

Mass and Density of Earth.

Newton's law of gravitation can be used to estimate the mass and density of the earth.

As we know $g = \frac{GM}{R^2}$, so we have $M = \frac{gR^2}{G}$

$$\therefore M = \frac{9.8 \times (6.4 \times 10^6)^2}{6.67 \times 10^{-11}} = 5.98 \times 10^{24} \text{ kg} \approx 10^{25} \text{ kg}$$

and as we know $g = \frac{4}{3} \pi \rho GR$, so we have $\rho = \frac{3g}{4\pi GR}$

$$\therefore \rho = \frac{3 \times 9.8}{4 \times 3.14 \times 6.67 \times 10^{-11} \times 6.4 \times 10^6} = 5478.4 \text{ kg/m}^3$$