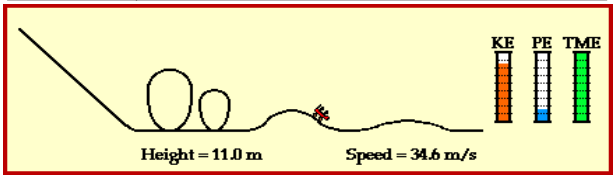
Announcements and Upcoming Events

PRACTICE	LABS	TESTS
Unit 11 PP's (1-10)	Roller Coaster Interactive (RsVCP)	Unit 11 Test Friday (3/8/19)

Conservation of Mechanical Energy

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



Conservative vs. Nonconservative Forces

CONSERVATIVE FORCES	NONCONSERVATIVE FORCES
• Work is stored in the form of energy that can be released at later time.  EXAMPLES Gravity & Springs	• Work cannot be recovered later as kinetic energy. Instead, it is converted to other forms of energy.  EXAMPLES Friction, Tension, Muscles

Potential Energy

- **Kinetic Energy (K)** is the energy of motion.

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

- **Potential Energy (U)** is a storage system for energy.
- Gravitational Potential Energy depends on weight and height, *h*, but it is independent of horizontal position.

$$U_g = mgh$$

- Potential energy stored in a spring

$$U_s = \frac{1}{2}kx^2$$

Conservation of Mechanical Energy

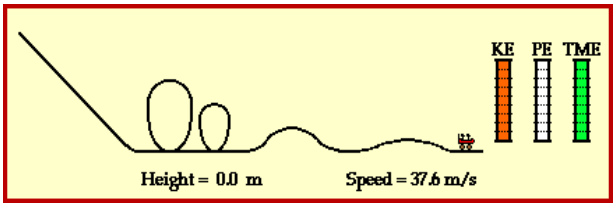
- **Mechanical Energy** is the sum of the potential and kinetic energies of an object.

$$E = K + U$$

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

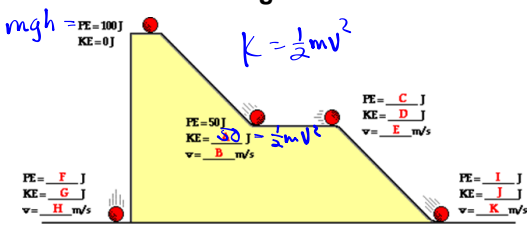
$$E_i = E_f$$

Conservation of Energy



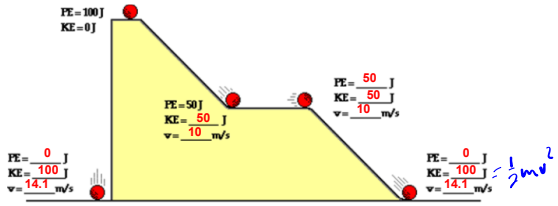
Fill In the Blanks

m = 1.0 kg

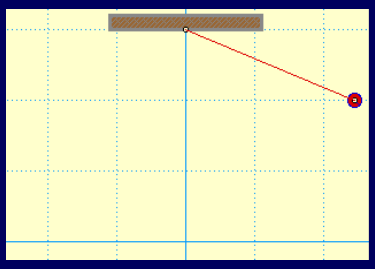


Fill In the Blanks

m = 1.0 kg

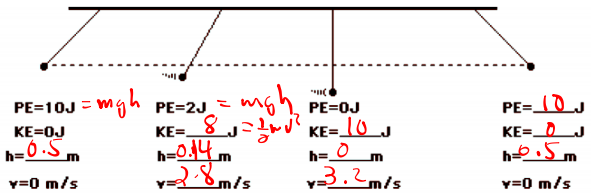


The Pendulum



The Pendulum

Use the conservation of energy to fill in the blanks for the following pedulum system (m = 2 kg). Neglect frictional forces.



Conservation of Energy

6. Suppose Spiderman is swinging from the top of a building to the street below. If he swings on a 13-m-long web that starts at an angle of 45°, then what is Spiderman's velocity when it reaches the ground?

7. A 1.70 kg block slides on a horizontal, frictionless surface until it encounters a spring with a force constant of 955 N/m. The block comes to rest after compressing the spring a distance of 4.60 cm. Find the initial speed of the block.

Conservation of Energy

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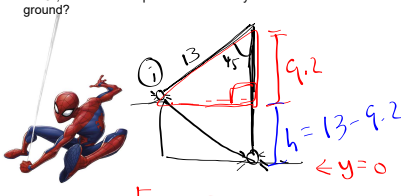


$E_i = E_f$

$h = 3.8\,m$

$U_i = K_f$

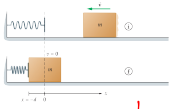
$mgh_i = \frac{1}{2}mv_f^2$

$\sqrt{2gh_i} = v = 8.6\,m/s$

Conservation of Energy

7. A 1.70 kg block slides on a horizontal, frictionless surface until it encounters a spring with a force constant of 955 N/m. The block comes to rest after compressing the spring a distance of 4.60 cm. Find the initial speed of the block.

0.046 m



$E_i = K_i + U_s + U_g$

$E_f = K_f + U_s + U_g$

$K_i = U_{s,f}$

$\frac{1}{2}mv_0^2 = \frac{1}{2}kx^2$

$v_0 = \sqrt{\frac{kx^2}{m}} = \sqrt{\frac{(955)(0.046)^2}{1.70\,kg}}$

$v_0 = 1.1\,m/s$

Practice Problems (1-10)