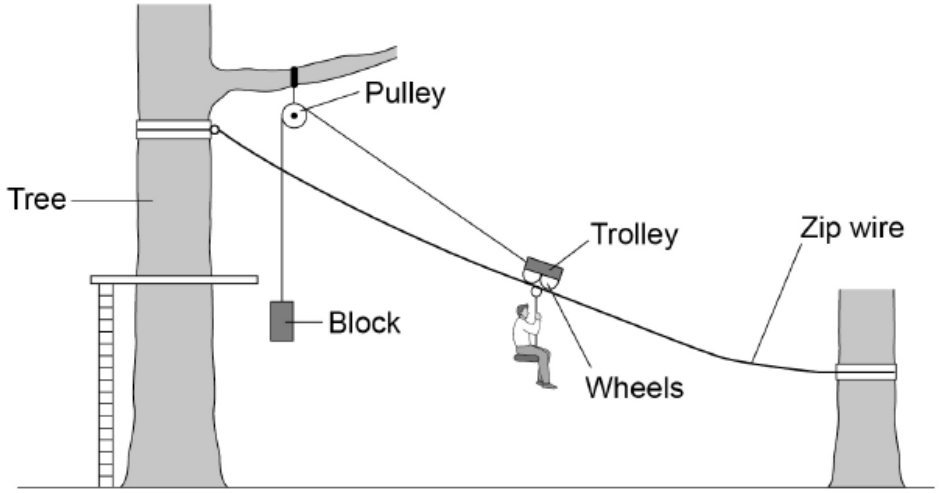
Energy and Power – GCSE CS Physics

1. No.2

0 2 **Figure 3** shows a person using a zip wire to move from a tree to the ground.

Figure 3



As the person moves down the zip wire, the block moves upwards.

0 2 . 1 What happens to the gravitational potential energy of the person as the person accelerates down the zip wire?

[1 mark]

Tick (✓) **one** box.

Decreases ☐

Stays the same ☐

Increases ☐

0 2 . 2 What happens to the kinetic energy of the person as the person accelerates down the zip wire?

[1 mark]

Tick (✓) **one** box.

Decreases ☐

Stays the same ☐

Increases ☐

0 2 . 3 The block is 3.4 m above the ground when the person is at the bottom of the zip wire.

mass of block = 2.5 kg

gravitational field strength = 9.8 N/kg

Calculate the gravitational potential energy of the block.

Use the equation:

gravitational potential energy = mass × gravitational field strength × height

[2 marks]

Gravitational potential energy = _____ J

The trolley is a seat suspended from wheels which can roll along the zip wire.

0 2 . 4 When the person reaches the end of the zip wire, the person gets off the trolley.

The block falls downwards pulling the trolley back to the top of the zip wire.

maximum speed of block = 4.8 m/s

mass of block = 2.5 kg

Calculate the maximum kinetic energy of the block.

Use the equation:

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

[2 marks]

Maximum kinetic energy = _____ J

0 2 . 5 As the trolley moves, work is done against friction.

What is the effect of this?

[1 mark]

Tick (✓) **one** box.

Some energy is destroyed. ☐

Some energy is transferred to the surroundings. ☐

The total energy of the block and trolley increases. ☐

0 2 . 6 The person oils the wheels on the trolley.

Explain how this will affect the speed of the person down the zip wire.

[2 marks]

2. No.5

0 5 Wind power and solar power are both renewable energy resources used to generate electricity for the National Grid.

0 5 . 1 Which of the following is also a renewable energy resource?

[1 mark]

Tick (✓) **one** box.

Geothermal ☐

Natural gas ☐

Nuclear fuel ☐

0 5 . 2 The energy transferred by the National Grid in one second was 36 gigajoules (GJ).

Which of the following is the same as 36 gigajoules?

[1 mark]

Tick (✓) **one** box.

36×10^3 J ☐

36×10^6 J ☐

36×10^9 J ☐

36×10^{12} J ☐

0 5 . 3 **Figure 6** shows how the mean power output from solar and wind energy resources in the UK varied between 2014 and 2019.

Figure 6

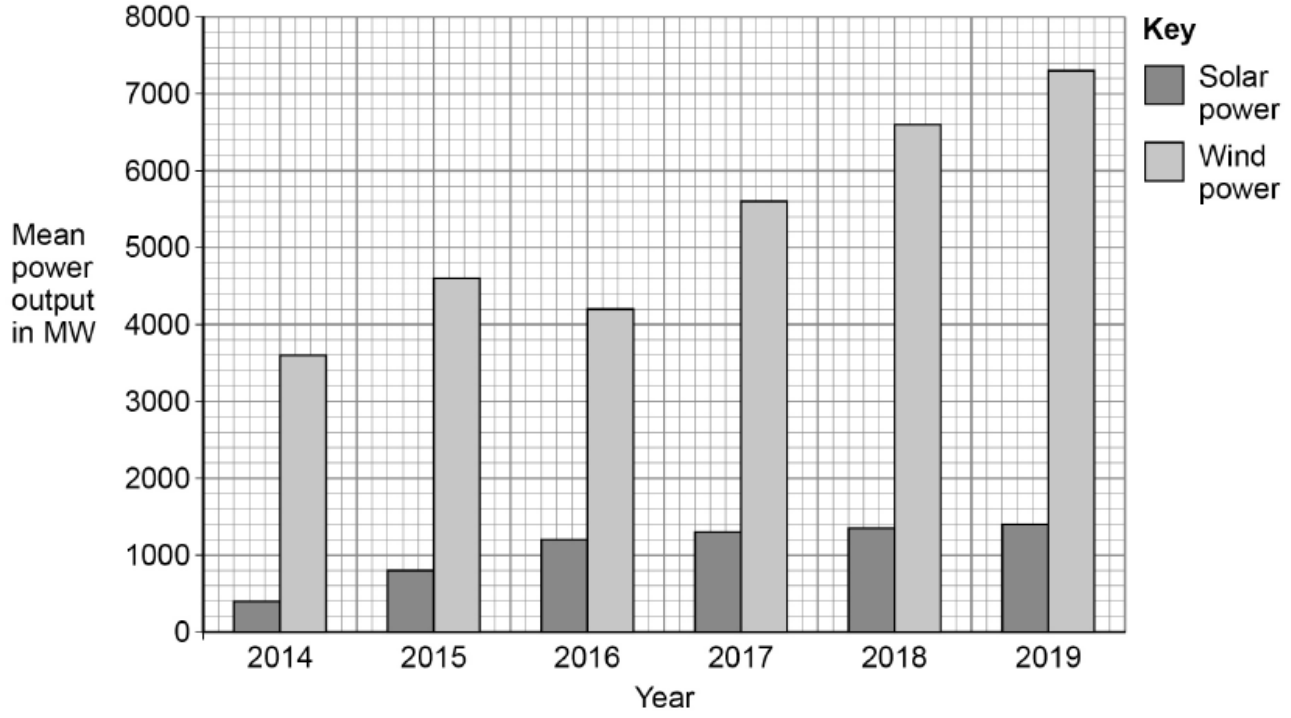
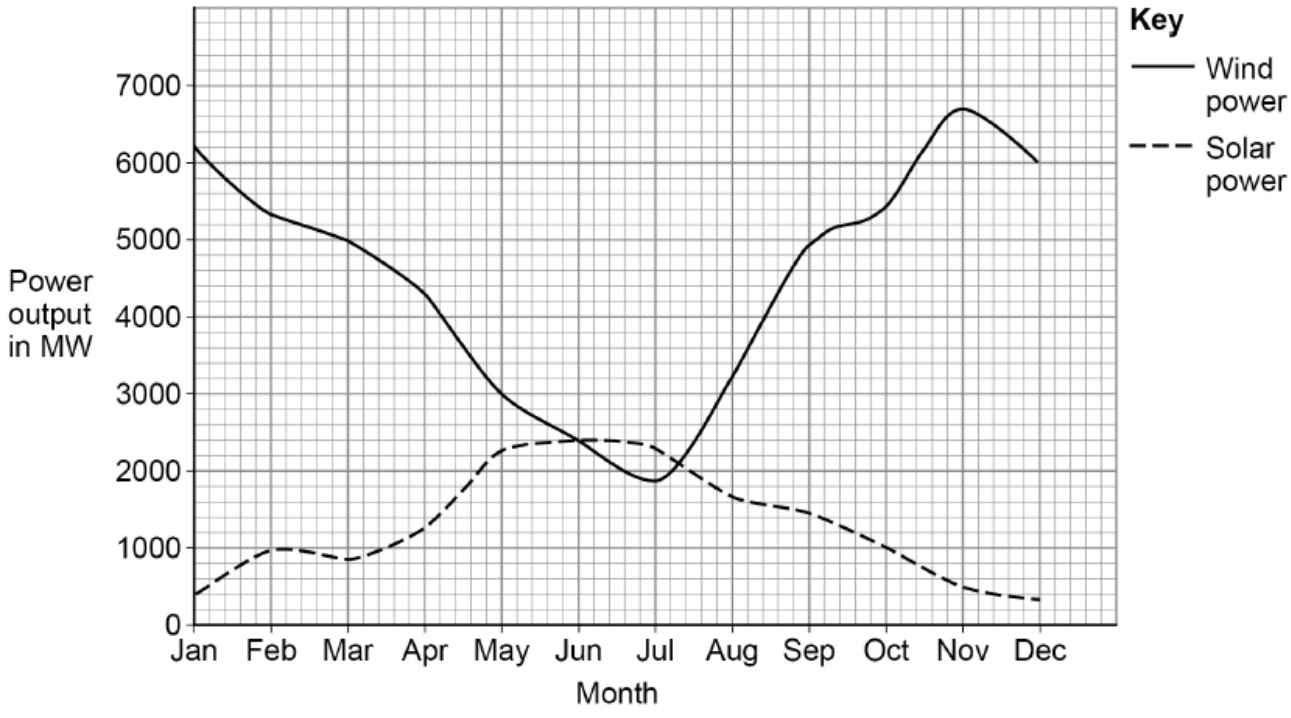


Figure 7 shows how the power output from solar and wind energy resources varies in a typical year.

Figure 7



Explain the changes in power output from solar and wind energy resources between 2014 and 2019.

You should include an explanation of the change in power output during a typical year.

[6 marks]

3. No.5

0 5 **Figure 10** shows a child's toy.

A child pushes down on the toy to compress the spring. The spring then launches the toy into the air.

Figure 10

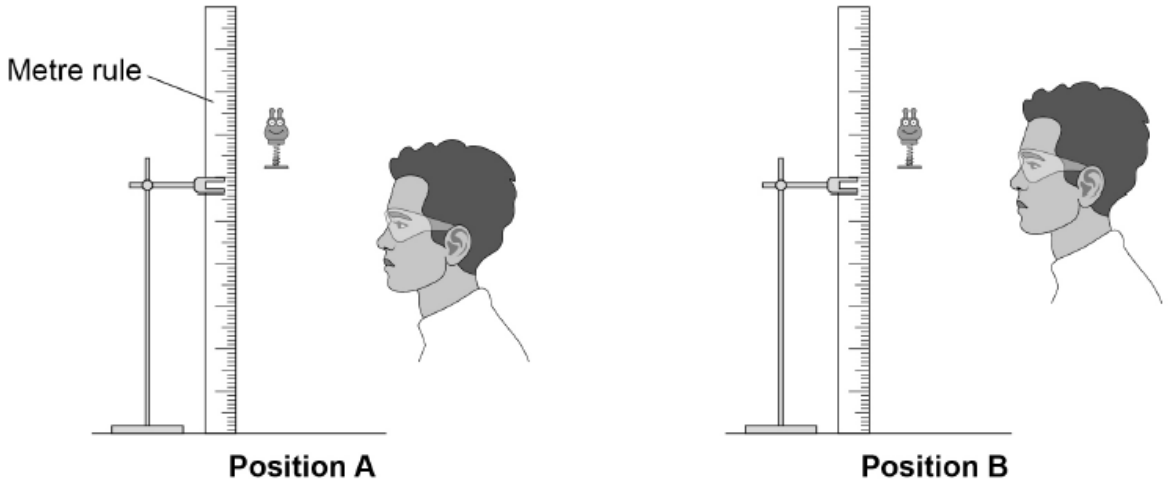
0 5 . 1 A student measured the maximum height reached by the toy.

The student placed a vertical metre rule near the toy, and observed the height reached by the toy.

The student repeated the experiment, observing from a different position.

Figure 11 shows the toy at its maximum height and the two positions of the student.

Figure 11



Observing the toy from **position B** instead of **position A** affected the measurement of the maximum height reached by the toy.

Explain how.

[2 marks]

0 5 . 2 The greatest height reached by the toy was 64 cm.

The gravitational potential energy of the toy at this height was 0.049 J.

gravitational field strength = 9.8 N/kg

Calculate the mass of the toy.

Use the Physics Equations Sheet.

Give your answer to 2 significant figures.

[5 marks]

Mass of toy (2 significant figures) = _____ kg

0 5 . 3 When the spring launches the toy into the air, the temperature of the air increases.

Explain why the child's toy on its own is **not** a closed system.

[2 marks]