Exercise 02 **Name:** Key

Consider the balanced molecular reaction:

$$K_2CO_3\ (aq) + Ba(NO_3)_2\ (aq) \rightarrow BaCO_3\ (s) + 2\ KNO_3\ (aq)$$

(a) Write the balanced net ionic equation.
(b) We mix 0.0375 mol K_2CO_3 and 0.0350 mol $Ba(NO_3)_2$. What mass of solid $BaCO_3$ can be made?

(a) We can start by writing the complete or total ionic equation, where we dissociate all *aqueous* species because they are soluble in water.

$$2\ K^+\ (aq) + CO_3^{2-}\ (aq) + Ba^{2+}\ (aq) + 2\ NO_3^-\ (aq) \rightarrow BaCO_3\ (s) + 2\ K^+\ (aq) + 2\ NO_3^-\ (aq)$$

Now we can write the net ionic equation, where we eliminate all spectator ions (species that appear unchanged between the reactants ad products side): K^+ (*aq*) and NO_3^- (*aq*).

$$\mathbf{CO_3^{2-}\ (aq) + Ba^{2+}\ (aq) \rightarrow BaCO_3\ (s)}$$

(b) First, determine the limiting reactant. Because the mole ratio between K_2CO_3 and $Ba(NO_3)_2$ is 1:1, we know that the limiting reactant is $Ba(NO_3)_2$.

Now, determine the yield of $BaCO_3$ from the limiting reactant:

$$0.0350\ \text{mol Ba(NO}_3)_2 \times \frac{1\ \text{mol BaCO}_3}{1\ \text{mol Ba(NO}_3)_2} \times \frac{137.31\ \text{g}}{1\ \text{mol BaCO}_3} = \mathbf{4.81\ g\ BaCO_3}$$