Exercise 54

The volume V of a sphere depends on the length of its radius as $V = (4/3)\pi r^3$. Because Earth is not a perfect sphere, we can use the *mean radius* when measuring from the center to its surface. The mean radius is the average distance from the physical center to the surface, based on a large number of samples. Find the volume of Earth with mean radius 6.371×10^6 m.

Solution

Plug 6.371×10^6 m into the formula for V.

$$\begin{aligned} V(6.371 \times 10^6 \text{ m}) &= \frac{4}{3}\pi(6.371 \times 10^6 \text{ m})^3 \\ &= \frac{4}{3}\pi(6.371)^3(10^6)^3 \text{ m}^3 \\ &= \frac{4}{3}\pi(6.371)^3(10^{18}) \text{ m}^3 \\ &\approx (1083)(10^{18}) \text{ m}^3 \\ &\approx 1.083 \times 10^{21} \text{ m}^3 \end{aligned}$$