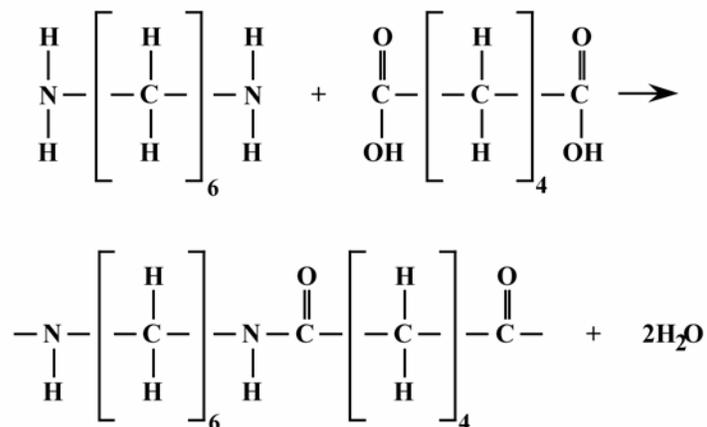


15.38 This problem asks for us to calculate the masses of hexamethylene diamine and adipic acid necessary to yield 20 kg of completely linear nylon 6,6. The chemical equation for this reaction is the answer to Concept Check 15.12, which is as follows:



From this equation we may calculate the molecular weights of these molecules.

$$\begin{aligned}
 MW(\text{adipic}) &= 6(A_{\text{C}}) + 10(A_{\text{H}}) + 4(A_{\text{O}}) \\
 &= 6(12.01 \text{ g/mol}) + 10(1.008 \text{ g/mol}) + 4(16.00 \text{ g/mol}) = 146.14 \text{ g/mol}
 \end{aligned}$$

$$\begin{aligned}
 MW(\text{hexamethylene}) &= 6(A_{\text{C}}) + 16(A_{\text{H}}) + 2(A_{\text{N}}) \\
 &= 6(12.01 \text{ g/mol}) + 16(1.008 \text{ g/mol}) + 2(14.01 \text{ g/mol}) = 116.21 \text{ g/mol}
 \end{aligned}$$

$$\begin{aligned}
 MW(\text{nylon}) &= 12(A_{\text{C}}) + 22(A_{\text{H}}) + 2(A_{\text{N}}) + 2(A_{\text{O}}) \\
 &= 12(12.01 \text{ g/mol}) + 22(1.008 \text{ g/mol}) + 2(14.01 \text{ g/mol}) + 2(16.00 \text{ g/mol}) \\
 &= 226.32 \text{ g/mol}
 \end{aligned}$$

The mass of 20 kg of nylon 6,6 equals 20,000 g or