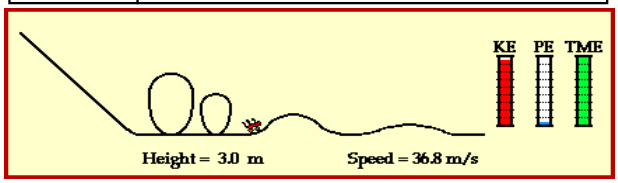
Conservation of Mechanical Energy

Learning Target	Description
10.2	I can define, interpret, and solve problems involving the Law of Conservation of Energy.



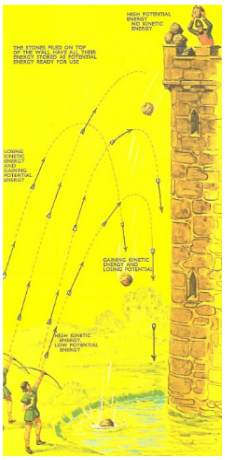
UNIT 9: WORK, ENERGY, AND POWER

$W = (F\cos\theta)\,d$ $\quad U = mgh$

$W = K_f - K_i = \Delta K$

$K = \frac{1}{2}mv^2$ $\quad \bar{P} = \frac{\Delta W}{\Delta t}$

$U = \frac{1}{2}kx^2$ $\quad P = Fv$



Mechanical Energy

Mechanical Energy is the sum of the potential and kinetic energies of an object.

$$E = K + U$$

Conservation of Mechanical Energy

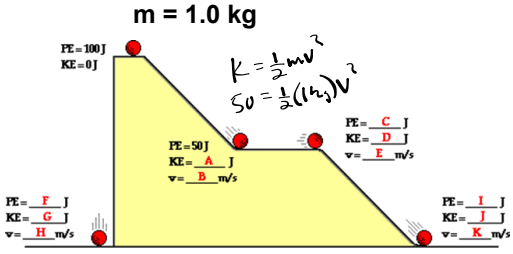
In systems with conservative forces only, the mechanical energy E is conserved.

$$E_i = E_f$$

$$K_i + U_i = K_f + U_f$$

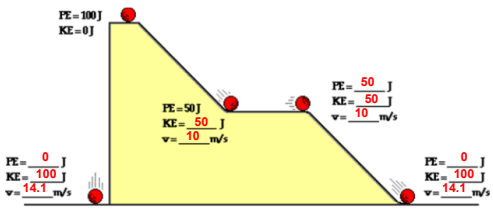
Fill In the Blanks

m = 1.0 kg



Fill In the Blanks

m = 1.0 kg



Graduation Fling

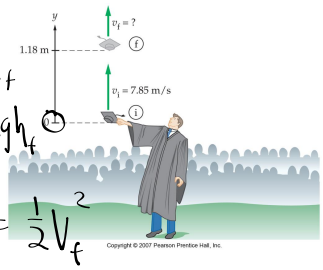
At the end of a graduation ceremony, graduates fling their caps into the air. Suppose a 0.120-kg is thrown straight upward with an initial speed of 7.85 m/s, and that air resistance can be ignored. Find the speed of the cap when it is 1.18 m above the release point.

$E_i = E_f$

$K_i + U_i = K_f + U_f$

$\frac{1}{2}mv_i^2 = \frac{1}{2}mv_f^2 + mgh_f$

$\left(\frac{1}{2}v_i^2\right) - (gh_f) = \frac{1}{2}v_f^2$



$v_f = 6.20$ m/s

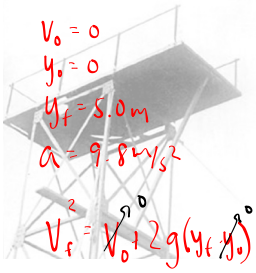
Conservation of Energy

5. A 68.2 kg diver steps off a 5.0 m platform. Ignoring air resistance, what is the kinetic energy and velocity of the diver as he enters the water?

6. In the bottom of the ninth inning, a player hits a 0.15-kg baseball over the outfield fence. The ball leaves the bat with a speed of 36 m/s, and a fan in the bleachers catches it 7.2 m above the point where it was hit. Assuming frictional forces can be ignored, find its speed when caught.

Conservation of Energy

A 68.2 kg diver steps off a 5.0 m platform. Ignoring air resistance, what is the kinetic energy and velocity of the diver as he enters the water?



$v_0 = 0$

$y_0 = 0$

$y_f = 5.0$ m

$a = 9.8$ m/s^2

$v_f^2 = v_0^2 + 2g(y_f - y_0)$

$v_f = \sqrt{2gy_f}$

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

$E_i = E_f$

$K_i + U_i = K_f + U_f$

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

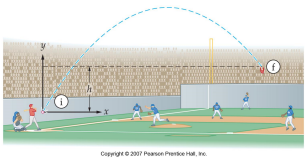
$\sqrt{2gh} = v_f$

$v_f = 9.9$ m/s

3300 J

Conservation of Energy

In the bottom of the ninth inning, a player hits a 0.15-kg baseball over the outfield fence. The ball leaves the bat with a speed of 36 m/s, and a fan in the bleachers catches it 7.2 m above the point where it was hit. Assuming frictional forces can be ignored, find its speed when caught.



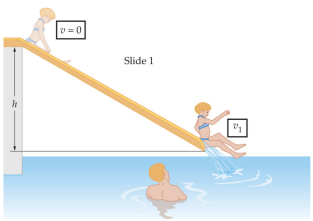
$E_i = E_f$

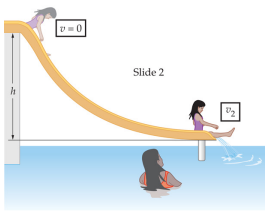
$K_i + U_i = K_f + U_f$

$\frac{1}{2}mv_i^2 = \frac{1}{2}mv_f^2 + mgh_f$

$v_f = 34$ m/s

Which Slide is Better?





PROBLEMS
(6-10)