

***Ch-11***  
***Work and Energy***

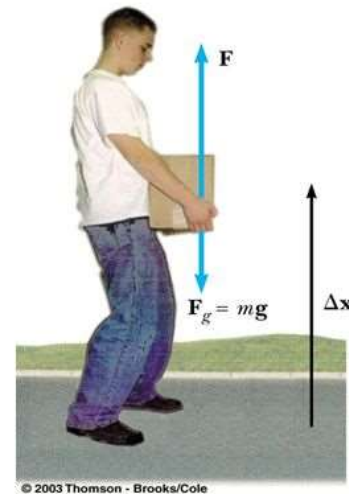
# Work

- A force should act on an object
- The object must be displaced.
- Work done= Force\*Displacement= $Fs$
- For example-girl pulls a trolley and the trolley moves through a distance. The girl has exerted a force on the trolley and it is displaced. Therefore, work is done.

# Positive and Negative Work

## Work can be positive or negative

- Man does positive work lifting box
- Man does negative work lowering box
- Gravity does positive work when box lowers
- Gravity does negative work when box is raised



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**Work is done on the books when they are being lifted, but no work is done on them when they are being held or carried horizontally.**

# ENERGY

- An object having a capability to do work is said to possess energy. The object which does the work loses energy and the object on which the work is done gains energy.
- The SI unit of energy is Joules
- Two types of energy are potential energy and kinetic energy.

# Potential Energy

The potential energy possessed by the object is the energy present in it by virtue of its position or configuration.

## Examples of Potential Energy

Stretching a rubber band..

-Stores energy



Water at the top of a waterfall..

-Stores energy

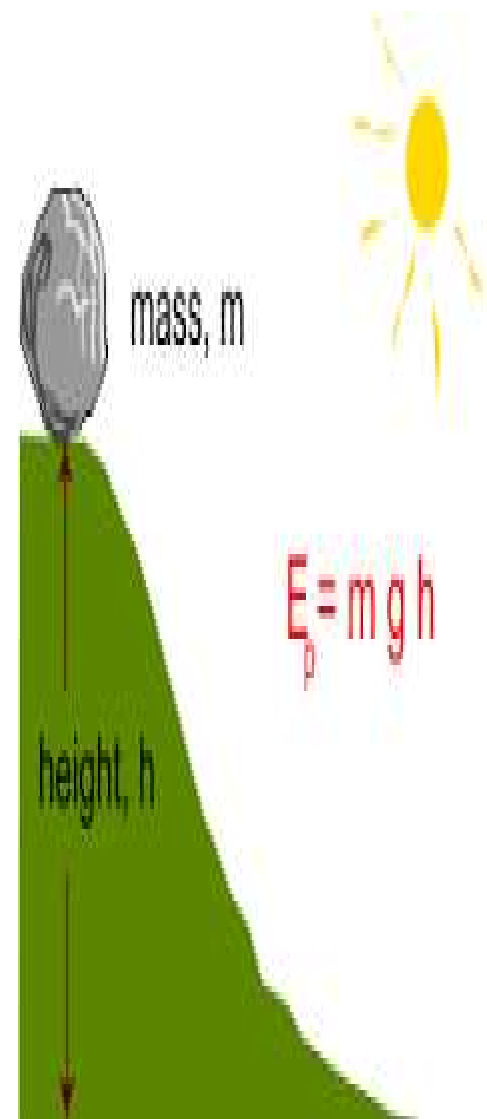
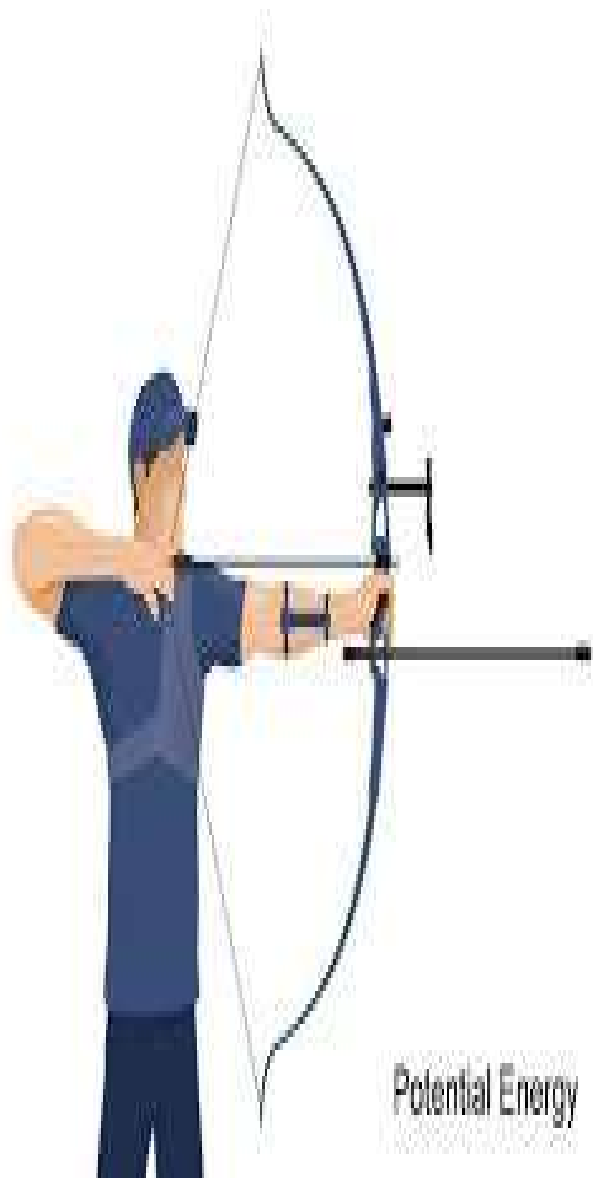
Yo-Yo in held in your hand..

-Stores energy because of position



Drawing a Bow...

-Stores energy because of position



# Kinetic energy

- Energy possessed by an object when it is in motion is called its kinetic energy.

For example -falling coconut, a speeding car, a rolling stone, a flying aircraft, flowing water, blowing wind, a running athlete etc. possess kinetic energy.

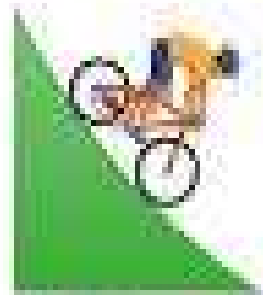
$$E_k = \frac{1}{2}mv^2$$

# Kinetic Energy

- The energy of motion that is released from stored energy.
- Examples:



An arrow released from the bow, flying through the air.



An object rolling down a hill.



Muscles moving.



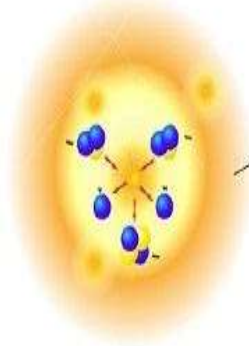
A car moving.

# Law of conservation of energy

According to this law, energy can only be converted from one form to another; it can neither be created or destroyed. The total energy before and after the transformation remains the same. The law of conservation of energy is valid in all situations and for all kinds of transformations.

$$Mgh + \frac{1}{2}mv^2 = \text{CONSTANT}$$

Nuclear energy  
(nuclear fusion in stars)



Light

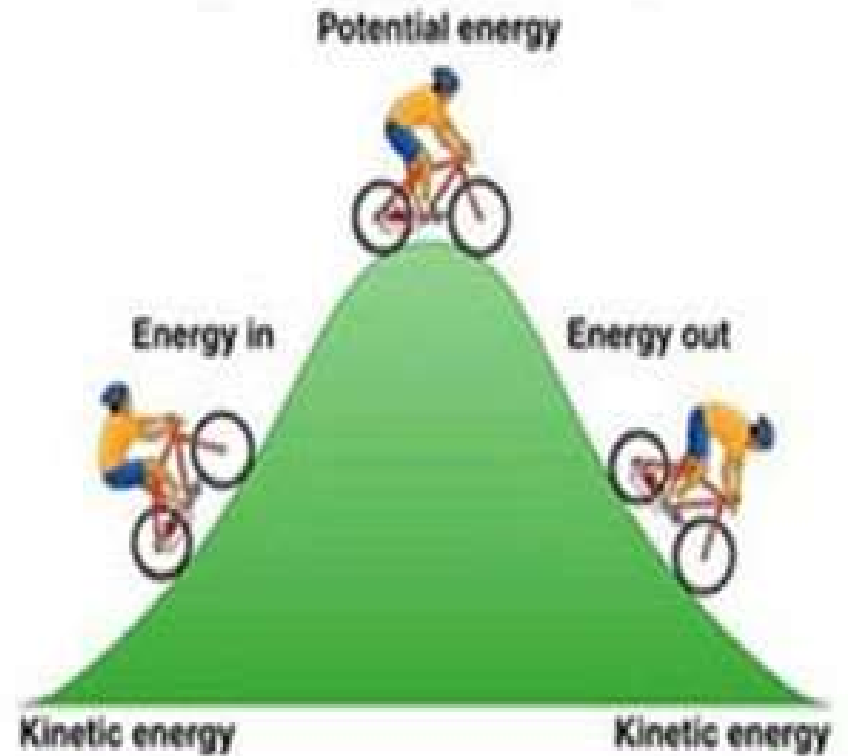
Electric  
energy



Potential  
energy



Kinetic  
energy



# POWER

Power is defined as the rate of doing work or the rate of transfer of energy. If an agent does a work  $W$  in time  $t$ , then power is

given by:

Power = work/time

SI unit is Watt

*THANK YOU*