# Work

# What is Work (According to Science)?

In everyday language, work can mean studying, typing, or using mental energy.

However, in Science, work has a specific definition:

Work is said to be done when a force is applied on an object and the object moves (is displaced) in the direction of the applied force.

If there is no movement or displacement, even with force applied, no work is done (as per science).

# **Conditions for Work to be Done**

For work to occur in science, two conditions must be met:

- Force must be applied
- The object must move in the direction of the force

# **Examples Where Work is Done**

In these cases, both force is applied and displacement occurs:

- A boy playing football
- Skating or running on a track
- Shooting a bullet from a revolver
- Pushing a cart in a supermarket
- Cycling or swimming

In all the above examples, an object or person moves in the direction of the applied force, so work is done.

# **Examples Where Work is NOT Done**

Even though force is applied or effort is felt, there is no movement, so no work is done (in science):

- Studying or preparing for an exam
- Sitting and working on a computer
- Pushing a wall with great force (but the wall doesn't move)

These examples may involve mental work or effort, but without physical displacement, it is not considered work in scientific terms.

### How Much Work is Done?

The amount of work done depends on two factors:

### i. Force Applied

More force = More work done

#### Example:

- Sahil moves an auto rickshaw 10 metres using some force.
- Saran moves a heavier car 15 metres (car is double the weight), so double the force is required, hence double the work is done.

### ii. Distance Moved

More distance = More work done

### Example:

- Rahul pushes his bike for 10 metres = some work
- Rohan pushes his bike for 20 metres = double the work

#### So,

Work Done ∝ Force × Distance Moved

### **Summary**

- In science, work = force × displacement
- If there's no displacement, no work is said to be done
- Work depends on:
- The amount of force applied
- The distance the object moves
- Mental effort or effort without physical movement is not considered work in physics