

Physics

Work and Energy

Work

Work is done when a force produces motion.

Work done in moving a body is equal to the product of force exerted on the body and the distance moved by the body in the direction of force. It is a vector quantity.

$$\text{WORK} = \text{Force} \times \text{Displacement}$$

S.I. unit of work is **1 joule** represented as 'J'

- Work done is positive when a force acts in the direction of motion of the body.
- Work done is negative when a force acts opposite to the direction of motion of the body.
- Work done is zero when a force acts at right angles to the direction of motion of the body.

ENERGY

Energy is the ability to do work.

The amount of energy possessed by a body is equal to the amount of work it can do when its energy is released.

S.I. unit of Energy is **Joule** represented as 'J'

Kinetic Energy

The energy of a body due to its motion is called kinetic energy. The kinetic energy of a moving body is measured by the amount of work it can do before coming to rest.

$$\text{Kinetic energy} = \frac{1}{2} mv^2$$

Potential Energy

The energy of a body due to its position or change in shape is known as potential energy.

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Potential Energy = mass × g × height

where g is acceleration due to gravity i.e. 9.8 m/s^2

POWER

Power is defined as the rate of doing work.

OR

Power is the work done per unit time

OR

power is also defined as the rate at which energy is consumed

$$\text{Power} = \frac{\text{Work done}}{\text{Time taken}}$$

The S.I. unit of power is **watt**

$$\text{Power} = \frac{\text{Energy consumed}}{\text{Time taken}}$$

represented as '**W**'.

Commercial unit of power

The commercial unit (or trade unit) of energy is **kilowatt-hour**. Represented as **kWh**.

Law of conservation of Energy

It states that energy can neither be created nor destroyed, but it can be transformed from one form to another. The total energy before and after the transformation remains the same.