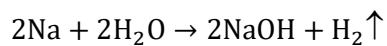How many molecules of hydrogen gas are formed when 24.6 g of sodium are added to water.

Show your work.

Solution

$$2Na + 2H_2O \rightarrow 2NaOH + H_2\uparrow$$

$$M(Na) = 22.989 \text{ g/mol}$$

$$n(Na) = \frac{m}{M} = \frac{24.6}{22.989} = 1.07 \text{ mol}$$

$$n(H_2) = \frac{n(Na)}{2} = \frac{1.07}{2} = 0.535 \text{ mol}$$

$$N(H_2) = n(H_2) \cdot N_A = 0 \cdot 535 \cdot 10^{23} = 535 \cdot 10^{20}$$

Answer: $N(H_2) = 535 \cdot 10^{20}$