Phys 11: Conservation of Energy Quiz 2

Ms Lysne

Rockridge Secondary School
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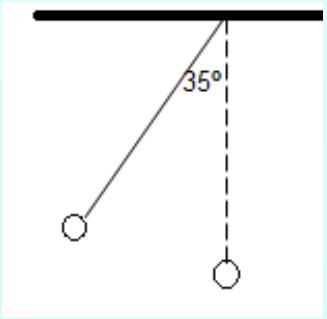
Conservation of Energy Quiz

1. A 2.0 m pendulum with mass 0.2 kg is pulled 35° away from equilibrium and dropped. What will be the speed of the pendulum when it reaches its equilibrium? Solve this problem using conservation of energy. 

Conservation of Energy Quiz Solutions

What is the height?

l=2.0 m, v_i=0 m/s, $g = 9.81\text{m/s}^2$, θ=35°
Start by determining how high the pendulum is.

$$\begin{aligned} h &= 2.0 \cos 35^\circ \\ &= 1.6m \end{aligned}$$

Now using conservation of energy. Set, $E_p = 0$ at the bottom of the pendulum when it is at equilibrium.

$$\begin{aligned} \cancel{E_{p,f}} + E_{k,f} &= E_{p,i} + \cancel{E_{k,i}} \\ \frac{1}{2}mv_f^2 &= mgh \\ v_f &= \sqrt{2gh} \\ &= \sqrt{(2)(9.81\text{m/s}^2)(2 - 1.6\text{m})} \\ &= 2.7\text{m/s} \end{aligned}$$

True or False

- Neglecting the effects of air resistance, a tennis ball dropped on Earth will have the same speed when it reaches the ground as one dropped on Mars.
- Friction causes energy to be converted into heat.
- Two pendulums are dropped from the same angle away from equilibrium. The heavier one will have a greater speed when it reaches equilibrium.