# Answer on Question # 61789 – Chemistry – General Chemistry

Aqueous hydrochloric acid HCl will react with solid sodium hydroxide NaOH to produce aqueous sodium chloride NaCl and liquid water $H_2O$. Suppose 1.8 g of hydrochloric acid is mixed with 3.66 g of sodium hydroxide. Calculate the maximum mass of water that could be produced by the chemical reaction. Be sure your answer has the correct number of significant digits.

**Solution:**

The reaction can be represented with a following equation:

$$HCl + NaOH = NaCl + H_2O$$
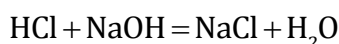
According to the equation, equal amounts of chemical agents and resultant products (in moles) participate in this reaction.

The amount of hydrochloric acid is as follows:

$$\nu_{HCl} = \frac{m_{HCl}}{M_{HCl}} = \frac{m_{HCl}}{A_H + A_{Cl}} = \frac{1.8}{1 + 35.46} = 0.05 \text{ [moles]},$$

where $m$ is the substance mass, A is the atomic mass of an element.

The amount of sodium hydroxide is as follows:

$$\nu_{NaOH} = \frac{m_{NaOH}}{M_{NaOH}} = \frac{m_{NaOH}}{A_{Na} + A_O + A_H} = \frac{3.66}{23 + 16 + 1} = 0.09 \left[\text{moles}\right].$$

Since the amount of sodium hydroxide exceeds the amount of hydrochloric acid, the maximum amount of each substance participating in the reaction is $\nu = \nu_{HCl} = 0.05\left[\text{moles}\right]$.

Therefore, the maximum amount of water that can be produced is as follows:

$$m_{H_2O} = M_{H_2O}\nu_{H_2O} = (2A_H + A_O) \times \nu = (2 \times 1 + 16) \times 0.05 = 0.9\left[g\right].$$

**Answer:** $0.9\left[g\right]$.