Given the reaction:  \( \text{CaCl}_2 (aq) + \text{Na}_2\text{C}_2\text{O}_4 (aq) \rightarrow \text{CaC}_2\text{O}_4 (s) + \text{NaCl} (aq) \)

a) If 0.043g of oxygen was produced, how many grams of chlorine reacted?
b) How many moles of \( \text{CaCl}_2 \) reacted?
c) How many moles of \( \text{NaCl} \) were produced if 4.39g of \( \text{Na}_2\text{C}_2\text{O}_4 \) reacted?

**STEP 1:** Make sure the equation is balanced!

The equation is not balanced. Adding a 2 in front of \( \text{NaCl} \) in the products yields:

\[
\text{CaCl}_2 (aq) + \text{Na}_2\text{C}_2\text{O}_4 (aq) \rightarrow \text{CaC}_2\text{O}_4 (s) + 2 \text{NaCl} (aq)
\]

Ca  \( 1 \)  \( 1 \)  \( \text{Ca} \)  
Cl  \( 2 \)  \( 2 \)  \( \text{Cl} \)  
Na  \( 2 \)  \( 2 \)  \( \text{Na} \)  
C\(_2\)O\(_4\)  \( 1 \)  \( 1 \)  \( \text{C}_2\text{O}_4 \)

Now the equation has equal numbers of each atom in both reactants and products.

a) **If 0.043g of oxygen was produced, how many grams of chlorine reacted?**

**STEP 2:** Set up the units going from what we have to what we want.

\[
\text{0.043 g O} = ? \text{ g Cl}
\]

\[
\begin{align*}
\text{g O} & \rightarrow \text{mole O} & \rightarrow \text{mole CaC}_2\text{O}_4 & \rightarrow \text{mole CaCl}_2 & \rightarrow \text{mole Cl} & \rightarrow \text{g Cl} \\
\text{g O} & \rightarrow \text{mole O} & \rightarrow \text{mole CaC}_2\text{O}_4 & \rightarrow \text{mole CaCl}_2 & \rightarrow \text{mole Cl} & \rightarrow \text{g Cl}
\end{align*}
\]

Cancel the units until the desired unit is the only one left.

**STEP 3:** Calculate any molar masses (formula weights) needed and fill in the numbers using the balanced equation to find the molar ratios.

\[
\begin{align*}
\text{0.043 g O} & \rightarrow 1 \text{ mole O} & \rightarrow 1 \text{ mole CaC}_2\text{O}_4 & \rightarrow 1 \text{ mole CaCl}_2 & \rightarrow 2 \text{ mole Cl} & \rightarrow 35.45 \text{ g Cl} = 0.048 \text{ g Cl} \\
16.00 \text{ g O} & \rightarrow 4 \text{ mole O} & \rightarrow 1 \text{ mole CaC}_2\text{O}_4 & \rightarrow 1 \text{ mole CaCl}_2 & \rightarrow 1 \text{ mole Cl} & \rightarrow \text{molar mass}
\end{align*}
\]
b) How many moles of CaCl$_2$ reacted?

**STEP 2:** Set up the units going from what we have to what we want.

\[
\begin{array}{c|c|c|c}
\text{what we have} & \text{what we want} \\
0.043 \text{ g O} & \text{? mole CaCl}_2 \\
\hline
\text{g O} & \text{mole O} & \text{mole CaC}_2\text{O}_4 & \text{mole CaCl}_2 \\
\end{array}
\]

Cancel the units until the desired unit is the only one left.

**STEP 3:** Calculate any molar masses (formula weights) needed and fill in the numbers using the balanced equation to find the molar ratios.

\[
\begin{array}{c|c|c|c}
0.043 \text{ g O} & 1 \text{ mole O} & 4 \text{ mole O} & \text{1 mole CaCl}_2 \\
\hline
16.00 \text{ g O} & 1 \text{ mole CaC}_2\text{O}_4 & \text{1 mole CaC}_2\text{O}_4 & \text{1 mole CaCl}_2 \\
\end{array}
\]

The molar ratio is \(6.7 \times 10^{-4}\) mole Cl.

---

c) How many moles of NaCl were produced if 4.39 g of Na$_2$C$_2$O$_4$ reacted?

**STEP 2:** Set up the units going from what we have to what we want.

\[
\begin{array}{c|c|c|c}
\text{what we have} & \text{what we want} \\
4.39 \text{ g NaC}_2\text{O}_4 & \text{? mole NaCl} \\
\hline
\text{g NaC}_2\text{O}_4 & \text{mole NaC}_2\text{O}_4 & \text{mole NaCl} \\
\end{array}
\]

Cancel the units until the desired unit is the only one left.

**STEP 3:** Calculate any molar masses (formula weights) needed and fill in the numbers using the balanced equation to find the molar ratios.

\[
\begin{array}{c|c|c|c}
4.39 \text{ g NaC}_2\text{O}_4 & 1 \text{ mole NaC}_2\text{O}_4 & \text{2 mole NaCl} \\
\hline
134.0 \text{ g NaC}_2\text{O}_4 & 1 \text{ mole NaC}_2\text{O}_4 & \text{1 mole NaCl} \\
\end{array}
\]

The molar ratio is 0.0655 mole Cl.

The same basic steps work for all three problems. Remember your significant figures!