Answer on Question #69223, Physics / Other

A space station of radius 20 m spins so that a person inside it has a sensation of artificial gravity when afloat in space. The rate of spin is chosen to attain. g= 9.8 ms^{-2}. Calculate the length of the day as seen in the spacecraft through a window.

Solution:

Occupants of the station would experience centripetal acceleration according to the following equation,

$$a = \frac{\omega^2}{r}$$

where ω is the angular velocity of the station, r is its radius, and a is linear acceleration at any point along its perimeter.

Thus,

$$\omega = \sqrt{ar} = \sqrt{9.8 \times 20} = 14 \frac{rad}{s}$$

The length of day will be the period of rotation

$$T = \frac{2\pi}{\omega} = \frac{2\pi}{14} = 0.45\ s$$

Answer: $0.45\ s$