HW 11-5 Soln)

For the simple pendulum:

$$P_{SP} = 2\pi\sqrt{\frac{L}{g}}$$

For the physical pendulum,

$$P_{PP} = 2\pi\sqrt{\frac{I}{Dgm}}$$

The moment of inertia of the sphere about the point of suspension can be found from the parallel axis theorem:

$$I = I_{CM} + mL^2 = \frac{2}{5}mR^2 + mL^2 = \frac{2}{5}m(0.1L)^2 + mL^2 = 1.004\,mL^2$$

And of course D = L. So,

$$P_{PP} = 2\pi\sqrt{\frac{1.004\,mL^2}{Lgm}} = (1.002)2\pi\sqrt{\frac{L}{g}}$$

which is about a 0.2% difference.