

## Answer on Question #72541, Chemistry / General Chemistry

Student A- 5.01g NaCl(s) reacts with 200mL of 0.35M solution of AgNO<sub>3</sub> (aq) with percentage yield of 76.3%. Student B- 6.58g AgNO<sub>3</sub>(aq) reacts with 40mL of 1.45M solution of BaCl<sub>2</sub>(aq) with percentage yield of 68.5%. What mass of silver chloride solid is produced by each student and what happens when the concentration of the solutions used was doubled?

### Solution

Student A:



As it's seen from the equation 1 mole of NaCl reacts with 1 mole of AgNO<sub>3</sub> producing 1 mole of AgCl.

Find the amounts of the reactants:

$$v(\text{NaCl}) = \frac{m}{M} = \frac{5.01}{58.5} = 0.086 \text{ (mole)}$$

$$v(\text{AgNO}_3) = C_m \times V = 0.35 \times 0.2 = 0.07 \text{ (mole)}$$

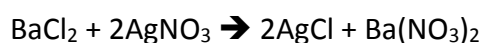
As NaCl is in excess then there is produced 0.07 mole of AgCl. Find it's mass:

$$m(\text{AgCl}) = M \times v = 143 \times 0.07 = 10.01 \text{ (g)} - \text{theoretical yield};$$

$$m_{\text{pr}}(\text{AgCl}) = m_{\text{theor}} \times w = 10.01 \times 0.763 = \mathbf{7.64 \text{ (g)}} - \text{mass of solid AgCl is produced by student A.}$$

**If the concentration of the solution used was doubled, then AgNO<sub>3</sub> would become in excess, so the theoretical yield of AgCl would be 0.086 mole instead of 0.07 mole.**

Student B:



As it's seen from the equation 1 mole of BaCl<sub>2</sub> reacts with 2 moles of AgNO<sub>3</sub> producing 2 moles of AgCl.

Find the amounts of the reactants:

$$v(\text{AgNO}_3) = \frac{m}{M} = \frac{6.58}{170} = 0.039 \text{ (mole)}$$

$$v(\text{BaCl}_2) = C_m \times V = 1.45 \times 0.04 = 0.058 \text{ (mole)}$$

0.039 mole of AgNO<sub>3</sub> requires 0.0195 mole of BaCl<sub>2</sub>. So BaCl<sub>2</sub> is in excess and there is produced 0.039 mole of AgCl. Find it's mass:

$$m(\text{AgCl}) = M \times v = 143 \times 0.039 = 5.58 \text{ (g)} - \text{theoretical yield};$$

$$m_{\text{pr}}(\text{AgCl}) = m_{\text{theor}} \times w = 5.58 \times 0.685 = \mathbf{3.82 \text{ (g)}} - \text{mass of solid AgCl is produced by student B.}$$

The doubling of the concentration of  $\text{BaCl}_2$  solution leads to increasing of  $\text{BaCl}_2$  amount. As it is already in excess, so nothing happens. The theoretical yield of  $\text{AgCl}$  is still 0.039 mole.

**Answer**

**Student A:**  $m(\text{AgCl}) = 7.64 \text{ g}$

**Student B:**  $m(\text{AgCl}) = 3.82 \text{ g}$

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