

EJERCICIO F2B53447:

"actimaged.com"

$m_b = 25g = 0.025 \text{ kg}$ (no aporta nada)

$T_{\text{pendulo}} = 3.12 \text{ s}$

$G = 6.67 \cdot 10^{-11} \text{ Nm}^2/\text{kg}^2$; $R_L = 1737 \text{ km} = 1737 \cdot 10^3 \text{ m}$; $M_L = 7.34 \cdot 10^{22} \text{ kg}$

a) $L_{\text{pendulo}} = ?$

b) $T'_{\text{pendulo}} = 4.5 \Rightarrow h_{\text{orbita}} = ?$

c) $T_{\text{ave}} = ?$

a) $L_{\text{pendulo}} = ?$:

$g = \frac{4\pi^2 \cdot L}{T^2}$; $g_L = G \frac{M_L}{R_L^2}$

$g_L = 6.67 \cdot 10^{-11} \cdot \frac{7.34 \cdot 10^{22}}{(1737 \cdot 10^3)^2} = 1.62 \frac{\text{N}}{\text{m}} = g_L$

$1.62 = \frac{4\pi^2 \cdot L}{T^2} \Rightarrow L = \frac{1.62 \cdot T^2}{4\pi^2}$

$L = \frac{1.62 \cdot 3.12^2}{4\pi^2} = 0.399 \text{ m} \Rightarrow L \approx 0.40 \text{ m}$

b) $h_{\text{orbita ave}} = ?$ ($T' = 4.5 \text{ s}$)

$g = \frac{4\pi^2 \cdot L}{T^2} = \frac{4\pi^2 \cdot 0.4}{4.5^2} = 0.78 \frac{\text{N}}{\text{m}}$

$g_{\text{orbita}} = G \frac{M_L}{R_{\text{orbita}}^2} \Rightarrow R_{\text{orbita}}^2 = G \frac{M_L}{g_{\text{orbita}}}$

$R_{\text{orbita}}^2 = 6.67 \cdot 10^{-11} \cdot \frac{7.34 \cdot 10^{22}}{0.78} = 6.25 \cdot 10^{12}$

$R_{\text{orbita}} = \sqrt{} = 2500197.43 \text{ m}$

$R_{\text{orbita}} = R_L + h \Rightarrow h = R_{\text{orbita}} - R_L$

$h \approx 7.63 \cdot 10^5 \text{ m} = 763 \text{ km}$

c) T_{nave} en órbita:

3ª Ley de Kepler:

$$F = m \cdot a$$

2ª Ley de Newton

$$F_g = m \cdot a_N$$

Ley de Grav. Universal y A.C.U.

$$G \frac{Mm}{R^2} = m \cdot \frac{v^2}{R} \Rightarrow v^2 = \frac{GM}{R} \Rightarrow \boxed{v_{orb} = \sqrt{\frac{GM}{R}}}$$

$$v^2 = \frac{GM}{R} \Rightarrow v = \frac{s}{t} \Rightarrow \left(\frac{2\pi R}{T} \right)^2 = \frac{GM}{R}$$

$$\frac{4\pi^2 R^2}{T^2} = \frac{GM}{R}$$

$$\boxed{R^3 = \frac{GM}{4\pi^2} \cdot T^2}$$

$$T^2 = \frac{4\pi^2}{GM} \cdot R^3$$

$$T^2 = \frac{4\pi^2}{6,67 \cdot 10^{-11} \cdot 7,34 \cdot 10^{22}} \cdot (2500197,43)^3 = 126\,026\,175,3$$

$$\boxed{T = 11\,226,14 \text{ s}}$$

$$11\,226,14 \text{ s} \cdot \frac{1 \text{ hora}}{3600 \text{ s}} = \boxed{3,12 \text{ horas} = T_{nave}}$$