

Counting atoms and molecules

- A. How many individual H atoms are contained in 10.0 gm of CH_3OH ?
- B. What mass of CH_3OH contains 1.75 mol of H atoms?

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A. How many individual CH_3OH molecules are contained in 10.0 g of CH_3OH ?

Solution: 1. Determine the molar mass of CH_3OH .

$$M_m = 12 + 16 + 4 = 32 \text{ grams/mole.}$$

2. Convert to moles:

$$n = m / M_m = (10 \text{ grams}) / (32 \text{ grams/mole}) = 0.3125 \text{ moles}$$

This corresponds to 1.88×10^{23} molecules.

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B. What mass of CH_3OH contains 1.75 mol of H atoms?

Solution: The mole ratio of H: CH_3OH is 4:1 so the number of moles of CH_3OH is

$$n_{\text{CH}_3\text{OH}} = \frac{n_{\text{H}}}{4} = \frac{1.75 \text{ moles}}{4} = 0.4375 \text{ moles}$$

The mass is

$$m = nM_{\text{m}} = (0.4375 \text{ moles})(32 \text{ grams/mole}) = 14 \text{ grams}$$