Given the reaction: $\mathrm{CaCl}_{2}(a q)+\mathrm{Na}_{2} \mathrm{C}_{2} \mathrm{O}_{4}(a q) \rightarrow \mathrm{CaC}_{2} \mathrm{O}_{4}(s)+\mathrm{NaCl}(a q)$
a) If 0.043 g of oxygen was produced, how many grams of chlorine reacted?
b) How many moles of $\mathrm{CaCl}_{2}$ reacted?
c) How many moles of NaCl were produced if 4.39 g of $\mathrm{Na}_{2} \mathrm{C}_{2} \mathrm{O}_{4}$ reacted?

STEP 1: Make sure the equation is balanced!
The equation is not balanced. Adding a 2 in front of NaCl in the products yields:

$$
\mathrm{CaCl}_{2}(a q)+\mathrm{Na}_{2} \mathrm{C}_{2} \mathrm{O}_{4}(a q) \rightarrow \mathrm{CaC}_{2} \mathrm{O}_{4}(s)+2 \mathrm{NaCl}(a q)
$$

| Ca | 1 | 1 | Ca |
| :--- | :--- | ---: | ---: |
| Cl | 2 | 2 | 1 |

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

## a) If 0.043 g 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.


| -90 | mole - | mole $\mathrm{CaC}_{2} \mathrm{O}_{4}$ | molecact | mole Ct | g Cl |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | $-90$ | mole $\theta$ | $\mathrm{moleCaC}_{2}$ | CaCT | mole Ct |

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.

| 0.043-90 | 1 mole O | 1 mole $\mathrm{CaC}_{2} \mathrm{O}_{4}$ | $1 \mathrm{~mole} \mathrm{CaCT}_{2}$ | 2 mole-Ct | 35.45 g Cl | $=0.048 \mathrm{~g} \mathrm{Cl}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 16.00 go | 4 mole $\theta$ | 1 mole $\mathrm{CaC}_{2}$ | 1 molecaCT | 1 mole- Ct |  |
|  | molar mass | molar ratio | molar ratio | molar ratio | molar |  |

## b) How many moles of $\mathrm{CaCl}_{2}$ reacted?

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


| -90 | mole 0 | moleCaC ${ }_{2} \mathrm{O}_{4}$ | $\mathrm{mole} \mathrm{CaCl}_{2}$ |
| :---: | :---: | :---: | :---: |
|  | -90 | moleO | moleCaC2 ${ }_{4}$ |

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.

| 0.043-90 | 1 mole $O$ | $1 \mathrm{moleCaC}_{2} \mathrm{O}_{4}$ | $1 \mathrm{~mole} \mathrm{CaCl}_{2}$ | $=6.7 \times 10^{-4} \mathrm{~mole} \mathrm{Cl}$ |
| :---: | :---: | :---: | :---: | :---: |
|  | 16.00 go | 4 mole $\theta$ | $1 \mathrm{moleCaC}_{2} \mathrm{O}_{4}$ |  |
|  | molar mass | molar ratio | molar rati |  |

## c) How many moles of NaCl were produced if 4.39 g of $\mathrm{Na}_{2} \mathrm{C}_{2} \mathrm{O}_{4}$ reacted?

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


| $\mathrm{gNa}_{2} \mathrm{C}_{2} \mathrm{O}_{4}$ | mole $\mathrm{Na}_{2} \mathrm{C}_{2} \mathrm{O}_{4}$ | mole NaCl |
| :---: | :---: | :---: |
|  | $\mathrm{gNa}_{2} \mathrm{C}_{2} \mathrm{O}_{4}$ | mole $\mathrm{Na}_{2} \mathrm{C}_{2} \mathrm{O}_{4}$ |

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.

| $4.39 \mathrm{~g} \mathrm{Na}_{2} \mathrm{C}_{2} \mathrm{O}_{4}$ | 1 mole $\mathrm{Na}_{2} \mathrm{C}_{2} \mathrm{O}_{4}$ | 2 (mole NaCl |
| :--- | :--- | :---: |
|  | $\underset{\text { molar mass }}{134.0 \mathrm{~g} \mathrm{Na}_{2} \mathrm{C}_{2} \mathrm{O}_{4}}$ | $1 \underset{\text { molar ratio }}{\text { mole } \mathrm{Na}_{2} \mathrm{C}_{2} \mathrm{O}_{4}}$ |$=0.0655 \mathrm{~mole} \mathrm{CaCl} 2$

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

