

Q- A seconds pendulum is one that moves through its equilibrium position once each second. The period of the pendulum is precisely 2s. The length of a seconds pendulum is 0.9927 m at Tokyo Japan and 0.994 2m at Cambridge England. What is the ratio of the free-fall accelerations at these two locations?

The time period of a simple pendulum is given by

$$T = 2\pi\sqrt{\frac{l}{g}}$$

Where the  $l$  is the length of the pendulum and  $g$  is acceleration due to gravity at that place. As the time period of both the pendulum is 2.0 second, we may equate them and can write

$$T = 2\pi\sqrt{\frac{l_1}{g_1}} = 2\pi\sqrt{\frac{l_2}{g_2}}$$

Hence, we get

$$\frac{g_1}{g_2} = \frac{l_1}{l_2}$$

Hence the ratio of the free fall accelerations at these two places is given by

$$\frac{g_T}{g_C} = \frac{l_T}{l_C} = \frac{0.9927}{0.9942} = 0.9985$$