Lec.1 : Work and Energ
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ميكانيك – مرحلة اولى
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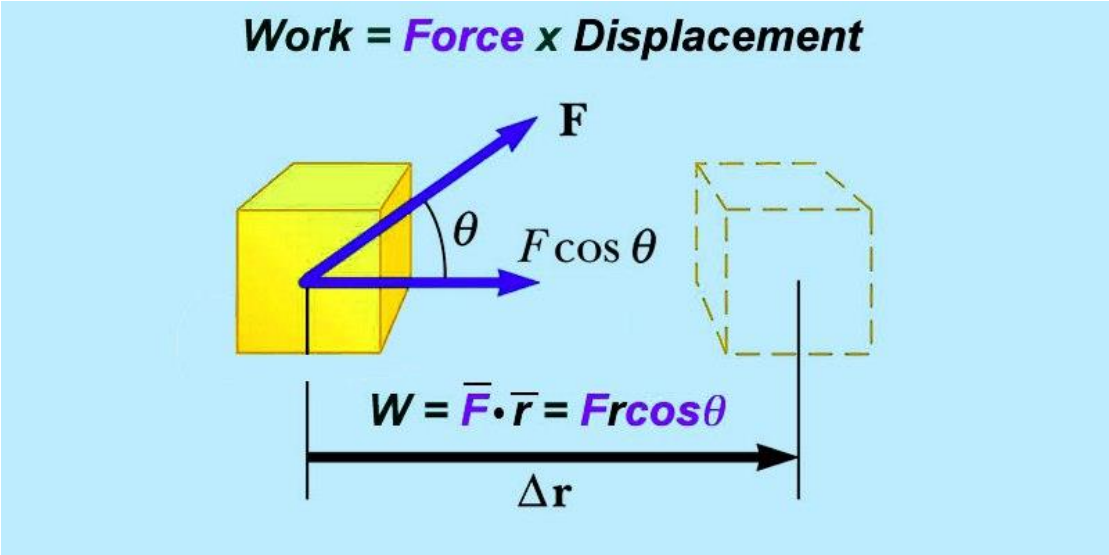
Work and energy

Work and energy are closely related to each other. Work can also be defined as the transfer of energy. In Physics, for two objects, the work done is defined as the transfer of energy from the first object to the second object. Also, energy is defined as the capacity to do work.

Work is believed to be done by a force when an object experiences displacement parallels to the line of action of the force. It's an activity that includes force and movement in the direction of the force. The capability for doing work is what the energy is! In this article, let's learn more about work and energy concept along with principle of work and energy.



Work is given by the equation Frcosθ, where r is the distance over which the force is applied and θ is the angle between the force and distance.

Principle of Work and Energy

The work-energy principle says states that

The change in kinetic energy of a body is equivalent to the net work done on the body.

This information is referred to as the work-energy principle and is derivable from the law conservation of energy

The law of conservation of energy states that

Energy can neither be created nor be destroyed. Although, it may be transformed from one form to another.

Work and Energy Equations

It is the resultant of the force applied (F) and the amount of displacement (r) and is articulated by the equation

$F = m \cdot g$

$W = F.r$

Power describes the rate at which work is done. It is articulated as

P = W/t

The energy or work is articulated in Newton-meter (Nm) or Joules or kg.m2/s2 .

N = Kg. m/s^2

J = Nm

J= Kg.m/s^2 (m)

J= Kg m^2/s^2

What happens when the work is done against gravity?

When the work done is against gravity, the amount of work done will be equal to the product of the weight of an object and the height through which the object is lifted.

The mathematical representation of work done against the gravity is given as:

$$W = m \times g \times h$$

Where:

- **W is the work done**
- **m is the mass of an object**
- **g is the acceleration due to gravity**
- **h is the height through which the object is been lifted**

Difference Between and Work Energy

Usually, there are two sorts of work **Positive** and **negative** work.

1- If the direction of the force is in the same direction as the motion of its spot of application, work done is said to be positive.
2- If the course of the force is in the opposite direction to the motion of its point of application, negative work is said to be done.

Work	Energy
Work is defined as transferring energy into an object so that there is some displacement	Energy is defined as the ability to do work
Work done is always the same	Energy can be of different types such as kinetic and potential energy
The mathematical representation of work is W = F.r where F is the force applied r is the displacement of the object	The mathematical representation of energy for kinetic energy is KE = 1/2 mv^2 and for potential energy is PE = mgh where, m is the mass, v is the velocity, g is the acceleration due to gravity, h is the height.

Frequently Asked Questions – FAQs

What is work?

Work is defined as transferring energy into an object so that there is some displacement.

What is energy?

Energy is defined as the ability to do work.

Give the mathematical representation of work done against gravity.

The mathematical representation of work done against the gravity is given as

$$W = m \times g \times h$$

What is the formula to find potential energy?

$$PE = mgh$$

State work-energy principle?

Work-energy principle states that, the change in kinetic energy of a body is equivalent to the net work done on the body.

Question 1: A person pulls a block 2 m along a horizontal surface by a constant force F = 20 N. Determine the work done by force F acting on the block.

Known :

Force (F) = 20 N

Displacement (r) = 2 m

Angle (θ) = 0

Wanted : Work (W)

Solution :

W = F r cos θ

= (20)(2)(cos 0)

= (20)(2)(1)

= 40 Joule

Question 2: A ball has a mass of 2Kg, suppose it travels at 10m/s. Find the kinetic energy possessed by it.

Given: m = 2Kg, and v = 10m/s

The KE is given by,

K.E =

K.E =

$\Rightarrow$ K.E = $\frac{1}{2}(2)(10)^2$

$\Rightarrow$ K.E = 100J