Challenge Problem

A mixture contains only NaCl and $Fe(NO_3)_3$. A 0.456 gram sample of the mixture is dissolved in water and an excess of NaOH is added, producing a precipitate of $Fe(OH)_3$. The precipitate is filtered, dried and weighed. Its mass is 0.107 grams. Calculate the following:

      a. The mass of iron in the sample
      b. The mass of $Fe(NO_3)_3$ in the sample
      c. The mass percent of $Fe(NO_3)_3$ in the sample

Problem Solving Template

Analyze

1A

Question: (what are you trying to find out?)

a) mass of Fe in original sample

b) mass of Fe(NO₃)₃ " "

c) mass % of Fe(NO₃)₃ " "

Known: (what information does the problem give you?)

0.456 g of mix NaCl & Fe(NO₃)₃ (reactants)

0.107 g Fe(OH)₃ (product) [assume all Fe is in the product]

1B

What do you need to do to solve the problem? (break it down into parts)

- molar masses

- mass Fe in product → (mass %)
  → same as in reactant.

- mass Fe(NO₃)₃, mass % Fe(NO₃)₃

Calculate

2A

Set up: (Do the work from 1-B)

a) $Fe(OH)_3 = \dfrac{55.845 + (17.007)3}{106.875\ g/mol}$

$\dfrac{55.845\,g}{106.87\,g} = 52.26\%\ Fe$

$(0.5226)(0.107\,g) = 0.0559\,g\ Fe$ in the product.

→ if all of the Fe came from the reactants then:

$\boxed{0.0559\,g\ Fe\ in\ the\ original\ sample}$

b) $Fe(NO_3)_3 = 241.86\,g/mol$

$0.0559\,g\ Fe\left(\dfrac{1\,mol\ Fe}{55.845\,g\,Fe}\right)\left(\dfrac{1\,mol\ Fe(NO_3)_3}{1\,mol\ Fe}\right)\left(\dfrac{241.86\,g}{1\,mol\ Fe(NO_3)_3}\right) = \boxed{0.242\,g\ Fe(NO_3)_3}$

c) $\dfrac{0.242\,g}{0.456\,g}(100) = \boxed{53.11\%\ Fe(NO_3)_3}$

2B

Answer the question: (Use the info from above to solve the problem)

Evaluate

3

Does your answer make **sense?**