



# **GCSE Physics**

## **Energy**

### **Question Paper**

**Time available: 50 minutes**

**Marks available: 40 marks**

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1. The image shows a battery-powered drone.



(a) Complete the sentences.

Choose the answers from the box.

chemical	elastic potential
gravitational potential	kinetic
	nuclear

As the drone accelerates upwards

its \_\_\_\_\_ energy increases

and its \_\_\_\_\_ energy increases.

The \_\_\_\_\_ energy store

of the battery decreases.

(3)

(b) In the USA, drones are not allowed to be flown too high above the ground.

Suggest **one** possible risk of flying a drone too high above the ground.

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(2)

(c) Write down the equation that links energy transferred, power and time.

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(1)

(d) The drone can fly for 25 minutes before the battery needs recharging.

The power output of the battery is 65.0 W

Calculate the maximum energy stored by the battery.

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Maximum energy = \_\_\_\_\_ joules

(3)

(Total 8 marks)

**2.**

The diagram below shows a cyclist riding along a flat road.



(a) Complete the sentence.

Choose answers from the box.

<b>chemical</b>	<b>elastic potential</b>	<b>gravitational potential</b>	<b>kinetic</b>
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As the cyclist accelerates, the \_\_\_\_\_ energy store in the cyclist's body decreases and the \_\_\_\_\_ energy of the cyclist increases.

(2)

(b) The mass of the cyclist is 80 kg. The speed of the cyclist is 12 m/s.

Calculate the kinetic energy of the cyclist.

Use the equation:

$$\text{kinetic energy} = 0.5 \times \text{mass} \times (\text{speed})^2$$

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Kinetic energy = \_\_\_\_\_ J

(2)

(c) When the cyclist uses the brakes, the bicycle slows down.

This causes the temperature of the brake pads to increase by 50 °C.

The mass of the brake pads is 0.040 kg.

The specific heat capacity of the material of the brake pads is 480 J/kg °C.

Calculate the change in thermal energy of the brake pads.

Use the equation:

$$\text{change in thermal energy} = \text{mass} \times \text{specific heat capacity} \times \text{temperature change}$$

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Change in thermal energy = \_\_\_\_\_ J

(2)

(d) How is the internal energy of the particles in the brake pads affected by the increase in temperature?

Tick **one** box.

Decreased

Increased

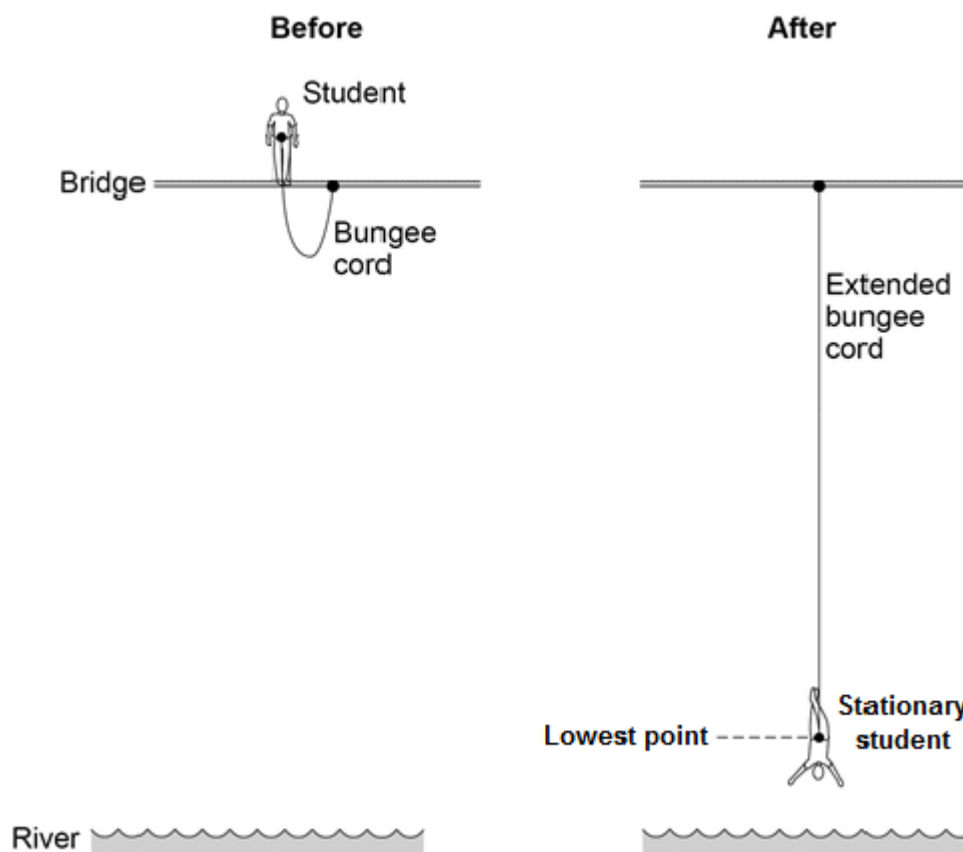
Not affected

(1)  
(Total 7 marks)

3.

The image below shows a student before and after a bungee jump.

The bungee cord has an unstretched length of 20 m.



(a) For safety reasons, it is important that the bungee cord used is appropriate for the student's weight.

Give **two** reasons why.

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

(2)

(b) The student jumps off the bridge.

Complete the sentences to describe the energy transfers.

Use answers from the box.

<b>elastic potential    gravitational potential    kinetic    sound    thermal</b>
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Before the student jumps from the bridge he has a store of

\_\_\_\_\_ energy.

When he is falling, the student's store of \_\_\_\_\_

energy increases.

When the bungee cord is stretched, the cord stores energy as

\_\_\_\_\_ energy.

(3)

(c) At the lowest point in the jump when the student is stationary, the extension of the bungee cord is 35 metres.

The bungee cord behaves like a spring with a spring constant of 40 N / m.

Calculate the energy stored in the stretched bungee cord.

Use the correct equation from the Physics Equations Sheet.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Energy = \_\_\_\_\_ J

(2)

(Total 7 marks)

4.

A student finds some information about energy-saving light bulbs.

(a) A 30W light bulb uses 600J of electrical energy in a certain period of time. In that time, it produces 450 J of light energy. The rest of the energy is wasted.

(i) Calculate the energy wasted by the light bulb in this period of time.

\_\_\_\_\_   
 Wasted energy = \_\_\_\_\_ J

(1)

(ii) What happens to the energy wasted by the light bulb?

\_\_\_\_\_   
 \_\_\_\_\_

(1)

(iii) Calculate the efficiency of this light bulb.

\_\_\_\_\_   
 \_\_\_\_\_   
 Efficiency = \_\_\_\_\_

(2)

(iv) Calculate the period of time, in seconds, during which the 600 J is provided to the 30 W light bulb.

\_\_\_\_\_   
 \_\_\_\_\_   
 Time = \_\_\_\_\_ s

(2)

(b) A company that makes light bulbs provides information about some of their products.

The table shows some of this information.

	Power in watts	Lifetime in hours	Cost of bulb in £
Filament bulb	60	1250	2.00
LED bulb	12	50 000	16.00

(i) Suggest why it is important to confirm this information independently.

\_\_\_\_\_

(1)

(ii) A homeowner is thinking about replacing his filament bulbs with LED bulbs.

A 12 W LED bulb gives the same light output as a 60 W filament bulb.

Suggest reasons why the homeowner is likely to choose LED bulbs.

Use the information given in the table.

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(2)

(iii) State **one** factor, other than efficiency, that is important when considering the choice of a bulb for lighting in the home.

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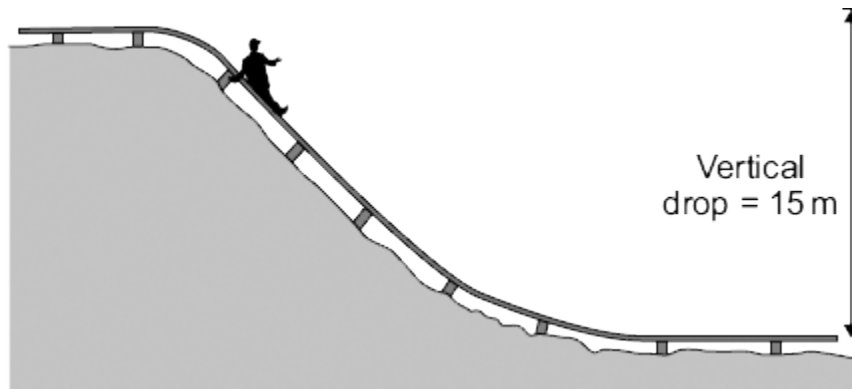
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(1)

(Total 10 marks)

5.

The miners working in a salt mine use smooth wooden slides to move quickly from one level to another.





- (a) A miner of mass 90 kg travels down the slide.

Calculate the change in gravitational potential energy of the miner when he moves 15 m vertically downwards.

gravitational field strength = 10 N/kg

Show clearly how you work out your answer.

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Change in gravitational potential energy = \_\_\_\_\_ J

(2)

- (b) Calculate the **maximum** possible speed that the miner could reach at the bottom of the slide.

Show clearly how you work out your answer.

Give your answer to an appropriate number of significant figures.

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Maximum possible speed = \_\_\_\_\_ m/s

(3)

- (c) The speed of the miner at the bottom of the slide is much less than the calculated maximum possible speed.

Explain why.

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(3)

(Total 8 marks)