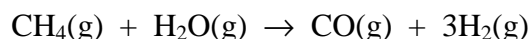


- The reaction of methane and water is one way to prepare hydrogen for use as a fuel.



Which compound is the limiting reactant if you begin with 995 g of methane and 2510 g of water?

**Marks**  
**3**

**The molar mass of methane, CH<sub>4</sub>, is (12.01 (C)) + (4 × 1.008 (H)) = 16.042. The number of moles of methane is therefore:**

$$\text{moles of methane} = \frac{\text{mass}}{\text{molar mass}} = \frac{995}{16.042} = 62.0 \text{ mol}$$

**The molar mass of water, H<sub>2</sub>O, is (2 × 1.008 (H)) + (16.00 (O)) = 18.016. The number of moles of water is therefore:**

$$\text{moles of methane} = \frac{\text{mass}}{\text{molar mass}} = \frac{2510}{18.016} = 139 \text{ mol}$$

**As the reaction is a 1:1 reaction of methane and water, methane is the limiting reagent.**

Answer: **methane, CH<sub>4</sub>**

What mass of the excess reactant remains when the reaction is completed?

**As the reaction is a 1:1 reaction, (139 – 62.0) = 77 mol of H<sub>2</sub>O will be left unreacted. This corresponds to a mass of:**

$$\text{mass of water} = \text{moles of water} \times \text{molar mass} = 77 \times 18.016 = 1400 \text{ g} = 1.4 \text{ kg.}$$

Answer: **1.4 kg**