

82. (a) Kepler's law of periods is

$$T^2 = \left(\frac{4\pi^2}{GM} \right) r^3 .$$

Thus, with $M = 6.0 \times 10^{30}$ kg and $T = 300(86400) = 2.6 \times 10^7$ s, we obtain $r = 1.9 \times 10^{11}$ m.

(b) That its orbit is circular suggests that its speed is constant, so

$$v = \frac{2\pi r}{T} = 4.6 \times 10^4 \text{ m/s} .$$