

# PHYSICS

## CLASS NOTES FOR CBSE

### Chapter 04. Work and Energy

Whenever a force makes a body move, then work is said to be done. For doing work, energy is required.

When work is done, an equal amount of energy is used up.

#### 01. 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.

Work = Force × Distance moved in the direction of force

Work = Force × Distance

$W = F \times s$

When a body is moved on the ground by applying force, then the work is done against friction.

#### 02. Unit of Work

The unit of work is newton metre Nm. When a force of 1 newton moves a body through a distance of 1 metre in its own direction, then the work done is known as 1 joule.

The SI unit of work is joule. Work is a scalar quantity. The condition for a force to do work is that it should produce motion in an object.

#### 03. Formula for Work Done When a Body Moves at an Angle to the Direction of Force

The work done in pulling the body will be equal to the product of horizontal component of the force and distance moved by body.



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$$W = F \cos \theta \times s$$

$F$  = force applied

$\theta$  = angle between the direction of force and direction of motion

$s$  = distance moved

The most important point to remember while applying this formula is that  $\theta$  is the angle between the direction of motion of body and the direction of force applied.

#### 04. Positive, Negative and Zero Work

The work done by a force can be positive, negative or zero.

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

#### 05. Energy

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

##### Different Forms of Energy

- (i) Kinetic energy
- (ii) Potential energy
- (iii) Chemical energy
- (iv) Heat energy
- (v) Light energy
- (vi) Sound energy
- (vii) Electrical energy
- (viii) Nuclear energy

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

$$\text{Work} = \text{Force} \times \text{Distance}$$

$$W = F \times s$$

$$\text{Kinetic energy} = W$$

$$\text{Kinetic energy} = F \times s$$

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



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