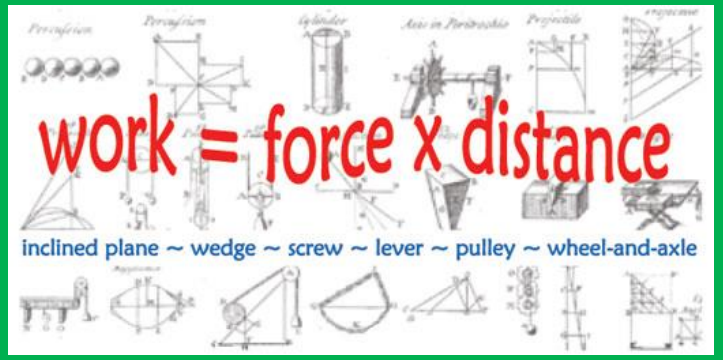
Ch 13 Work & Energy

13.1 Work is the use of force to move an object

- A force must be applied to an object to do work & the object must move in the direction of the force



Work = force x distance

Joule is the standard unit of measurement for work (force must be in Newtons & distance in meters)

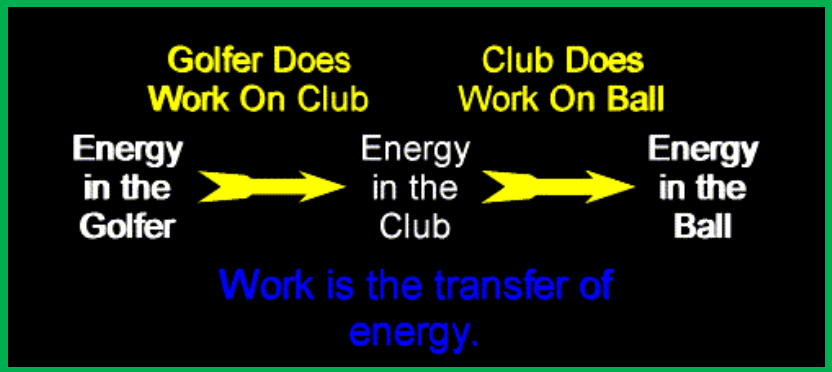
Objects that are moving can do work

- Earth's gravitational force does work on water & other natural materials
- People use moving objects

to help them do work

13. 2 Energy is transferred when work is done

- Work transfers energy
  - When work is done on an object, the energy is transferred from whatever is exerting the force to the object



Work changes potential & kinetic energy

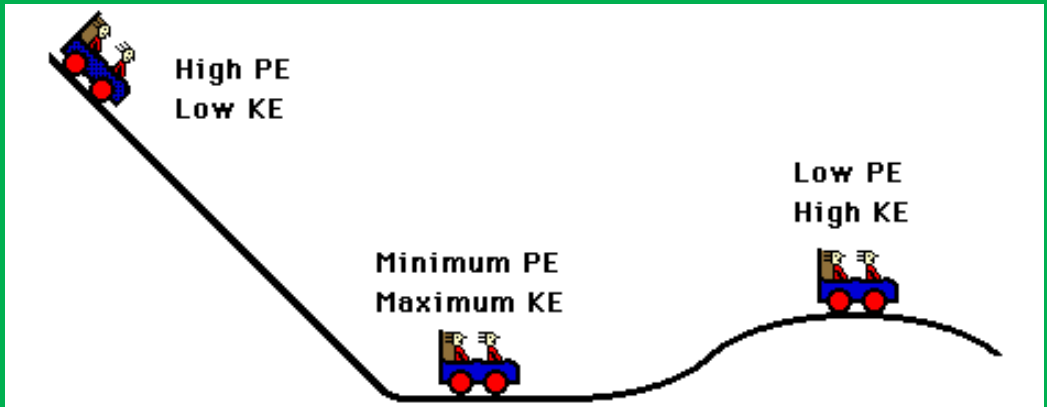
- An object has potential energy due to its position or shape

**Gravitational potential energy

GPE = m X g X h

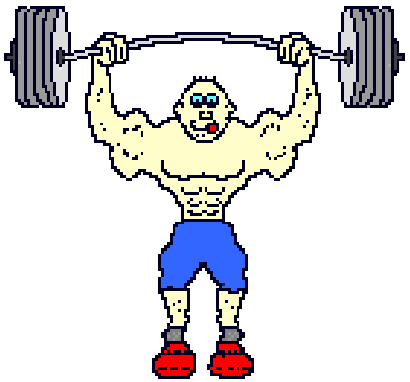
**Kinetic energy

KE = ½ mV_2

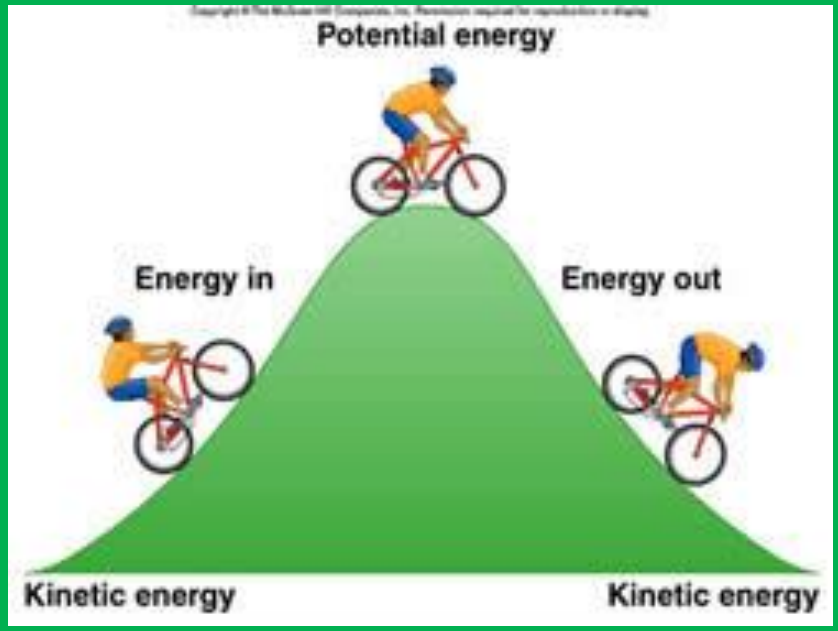


As a coaster car loses height, it gains speed; PE is transformed into KE. As a coaster car gains height it loses speed; KE is transformed into PE. The sum of the KE and PE is a constant.

- Mechanical energy is an object's combined PE & KE
- An object with mechanical energy can do work on another object

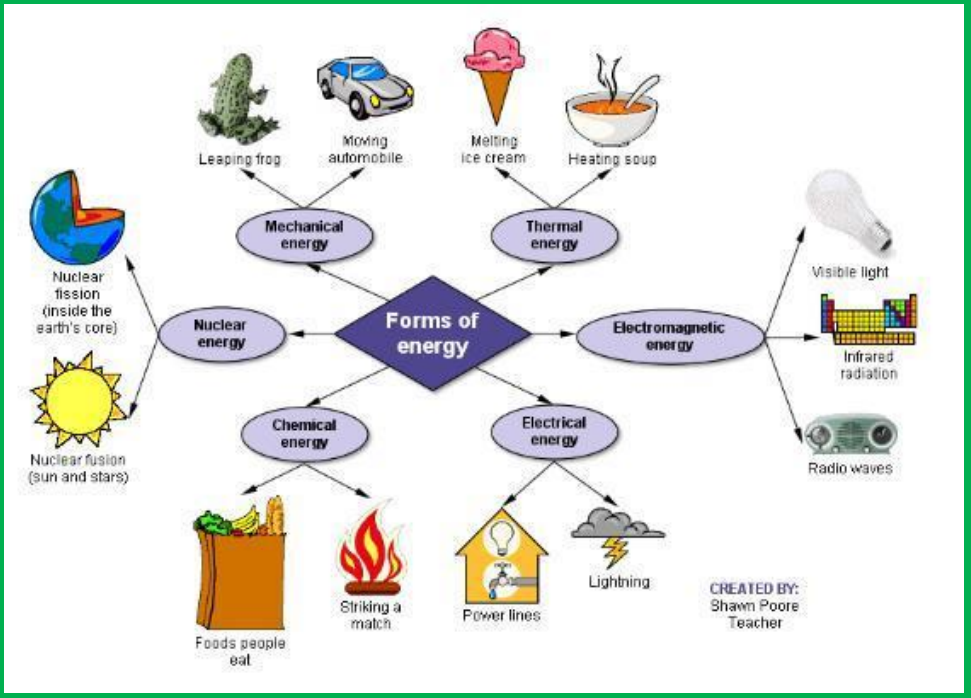


A weightlifter applies a force to cause a barbell to be displaced. The barbell then possesses mechanical energy – all in the form of potential energy.

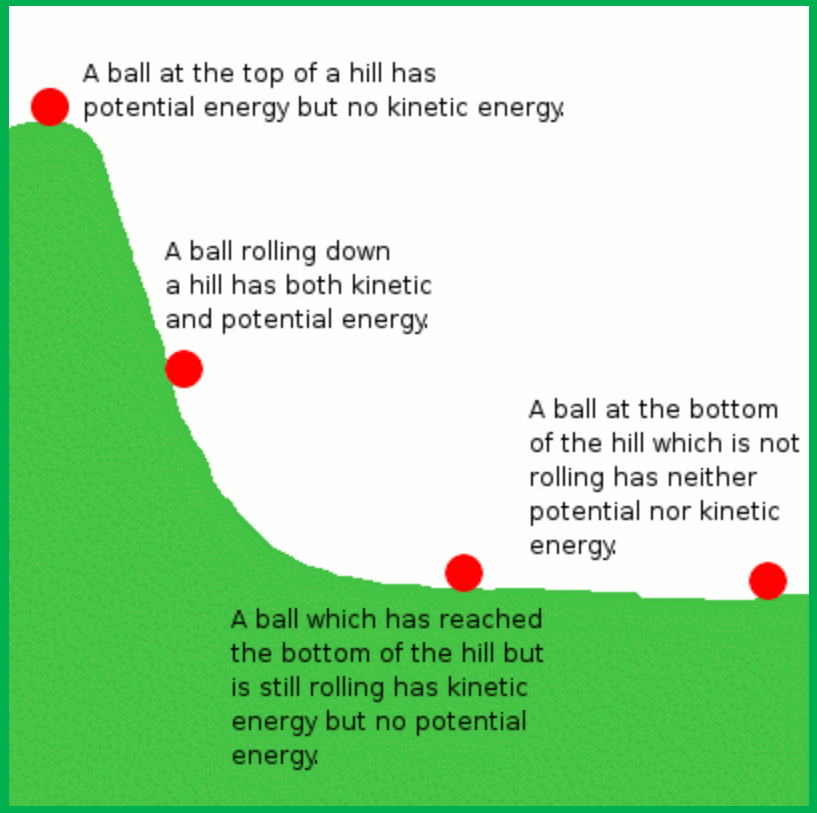


The total amount of energy is constant

- Law of Conservation of Energy—energy is neither created or destroyed but can change into other forms
- Common forms of energy
  - Mechanical
  - Thermal
  - Chemical
  - Nuclear
  - electromagnetic



- As a ball rolls down a ramp, the amounts of PE & KE change but the <u>total energy is the same</u>




POTENTIAL AND KINETIC ENERGY, IT'S EVERYWHERE!
SO YOU MEAN WHEN WE WERE RIDING THE ROLLER COASTER IT WAS ACTUALLY SCIENCE?


YES EXACTLY! WHEN WE WERE COMPLETELY STOPPED, WE HAD STORED ENERGY.

13.3 Power is the rate at which work is done

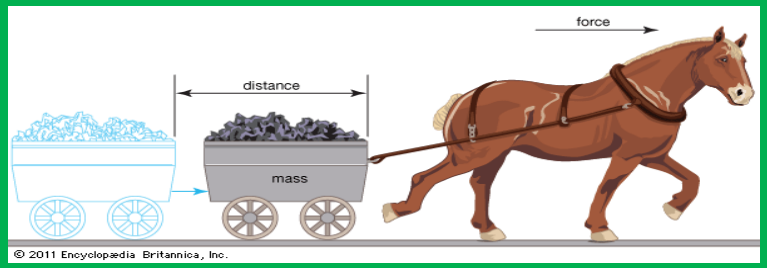
- Power can be calculated from work & time
- When the power of an object increases, work is done faster

$P = W/t$ or $P = F \times d/t$

Watt—unit for power (1 watt = 1 joule of work in 1 second)

Horsepower—unit of power based on how much work a horse can do in 1 minute (used in engines or motors)

1 HP = 745 W



Power can be calculated from energy and time

- Power can be thought of as the rate which energy is transferred over a certain period of time

P = Energy/time