CONSERVATION OF ENERGY AND ENERGY TRANSFORMATIONS

Types of Energy

There are two different types of energy:

Kinetic Energy: the energy of motion

Potential Energy: the energy of position or deformation

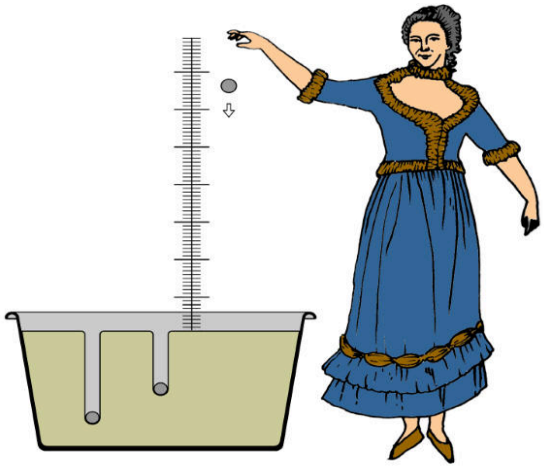
Types of Energy

Elastic	Energy due to deformation, stored by bending, stretching, or compressing matter.
Thermal/Heat	Energy that makes an object hot. Due to the movement of particles.
Radiant	Energy transferred by electromagnetic waves.

Movement	Energy of a moving piece of matter.
Chemical	Energy stored in the chemical bonds of matter.
Nuclear	Energy stored in an atom's nucleus.
Sound	Energy transferred by the collision of particles.

Law of Conservation of Energy

Energy can neither be created nor destroyed...only transferred from one form to another.



http://www-history.mcs.st-and.ac.uk/PictDisplay/Chatelet.html

http://workenergytheorem.com/index.html

Energy Transformation Equation Examples

a) When we turn on our flashlight, chemical energy stored in the batteries is converted into light energy.

b) When we move a vehicle, the engine converts the chemical energy stored in the fuel into heat, sound and kinetic energy. Note that the heat and the sound that are produced are not desirable.

Example: Transfer of Gravitational Potential Energy to Kinetic Energy

Mechanical Energy
$=\Delta PE+\Delta KE$
$=mg\Delta h+1/2m(\Delta v)^2$

https://youtu.be/LrRdKmjhOgw

Examples:

a) Brandan drops a 1.5 kg water balloon from a 14 m high roof. (a) What is the gravitational potential energy of the balloon on the roof?

$E_{total} = mg\Delta h_1 + 1/2mv_1^2$

$E_{total} = (1.5\ kg)(9.8\ N/kg)(14\ m)$

$E_{total} = 68.6\ N*m = 68.66\ J$

The gravitational potential energy is 69 J.

b) What is the speed of the balloon when it hits the ground?

$E_{total} = mg\Delta h_2 + 1/2mv_2^2$

$68.6\ J = 0 + 1/2mv_2^2$

$$\frac{2(68.6\ J)}{1.5\ kg} = v_2^2$$

$91.5 = v_2^2$

$9.6 = v_2$

The speed of the balloon is 9.6 m/s.

Example

A 168-g bird has a total mechanical energy of 15 J when flying at a speed of 9.7 m/s, what is the height of the bird above the ground?

$E_{total} = mg\Delta h + 1/2mv^2$

$15\ J = (0.168\ kg)(9.8\ m/s^2)\Delta h + ½(0.168\ kg)(9.7\ m/s)^2$

$\underline{15\ J - 7.9\ J} = \Delta h$

$1.65\ kg*m/s^2$

$4.3\ m = \Delta h$

The bird is 4.3 m above the ground.