

PHYS101.31
QUIZ#1- CHAPTER 1
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Using the fact that the speed of light in space is about 3.00×10^8 m/s, determine how many miles light will travel in 10 hours. (1 mile = 1.6 km)

$$x = vt = (3 \times 10^8 \frac{\text{m}}{\text{s}}) (10 \text{ h})$$

$$= (3 \times 10^8 \frac{\text{m}}{\text{s}}) \left(\frac{1}{1000} \frac{\text{km}}{\text{m}} \right) \left(\frac{1.6}{1.6} \frac{\text{mile}}{\text{km}} \right) (10 \text{ h}) \left(\frac{3600 \text{ s}}{1 \text{ h}} \right)$$

$$= \boxed{6.75 \times 10^9 \text{ miles}}$$

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The standard kilogram is a platinum-iridium cylinder 3.9 cm in height and 1.95 cm in radius.
What is the density of the material in g/cm^3 ?

$$\rho = \frac{m}{V}$$

$$m = 1 \text{ kg} = 1 \cancel{\text{kg}} \left(\frac{1000 \cancel{\text{g}}}{1 \cancel{\text{kg}}} \right) = 1000 \text{ g}$$

$$V = \pi r^2 h = \pi (1.95 \text{ cm})^2 (3.9 \text{ cm}) \\ = \pi \times 14.8 \text{ cm}^3 = 46.6 \text{ cm}^3$$

$$\rho = \frac{1000 \text{ g}}{46.6 \text{ cm}^3} = \boxed{21.5 \text{ g/cm}^3}$$

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Suppose $A = B^n/C^m$ where A has dimensions LT , B has dimension L^2T^{-1} , and C has dimensions LT^2 , and n and m are constants. Find the values of n and m.

$$\begin{aligned} L^1 T^1 &= \frac{(L^2 T^{-1})^n}{(L T^2)^m} = \frac{L^{2n} T^{-n}}{L^m T^{2m}} \\ &= L^{2n-m} T^{-(n+2m)} \end{aligned}$$

$$\Rightarrow \left. \begin{aligned} 2n - m &= 1 \\ n + 2m &= -1 \end{aligned} \right\} \Rightarrow \begin{aligned} 2n &= 1 + m \\ n &= -(2m + 1) \end{aligned}$$

$$\Rightarrow -2(2m + 1) = 1 + m \Rightarrow -4m - 2 = 1 + m$$

$$\Rightarrow 5m = -3 \Rightarrow \boxed{m = -\frac{3}{5}}$$

$$n = -\left(2 \times -\frac{3}{5} + 1\right) = \frac{6}{5} - 1 = \frac{6-5}{5} = \frac{1}{5}$$

$$\boxed{n = \frac{1}{5}}$$