

# One more example

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s+/2

**Example.** Consider a globular protein of molecular weight of 20 kDa. The density of the protein is  $1.35 \text{ g cm}^{-3}$ . Calculate the approximate protein diameter.

$$m = \frac{20 \text{ kg mol}^{-1}}{6.022 \times 10^{23} \text{ mol}^{-1}} = 3.32 \times 10^{-23} \text{ kg}$$

or  $1 \text{ Da} = 1 \text{ g mol}^{-1}/N_A = 1.6605 \times 10^{-27} \text{ kg}$  (atomic mass unit)

$$m = 20000 \times 1.6605 \times 10^{-27} \text{ kg} = 3.32 \times 10^{-23} \text{ kg}$$

$$V = \frac{m}{\rho} = \frac{3.32 \times 10^{-23} \text{ kg}}{1350 \text{ kg m}^{-3}} = 2.46 \times 10^{-26} \text{ m}^3$$

$$\frac{4\pi}{3}r^3 = \frac{\pi}{6}d^3 = V$$

$$d = \sqrt[3]{\frac{6V}{\pi}} = \sqrt[3]{\frac{6 \cdot 2.46 \times 10^{-26} \text{ m}^3}{\pi}} = 3.61 \times 10^{-9} \text{ m} \doteq \underline{3.6 \text{ nm}} = 36 \text{ \AA}$$

