

Work and energy

When a force moves an object, energy is transferred and work is done.

Work done = energy transferred It is measured in joules.

Work done = force × distance moved
(in joules) (in N) (in metres)

Example

A man lifts a parcel, mass 4 kg, from the floor to a shelf 2 m high.

- What is the weight of the parcel?
- How much work is done on it?
- Where does this energy come from?

Answer

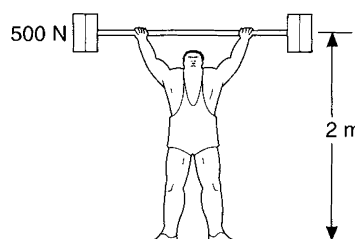
- Weight = $4 \text{ kg} \times 10 = 40 \text{ N}$ (see page 75)
- Work done = force × distance moved
= $40 \text{ N} \times 2 \text{ m}$
= 80 joules (from his food)

Questions

For each question show all your working clearly.

1. How much work is done in these situations:

- A man pushes a van against a friction force of 300 N for 10 m.
- A mother pushes a pram with a force of 30 N for a distance of 100 m.
- A weight-lifter lifts a weight of 500 N through a height of 2 m.



2. A worker pushes a barrow at a steady speed of 2 m/s for 10 s, using a force of 100 N.

- How far did he travel?
- How much work is done?
- Where does the energy come from?

3. A boy with a mass of 60 kg climbs 10 m vertically up a ladder.

- What is his weight?
- How much work is done?
- What are the energy changes here?

4. An archer pulls back the arrow in his bow a distance of 0.5 m against an average force of 200 N.

- How much work is done?
- What are the energy changes here?

5. A car is travelling along the road with 40 000 J of kinetic energy. The brakes are applied and it comes to rest in 20 m.

- Calculate the average braking force.
- What happens to the kinetic energy?

