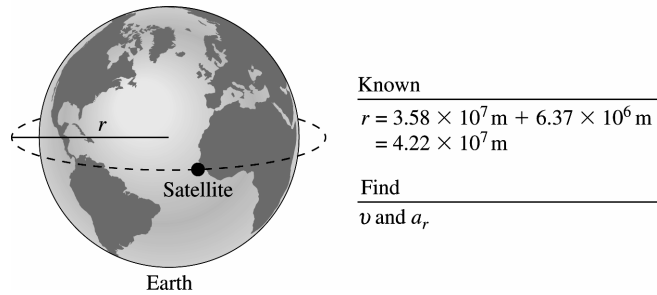


4.65. Model: The satellite is a particle in uniform circular motion.

Visualize:

Pictorial representation



Solve: (a) The satellite makes one complete revolution in 24 h about the center of the earth. The radius of the motion of the satellite is

$$r = 6.37 \times 10^6 \text{ m} + 3.58 \times 10^7 \text{ m} = 4.22 \times 10^7 \text{ m}$$

The speed of the satellite is $v = \frac{(\text{distance traveled})}{(\text{time taken})} = \frac{2\pi r}{24 \text{ h}} = 3.07 \times 10^3 \text{ m/s}$.

(b) The acceleration of the satellite is centripetal, with magnitude

$$a_r = \frac{v^2}{r} = \frac{(3.07 \times 10^3 \text{ m/s})^2}{4.22 \times 10^7 \text{ m}} = 0.223 \text{ m/s}^2$$

Assess: The small centripetal acceleration makes sense when realized it is for an object traveling in a circle with radius $\approx 26,400$ miles.