Mechanical Energy

Q: What is Energy??

Mechanical Energy

Q: What is Energy??

A: Energy takes many forms, but *Mechanical Energy* is the energy due to the motion and position of a mass.

Mechanical Energy

There are two kinds of Mechanical Energy; *Kinetic Energy* and *Potential Energy*.

$$\text{KE} = \frac{1}{2}mv^2$$

$$\text{PE} = mgh$$

(Note: the above equation for PE is for *gravitational potential energy*. There are other kinds of potential energy. For example; PEwhich is stored in a spring.)

Mechanical Energy

Sputnik 1 (1957), the first ever satellite, circled the globe at 29,000 km/hr at a height of 577 km.

Mechanical Energy

Sputnik 1 (1957), the first ever satellite, circled the globe at 29,000 km/hr at a height of 577 km.
What is the kinetic and potential energy of the satellite?

Mechanical Energy

Sputnik 1 (1957), the first ever satellite, circled the globe at 29,000 km/hr at a height of 577 km.
What is the kinetic and potential energy of the satellite?
The mass of Sputnik was 84 kg.

Mechanical Energy

Sputnik 1 (1957), the first ever satellite, circled the globe at 29,000 km/hr at a height of 577 km.
What is the kinetic and potential energy of the satellite?
The mass of Sputnik was 84 kg. Assume the gravitational force is the same as it is at the surface of the earth.

Mechanical Energy

Notice that mechanical energy (KE and PE) are *scalar quantities*.

Mechanical Energy

Notice that mechanical energy (KE and PE) are *scalar quantities*.
WE ARE NOT CONCERNED WITH DIRECTION HERE,

Mechanical Energy

Notice that mechanical energy (KE and PE) are *scalar quantities*.
WE ARE NOT CONCERNED WITH DIRECTION HERE,
only POSITION and SPEED.

Mechanical Energy

Energy is conserved in the universe.

Mechanical Energy

Energy is conserved in the universe.

Therefore:

$$\mathrm{KE}_\circ + \mathrm{PE}_\circ = \mathrm{KE}_f + \mathrm{PE}_f$$

Mechanical Energy

Suppose someone drops a 3kg bowling ball, initially at rest, off a 100m high cliff. How fast will it be going when it hits the bottom?

Units

We see that mechanical energy has units of $\text{kg} \cdot \text{m}^2/\text{s}^2$. We give this a name, "Joule."

$$\frac{1\ \text{kg} \cdot \text{m}^2}{\text{s}^2} = 1\text{J}$$