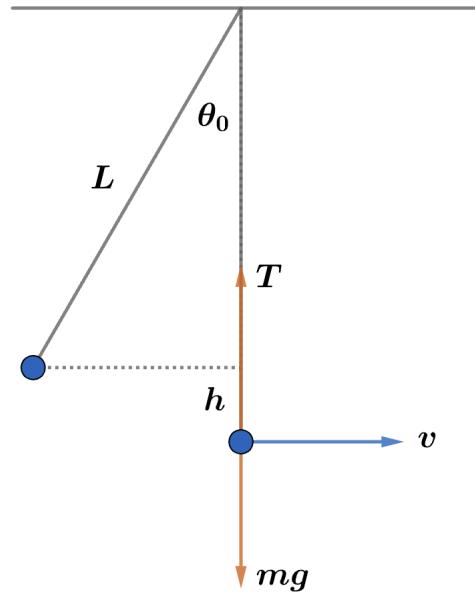


2013 F=ma Exam: Problem 20

Kevin S. Huang



We found in the previous problem that the tension is maximized when the pendulum is at the bottom. We have

$$T - mg = \frac{mv^2}{L}$$

Since the pendulum amplitude is θ_0 , the pendulum has fallen a height

$$h = L(1 - \cos \theta_0)$$

By conservation of energy,

$$mgh = \frac{1}{2}mv^2$$

$$v^2 = 2gh = 2gL(1 - \cos \theta_0)$$

Substituting this into the force equation,

$$T - mg = 2mg(1 - \cos \theta_0)$$

$$T = mg(3 - 2\cos \theta_0)$$

so the answer is E.