Answer on Question #54536 – Chemistry – General chemistry

Question:

What is the theoretical yield of sodium bromide formed from the reaction of 0.81g of hydrobromic acid and 0.19 of sodium hydroxide?

Solution:

The reaction formula is

$$\mathrm{HBr} + \mathrm{NaOH} \rightarrow \mathrm{NaBr} + \mathrm{H_2O}$$

Molar mass of hydrobromic acid

$$\mathrm{HBr} = 1 + 79.9 = 80.9\ \mathrm{g/mole}$$

Molar mass of sodium hydroxide

$$\mathrm{NaOH} = 23 + 16 + 1 = 40\ \mathrm{g/mole}$$

Molar mass of sodium sodium bromide

$$\mathrm{NaBr} = 23 + 79.9 = 102.9\ \mathrm{g/mole}$$

From the equation you see that you need 80.9/40=2.02 more HBr than NaOH

As the amount of HBr/NaOH is in your case 0.81/0.19=4.26 you see that NaOH is limiting reactant.

So mass (the theoretical yield) of NaBr produced is

$$m = \frac{0.19\ \mathrm{g}}{40\ \mathrm{g/mole}} \times 102.9 \frac{\mathrm{g}}{\mathrm{mole}} = 0.489\ \mathrm{g} \approx 0.49\ \mathrm{g}$$

Answer: $0.49\ \mathrm{g}$.