2. A satellite orbits the Earth in one day and it flies around the Earth an altitude of twice the Earth's radius, find the following: (hint use reference tables to find the Earth's radius)

A. The period of the satellite (in seconds).

$$1\,\text{DAY} \times \frac{24\,\text{hr}}{1\,\text{DAY}} \times \frac{60\,\text{min}}{1\,\text{hr}} \times \frac{60\,\text{s}}{1\,\text{min}} = 86{,}400\,\text{s}$$

B. The speed of the satellite.

$$3r_E = (6.37\times10^6\,\text{m})3 = 1.91\times10^7\,\text{m}$$

$$v = \frac{2\pi r}{T} = \frac{2\pi(1.91\times10^7\,\text{m})}{(86{,}400\,\text{s})}$$

$$v = 1{,}390\,\text{m/s}$$

C. The centripetal acceleration of the satellite.

$$a_c = \frac{v^2}{r} = \frac{(1{,}390\,\text{m/s})^2}{1.91\times10^7\,\text{m}} = 0.101\,\text{m/s}^2$$

3. A man on a motorcycle is traveling around in a spherical steel cage (radius = 3 m) with an acceleration of 133 m/s^2. Find the motorcycle circular speed of the motorcycle.

$$a_c = \frac{v^2}{r} \rightarrow v = \sqrt{a_c r}$$

$$v = \sqrt{(133\,\text{m/s}^2)(3\,\text{m})}$$

$$v = 20.0\,\text{m/s}$$

4. A 2000 kg car goes around a circular track with a speed of 25 m/s. What is the time it takes the car to complete one lap if the radius of the track is 100 m?

$$v = \frac{2\pi r}{T} \rightarrow T = \frac{2\pi r}{v} = \frac{2(\pi)(100\,\text{m})}{25\,\text{m/s}}$$

$$T = 25.1\,\text{s}$$

5. Find the radius of an object in circular motion if it has a speed of 2 m/s and an acceleration of 5 m/s^2.

$$a_c = \frac{v^2}{r}$$

$$r = \frac{v^2}{a_c} = \frac{(2\,\text{m/s})^2}{5\,\text{m/s}^2} = 0.8\,\text{m}$$