Law of Conservation of Energy

The total amount of energy in an isolated system remains constant over time.

Law of Conservation of Energy

- Total energy is conserved
- Energy can change its location within the system
- Energy can change its form within the system
- Energy cannot be created or destroyed

Law of Conservation of Energy

- The sum of all the energies within the system is a constant.
- PE(initial) + KE(initial) = PE(final) + PE(final)

Example

- Simple Pendulum

Example

- A 0.5 kg ball is projected vertically and rises to a height of 2.0 m above the ground.
- At its highest point the speed of the ball is zero, so KE = 0 J
- PE(grav) = mgh = (0.5)(9.8)(2) = 9.8 J at 2 m
- KE + PE = 9.8 J
- Knowing the ball's PE we now know the ball's initial KE and we can solve for v(initial).
- KE(initial) = 9.8 J = ½ (0.5) v^2
- so, v(initial) = 6.3 m/s

An object is thrown vertically upward.

- KE versus Displacement is a decreasing graph.

- PE versus Displacement is an increasing graph.

Group Activity

- 1. A basketball player who weighs 600 N jumps 0.5 m vertically off the floor. What is her KE just before hitting the floor?
- 2. A bike rider approaches a hill at a speed of 8.5 m/s. The mass of the bike and rider together is 85 kg. Find the initial KE of the system. The bike goes up the hill. Now find the height at which the bike will come to rest.

Group Activity

- 3. Tarzan, mass 85 kg, swings down on the end of a vine from a tree limb 4.0 m above the ground. How fast is Tarzan moving when he reaches the ground?