Challenge Problem

An original sample is a mixture of KCl and 22.9% KBr. When 0.1024 grams of the sample is dissolved in water and reacted with excess silver nitrate, 0.1889 grams of solid (a mixture of silver chloride and silver bromide) is produced. What is the composition of the product mixture in grams for each substance?

Problem Solving Template

Analyze

1A

Question: (what are you trying to find out?)
How many g of each AgBr & AgCl are in the product?

Known: (what information does the problem give you?)
reactants - 0.1024g mix KCl & 22.9% KBr w/ Excess $AgNO_3$

products - 0.1889g mix AgCl & AgBr

1B

What do you need to do to solve the problem? (break it down into parts)
- Molar masses - Balanced Eqn.
- g KBr → g AgBr → g AgCl
- check w/ % KCl → g KCl → g AgCl

Calculate

2A

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

$KCl + KBr + 2AgNO_3 \rightarrow AgCl + AgBr + 2KNO_3$

$KBr = 119.0023\ g/mol$ $AgBr = 187.7722\ g/mol$

$(0.229)(0.1024g) = 0.0235g\ KBr$

$0.0235g\ KBr\left(\frac{1mol\ KBr}{119.0023g}\right)\left(\frac{1mol\ AgBr}{1mol\ KBr}\right)\left(\frac{187.7722g}{1mol\ AgBr}\right) = 0.0371g\ AgBr$

$0.1889g\ mix - 0.0371g\ AgBr = 0.1518g\ AgCl.$

∴ product mix contains 0.0371g AgBr, 0.1518g AgCl

✓ $100 - 22.9 = 77.1\%\ KCl$ $(0.771)(0.1024g) = 0.07895g\ KCl$

$0.07895g\ KCl\left(\frac{1mol\ KCl}{74.55g}\right)\left(\frac{1mol\ AgCl}{1mol\ KCl}\right)\left(\frac{143.32g}{1mol\ AgCl}\right) = 0.1528g\ AgCl$

2B

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

KCl, KBr, $AgNO_3$, $AgNO_3$ → AgCl, AgBr, KNO_3

Evaluate

3

Does your answer make sense?

✓