M} \end{aligned}$$

Ionization



$$\boxed{[\text{Cl}^-] = 0.475\text{M}}$$