Conservation of Energy

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Objectives

- Apply conservation of energy to analyze energy transitions and transformations in a system.

Mechanical Energy

- Both potential energy and kinetic energy are forms of mechanical energy.
- They often act together on objects at the same time.
- Let's try to see how they relate to each other.

Mechanical Energy

- Lets think of a book being dropped off a building.
- At the top before the book is dropped, what is it's PE and KE?
  - PE = some value, KE = 0

- As the book falls how do they change.
  - Height decreases, so PE decreases
  - Speed increases, so KE increases

Mechanical Energy

- It seems that as PE decreases, KE increases.
- What happens in reverse?
- When you throw a ball into the air, it initially has no PE and a lot of KE. As it goes higher the PE increases, and the ball slows down so the KE decreases.
- Take a look at the skater.

Law of Conservation of Energy

- "Energy cannot be created or destroyed… it can only be changed."

- Mechanical Energy = KE + PE_g + Pe_s

- Conservation Laws
  - Total Energy
  - Mechanical Energy (neglects friction)

Conservation of ME

- ME = KE + PE = constant in closed system.
  - $ME_{initial} = ME_{final}$
- $PE_{initial} + KE_{initial} = PE_{final} + KE_{final}$
  - Lets take a look at a simple pendulum.

ME Samples

- Turn to page 185 in textbook.
- We will work questions 1,2, and 4.

Conservation of ME Sample 1

- A bird if flying with a speed of 18.0 m/s over water when it accidentally drops a 2.00 kg fish. If the altitude of the bird is 5.40 m and friction is disregarded, what is the speed of the fish when it hits the water?

ME Sample 2

- A 755 N diver drops from a board of 10.0 m above the water's surface. Find the diver's speed 5.00 above the water's surface. Then find the diver's speed just before striking the water.

ME Sample 3

- An Olympic runner leaps over a hurdle. If the runner's initial vertical speed is 2.2 m/s, how much will the runner's center of mass be raised during the jump?

ME Sample 4

- The work done in accelerating an object along a frictionless horizontal surface is equal to the change in the object's

a) Momentum
b) Velocity
c) Potential energy
d) Kinetic energy