N5

Kinetic Energy

Kinetic energy is the energy an object has because it is moving. Kinetic energy has the symbol E_k and is measured in joules, J.

The kinetic energy an object has depends on the mass and velocity of the object they are related as follows:

kinetic energy = ½ x mass x velocity²

$$E_k = \tfrac{1}{2} \times m \times v^2$$

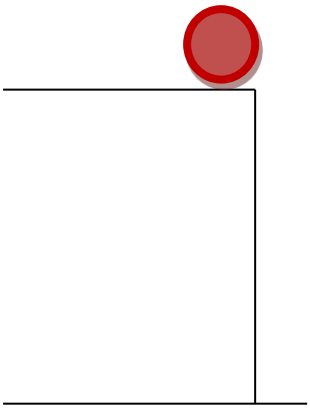
Joules, **J**

kilograms, **kg**

Calculations involving energy transformations using the Principle of Conservation of Energy

N5

As an object falls from a height its gravitational potential energy is transformed into other forms. If there are no energy losses all the gravitational potential energy would be converted into kinetic energy.



As the balls falls all its E_p is transformed into E_k

Therefore $E_p = E_k$

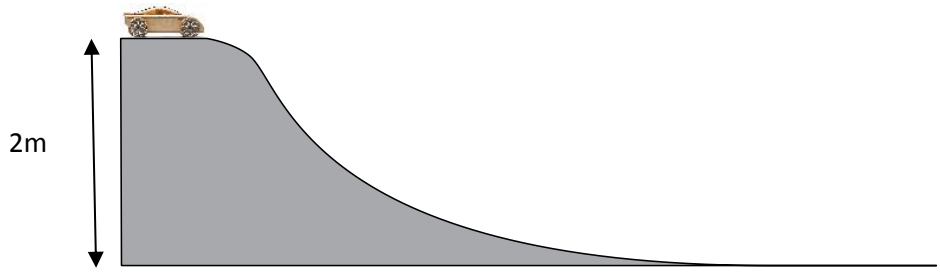
$m \times g \times h = \tfrac{1}{2} \times m \times v^2$ **(m's cancel)**

$g \times h = \tfrac{1}{2} \times v^2$

$v = \sqrt{2gh}$

Example

A model car has a mass of 0.5 kg, it starts from rest and is allowed to roll down a slope.



(a) Calculate the amount of gravitational potential energy it loses as it runs down the slope.
(b) Ignoring any energy loses state its gain in kinetic energy as it runs down to the bottom of the slope.
(c) Calculate the speed of the model car at the bottom of the slope.

Solutions

(a) E_p **= m x g x h**
= 0.5 x 9.8 x 2
= **9.8 J**

(b) E_k = 10 J, since all potential energy is converted into kinetic energy as no energy is lost.

(c) **v =** $\sqrt{2\,g\,h}$

v = $\sqrt{2 \times 9.8 \times 2}$

= 39.2

= **6.3 ms^{-1}**