

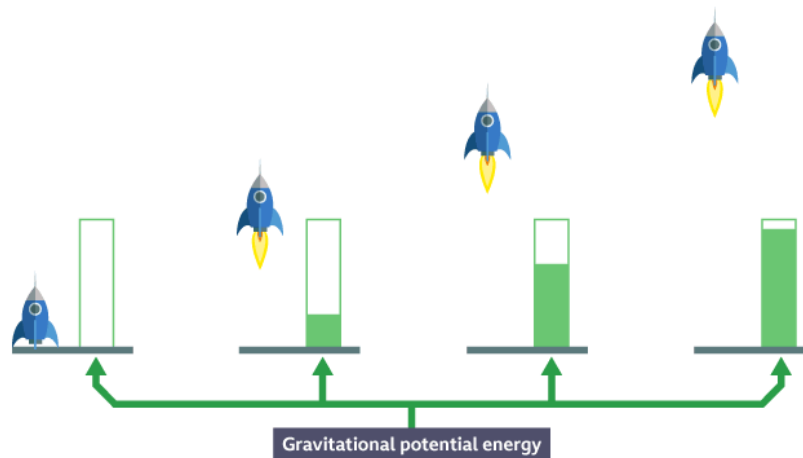
What is energy?

When energy is stored within a system, equations can sometimes be used to quantify how much is stored.

Energy is conserved. It cannot be created or destroyed. Energy can be transferred between stores. The total energy has the same value before and after any changes.

The gravitational potential energy store

As an object is lifted, work is done against the force of gravity. The higher the object, the more energy is in the gravitational potential energy store.



Measuring gravitational potential energy

Use the following equation to calculate how much energy is stored in the *gravitational potential energy store*:

$$E = mgh$$

Energy in the gravitational potential energy store (E_p) = mass (m) x gravitational field strength (g) x height (h)

The unit of measurement for energy in the gravitational potential energy store is the joule (J). On Earth, the *gravitational field strength* (g) is 9.8 N/kg.

Example

A diving platform is 10 m above the ground. When an 80 kg diver climbs to the top of the platform, how much is the increase in energy in their gravitational potential energy store?

Energy in the gravitational potential energy store = ?

- Mass = 80 kg
- Gravitational field strength = 9.8 N/kg
- Height = 10 m

use the following equation:

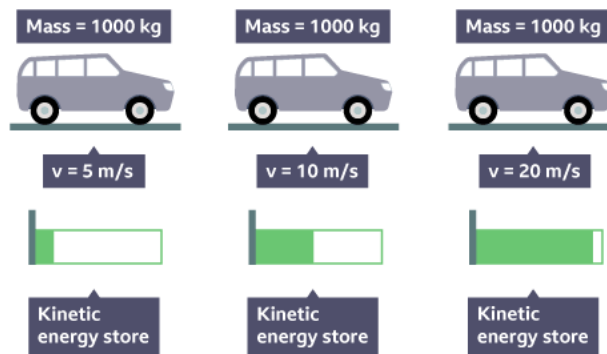
Energy in the gravitational potential energy store (E_p) = mass (m) x gravitational field strength (g) x height (h)

$$E = 80 \times 9.8 \times 10 = \mathbf{7840 \text{ J}}$$

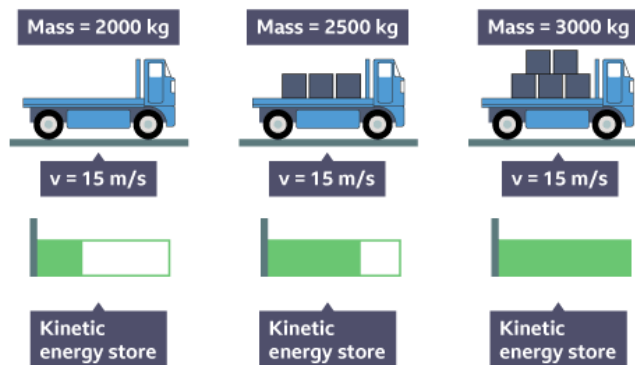
**The kinetic energy store**

The faster an object is travelling, the more energy there is in the kinetic energy store of the object.

How fast the object is moving is its speed. Speed is measured in m/s. Velocity is speed in a particular direction. Velocity (v) is also measured in m/s.



The more mass an object has, the more energy in the kinetic energy store.



Energy in the kinetic energy store (Ek)

Use the following equation to calculate the amount of energy in the *kinetic energy store* of a moving object:

$$\text{Energy in the kinetic energy store (Ek)} = 0.5 \times \text{mass (m)} \times \text{velocity}^2 (\text{v}^2)$$

The unit of measurement for the amount of energy in the kinetic energy store is the joule (J).

Example

A runner with a mass of 60kg is running at a speed of 1 m/s. Calculate the amount of energy in their kinetic energy store.

Energy in kinetic energy store = ?

- Mass = 60 kg
- Velocity = 1 m/s

Use the following equation:

$$\text{Energy in the kinetic energy store (Ek)} = 0.5 \times \text{mass (m)} \times \text{velocity}^2 (\text{v}^2)$$

$$E = 0.5 \times 60 \times 1 \times 1 = \mathbf{30 \text{ J}}$$

Navigate to the following page and test yourself

<https://www.bbc.co.uk/bitesize/articles/zm6yf82#zwrtrrd>