



Physics. *You work it out.*

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# Work, Potential Energy and Power 2

Essential GCSE Physics 33.2

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A builder needs to drag a sack of cement 20 m along the floor against a friction force of 60 N.

## Part A Work Done

Calculate the work done.

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## Part B Power

If the builder took two minutes to do the dragging, what was their power?

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# Work, Potential Energy and Power 5

Essential GCSE Physics 33.5



A lighting bar on stage has a mass of 300 kg when supporting stage lights.

## Part A Weight

What is its weight?

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## Part B Energy to lift

How much energy do you need to lift it by 10 m?

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## Part C Time to lift

If your power is 100 W, how long would it take you to lift the bar by 10 m?

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## Part D Gravitational potential energy

What is the increase in gravitational potential energy when the bar is lifted by 10 m?

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# Kinetic Energy 2

## Essential GCSE Physics 34.2

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Calculate the kinetic energy of an 800 kg car when it is going at

### Part A Kinetic energy at 30 mph

30 mph (which is 13.4 m/s);

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### Part B Kinetic energy at 40 mph

40 mph (which is 17.9 m/s).

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### Part C Road safety

Road safety campaigners are continually reminding motorists that 40 mph is much more dangerous than 30 mph even though it only seems a little bit faster. What does this question suggest about the issue?

- ☐ The difference between the two is actually minimal.
  - ☐ The kinetic energy is a lot greater, almost double.
  - ☐ 40 mph is actually safer than 30 mph.
-

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# Work, Energy and Power 2

## Essential Pre-Uni Physics B8.2

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Physical constants which may be necessary to answer the problems on this page can be found within the hint tabs.

### Part A GPE lost by the ball

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An object of mass 3.5 kg slides all the way down a slope inclined at  $40^\circ$  to the horizontal, with a base of length 4.8 m. How much GPE does the object lose?

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### Part B Work done by the ball against friction

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If the average frictional forces are 4.0 N, work out how much work the object does against friction.

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# Work, Energy and Power 3

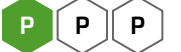
## Essential Pre-Uni Physics B8.3

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GCSE



A Level



Physical constants which may be necessary to answer the problems on this page can be found within the hint tabs.

50 J of work is done in stretching a spring to an extension of 3.5 cm. Work out the average force applied.

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Gameboard:

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# Work, Energy and Power 4

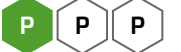
Essential Pre-Uni Physics B8.4

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GCSE



A Level



Physical constants which may be necessary to answer the problems on this page can be found within the hint tabs.

A boy whirls a 30 g conker around his head in a circle at a speed of  $2.2 \text{ m s}^{-1}$ , using a ~~taut inextensible~~ string. How much work is done on the conker by the tension in the string?

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Gameboard:

**STEM SMART Physics 7 - Energy**

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# Work, Energy and Power 7

GCSE      A Level



## Essential Pre-Uni Physics B8.7

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A child of 40 kg rides a 35 kg bike at  $9.0 \text{ m s}^{-1}$ . The brakes are then applied and the bike is slowed to  $3.8 \text{ m s}^{-1}$ . How much work is done by frictional forces?

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Gameboard:

[\*\*STEM SMART Physics 7 - Energy\*\*](#)

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# Kinetic Energy 9

Essential GCSE Physics 34.9

GCSE



This question allows you to derive the equation for kinetic energy using a numeric example. We assume constant acceleration and no resistive forces. You can use these equations:

distance = average speed  $\times$  time

acceleration = change in speed / time taken

force = mass  $\times$  acceleration

energy transferred = force  $\times$  distance

## Part A Acceleration

A 700 kg car accelerates uniformly from rest to 30 m/s in 10 s. Calculate its acceleration.

## Part B Force

Calculate the force needed to give the car this acceleration.

## Part C Distance

The average speed of the car is midway between the starting speed (0.0 m/s) and the final speed. Use this information to work out how far the car will go while accelerating.

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## Part D    Kinetic energy

The kinetic energy equals the work done in accelerating the car. Use this fact to calculate the kinetic energy.

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## Part E    Symbolic

Now repeat this question for a car of mass  $m$  going from rest to speed  $v$  in time  $t$ .

The following symbols may be useful:  $E$ ,  $m$ ,  $t$ ,  $v$

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Gameboard:

**STEM SMART Physics 7 - Energy**

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# Work, Energy and Power 9

GCSE



A Level



## Essential Pre-Uni Physics B8.9

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Physical constants which may be necessary to answer this problem can be found within the hint tab.

A  $4.0\text{ kg}$  ball is thrown vertically up into the air with an initial velocity of  $8.5\text{ m s}^{-1}$ . By the time it is height  $h$  metres above the starting point, it has a velocity of  $3.0\text{ m s}^{-1}$  and has done  $4.0\text{ J}$  of work against air resistance. Find  $h$ .

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