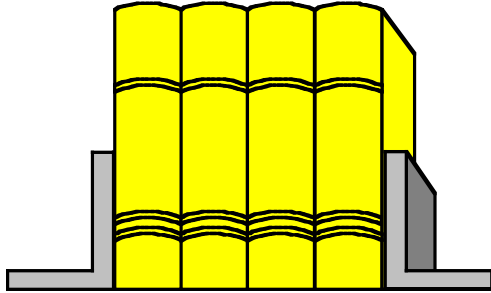


Energy Equations

It is possible to work out the amount of gravitational or kinetic energy an object may have in a given situation if certain facts are known. The gravitational energy of an object can be calculated from the height and mass of the object as well as the figure for gravitational acceleration - g (g = 10m/s² on Earth). Kinetic (movement) energy is figured out from the mass and velocity (or speed) of an object.

Gravitational Potential Energy

$$P.E = m \times g \times h$$



Kinetic Energy

$$K.E. = \frac{1}{2} \times m \times v^2$$

e.g. 1

Use the formula above to calculate the amount of gravitational energy a set of books weighing 3kg will have, if they are on a shelf 2m from the ground.

$$P.E = m \times g \times h$$

$$P.E = 3 \times 10 \times 2$$

$$P.E = \underline{60 \text{ J}}$$

e.g. 2

Calculate the kinetic energy of an athlete running at 10m/s and her mass is 80kg.

$$K.E. = \frac{1}{2} \times m \times v^2$$

$$K.E. = \frac{1}{2} \times 80 \times 10^2$$

$$K.E. = 40 \times 100$$

$$K.E. = \underline{4000 \text{ J}}$$



Section A

Calculate the kinetic energy in the following situations :

1. A toy car mass 2kg moves at 12m/s.
2. A dog mass 9kg runs at 9m/s.
3. The same dog slows to 8m/s.
4. A truck mass 2600kg moves at 30m/s.
5. The same truck moves at 108km/h.

Section C

Calculate the mass of the following objects :

1. A seagull flying at 6m/s has 72J of KE.
2. A bowling ball has 100J of KE moving at 5m/s.
3. A boulder rolls down a hill at 11m/s. It has 54450J of KE.

Section E

Calculate the speed of the following objects :

1. A running dog (mass 30kg) has 1215J of KE.
2. A toy car mass 1.5kg has 12J of KE.
3. A rock mass 64kg rolls along with 72J of KE.

Section B

Calculate the gravitational potential energy of the following objects : (g = 10m/s²)

1. A crow mass 2kg fly's 12m from the ground.
2. A brick 120m up a wall has a mass of 1.5kg.
3. A missile (22kg) flies at 30m from sea level.
4. A climber 90kg reaches 230m up the cliff.
5. A rock 21kg falls from 10m above the climber.

Section D

Calculate the mass of the following objects :

1. A seagull flying at 15m high has 450J of PE.
2. A ball 1.5m from the ground has 15J of PE.
3. A boulder 380m up a mountain has 110200J of PE.

Section F

Calculate the height of the following objects :

1. A monkey (mass 30kg) has 12600J of PE.
2. A model plane mass 1.5kg has 555J of PE.
3. A bomb mass 64kg has 71680J of PE.