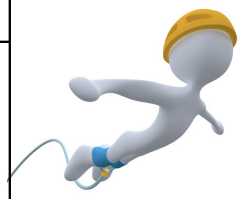
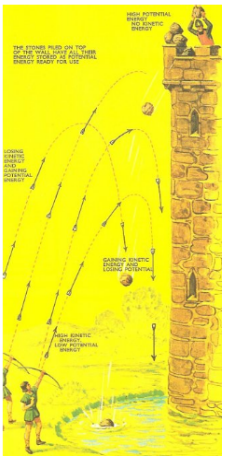
PRACTICE	LABS	TESTS
Practice Problems (1-5)	Roller Coaster Interactive (RsVCP)	Unit 11 Test Thursday 3/7/19

Conservation of Mechanical Energy

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





Mechanical Energy

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

$$E = K + U$$

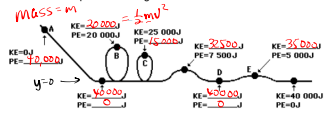
Conservation of Mechanical Energy

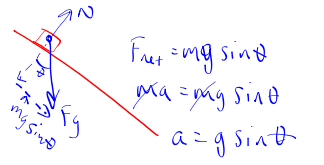
In systems with conservative forces only, the mechanical energy E is conserved.

$$E_i = E_f$$

Conservation of Mechanical Energy

Use the law of conservation of energy (assume no friction nor air resistance) to determine the kinetic and potential energy at the various marked positions along the roller coaster track below.





$$V_f^2 = V_0^2 + 2a(x_f - x)$$

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

$$\sqrt{2gh} = V$$

Conservation of Mechanical Energy

During a hurricane, a large tree limb, with a mass of 22.0 kg and a height of 13.3 m above the ground, falls on a roof that is 6.0 m above the ground. What is the speed of the limb when it reaches the roof?

Conservation of Mechanical Energy

Three important questions:

1. Is the object moving?
2. Is the object at y = 0?
3. Is there a spring being stretched or compressed?

$$E_i = E_f$$

$$K_i + U_{g,i} + U_{s,i} = K_f + U_{g,f} + U_{s,f}$$

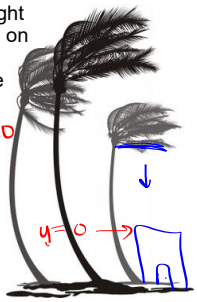
Conservation of Energy

4. 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?

5. 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 Mechanical Energy

During a hurricane, a large tree limb, with a mass of 22.0 kg and a height of 13.3 m above the ground, falls on a roof that is 6.0 m above the ground. What is the speed of the limb when it reaches the roof?



$K_i^{\,0} + U_{g,i} + U_{s,i}^{\,0} = K_f + U_{g,f}^{\,0} + U_{s,f}^{\,0}$

$U_{g,i} = K_f$

$2 \cdot mgh_i = \frac{1}{2}mv_f^2 \cdot 2$

$\sqrt{2gh_i} = V_f = 12\ m/s$

Conservation of Energy

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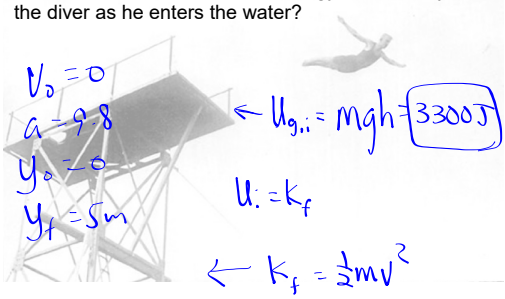


$v_0 = 0$

$a = -9.8$

$y_0 = 0$

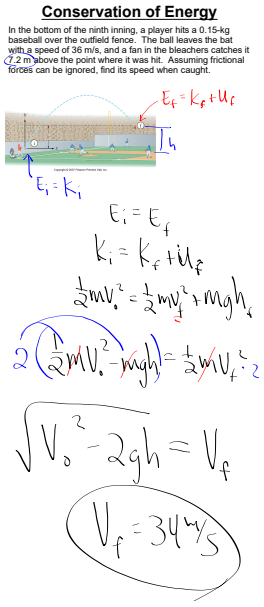
$y_f = -5m$

$U_i = mgh = 3300J \rightarrow$ $U_i = K_f$

$K_f = \frac{1}{2}mv^2 \rightarrow$

$V = \sqrt{2gh}$ $\quad 3300J = \frac{1}{2}mv^2$

$V = 9.9\ m/s$



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.

$E_f = K_f + U_f$

$E_i = K_i$

$E_i = E_f$

$K_i = K_f + U_f$

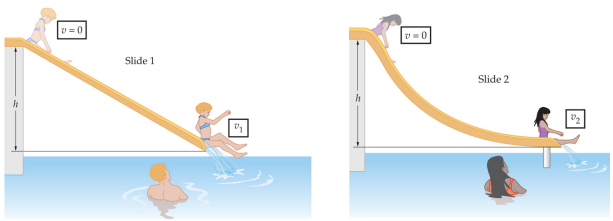
$\frac{1}{2}mv_0^2 = \frac{1}{2}mv_f^2 + mgh$

$2\left(\frac{1}{2}mv_0^2 - mgh\right) = \frac{1}{2}mv_f^2 \cdot 2$

$\sqrt{v_0^2 - 2gh} = v_f$

$v_f = 34\ m/s$

Which Slide is Better?




Practice
Practice
PROBLEMS
(6-10)
Practice