Quiz 5.3 – Molar Concentration

Name: Key

Question 1 (2 point)

Give the molar concentration for each solution:

- 0.345 g of $Mg(NO_3)_2$ are dissolved to make 150 ml of solution

$$0.345\ g\ Mg(NO_3)_2 \left| \frac{1\ mol\ Mg(NO_3)_2}{148.31\ g\ Mg(NO_3)_2} \right. = 0.002326\ mol\ Mg(NO_3)_2 \quad \frac{0.002326\ mol}{0.150\ L} = 0.0155\ M$$

- 0.241 g of CH_3COOH are dissolved to make 125 ml of solution

$$\frac{0.241\ g\ CH_3COOH}{0.125\ L} \left| \frac{1\ mol\ CH_3COOH}{60.05\ g\ CH_3COOH} \right. = 0.0321\ M$$

Question 2 (1 point)

A student needs to make 100.00 ml of a solution with $[Na_2SO_4] = 0.025\ M$ by diluting a stock solution with $[Na_2SO_4] = 0.334\ M$. How many ml of the stock solution should they use?

$C_1V_1 = C_2V_2$

$$0.334\ M \cdot V_1 = 0.025\ M \cdot 100.00\ ml \rightarrow V_1 = 7.5\ ml$$

Question 3 (2 points)

Consider the *unbalanced* reaction: 1 $Pb(NO_3)_2(aq)$ + 2 $KCl(aq)$ ⟶ 1 $PbCl_2(s)$ + 2 $KNO_3(aq)$

- How many ml of 0.283 M $Pb(NO_3)_2$ solution are required to react with 75.00 ml of 0.167 M KCl?

$$75.00\ ml\ KCl \left| \frac{0.167\ moles\ KCl}{1\ L\ KCl} \right| \frac{1\ mole\ Pb(NO_3)_2}{2\ moles\ KCl} \left| \frac{1\ L\ Pb(NO_3)_2}{0.283\ moles\ Pb(NO_3)_2} \right. = 22.1\ ml$$

- How many g of $PbCl_2$ will be produced?

$$75.00\ ml\ KCl \left| \frac{1\ L}{1000\ ml} \right| \frac{0.167\ mol\ KCl}{1\ L\ KCl} \left| \frac{1\ mol\ PbCl_2}{2\ moles\ KCl} \right| \frac{278.11\ g\ PbCl_2}{1\ mol\ PbCl_2} = 1.74\ g\ PbCl_2$$

- What is the final $[NO_3^-]$?

Use $[K^+]$ as a proxy and account for dilution $V_{final} = 97.1\ ml$

$C_1V_1 = C_2V_2$

$$0.167\ M \cdot 75.00\ ml = C_2 \cdot 97.1\ ml \rightarrow C_2 = 0.129\ M$$