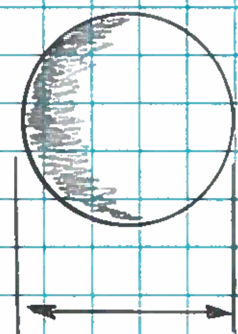
Uranium Nucleus



$m = 4 \times 10^{-25}$ kg.

diameter, $d = 1.5 \times 10^{-14}$ m

radius, $r = d/2 = 7.5 \times 10^{-15}$ m

Density: $\rho = \frac{m}{V} = \frac{m}{\frac{4}{3}\pi r^3}$

$\therefore \; \boxed{\rho = 2.26 \times 10^{17} \text{ kg/m}^3}$

Compare this to the values in Table 18.1

e.g. $\rho_{air} = 1.3$ kg/m³ ; $\rho_{water} = 1000$ kg/m³

$\rho_{gold} = 1.9 \times 10^4$ kg/m³

Do such high densities exist anywhere else in nature?

Yes, Neutron Stars.

How much would a thimble of NS material weigh on Earth?

$$V \approx 2\,cm^3 \left(\frac{1\,m}{100\,cm}\right)^3 = 2\times10^{-6}\,m^3$$

$$M = \rho V = 4.5\times10^{11}\,kg$$

$$\text{Weight} = Mg = 4.4\times10^{12}\,N \left(\frac{1\,lb}{4.45\,N}\right) = \underline{9.9\times10^{11}\,lb.}$$

$\sim \underline{10^{12}\text{ pounds!}}$

$1\,N = 4.45\,lb.$