

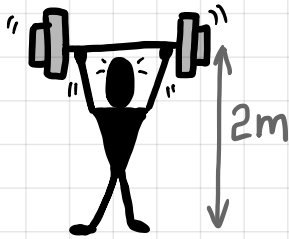
Gravitational potential energy

- 1 Calculate the amount of gravitational potential energy gained by an object raised above ground level.

Gravitational potential energy

🌍 Gravitational potential energy is the amount of energy gained by an object raised above ground level

🌍 This is due to the force of gravity acting upon the object.



Here is a weightlifter. When the weights are on the ground they have no gravitational potential energy. When the weightlifter lifts the weights, energy is transferred from chemical energy stores in the muscles to gravitational potential stores in the weights.

🌍 The equation to calculate gravitational potential energy is:

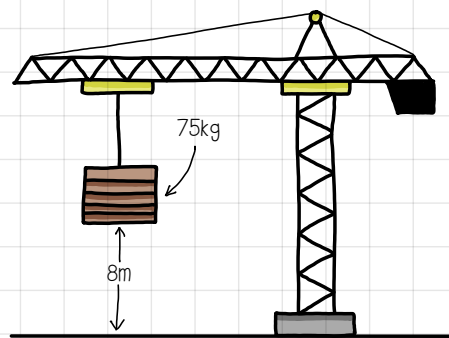
gravitational potential energy = mass x gravitational field strength x height or $E_p = m \times g \times h$

joules (J) kilograms (kg) newtons / kilogram (N/kg) metres (m)

You need to learn this equation for the exam

Calculating gravitational potential energy

A crane lifts a 75kg mass 8m off the ground. Calculate the gravitational potential energy gained by the mass. ($g = 9.8 \text{ N/kg}$).



1. Use the equation $E_p = m \times g \times h$
2. Substitute the values into the equation. $E_p = 75 \times 9.8 \times 8$
3. $E_p = 5880$
4. Do not forget to add the units. $E_p = 5880 \text{ J}$ (or 5.88 kJ)

Gravitational potential energy...

Practice question #1

0.5kg

A ball with a mass of 500g is lifted 1.5m onto a shelf. Calculate the gravitational potential energy gained by the ball. ($g = 9.8\text{N/kg}$)

1. First, convert the mass in grams into the mass in kilograms.

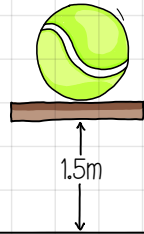
$$500\text{g} \div 1000 = 0.5\text{kg}$$

2. Use the equation $E_p = m \times g \times h$

3. Substitute the values into the equation. $E_p = 0.5 \times 9.8 \times 1.5$

$$E_p = 7.35$$

5. Do not forget to add the units. $E_p = 7.35\text{J}$



Practice question #2

A tourist with a mass of 60kg climbs to the top of the Eiffel Tower. They have gained 190 512J of gravitational potential energy. Calculate the height of the building. ($g = 9.8\text{N/kg}$)

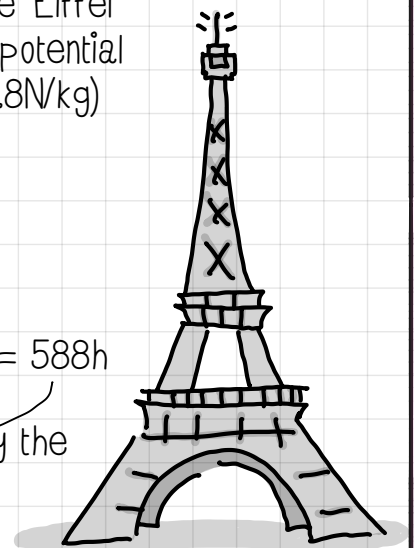
1. Use the equation $E_p = m \times g \times h$


2. Substitute the values. $190512 = 60 \times 9.8 \times h$


3. Simplify the right side of the equation. $190512 = 588h$

4. To calculate h , divide the number on the left by the number on the right. $h = 190512 \div 588$

$$h = 324\text{m}$$



 The gravitational field strength is usually given to you in the question. It is normally given as 9.8 N/kg but sometimes it can be rounded up to 10 N/kg .

 A harder question may put you on the moon or another planet and ask you to calculate the gravitational field strength. Simply follow the procedure above to calculate.

 watch video