AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 6.2.4.3

The National Grid

Past-paper questions

Tier	**Higher**
Question groups	**3**
Available paper years	**2023–2025**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

6.2.4.3 The National Grid

Question 01

June 2023 | 8464/P/1H | Original Q1

0 1 Wind power and solar power are both renewable energy resources used to generate electricity for the National Grid.

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

[1 mark]

Tick (✓) **one** box.

- Geothermal ☐
- Natural gas ☐
- Nuclear fuel ☐

0 1 . 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 ☐

Question 1 continues on the next page

6.2.4.3 The National Grid

Question 01 · continued

0 1 . 3 **Figure 1** shows how the mean power output from solar and wind energy resources in the UK varied between 2014 and 2019.

Figure 1

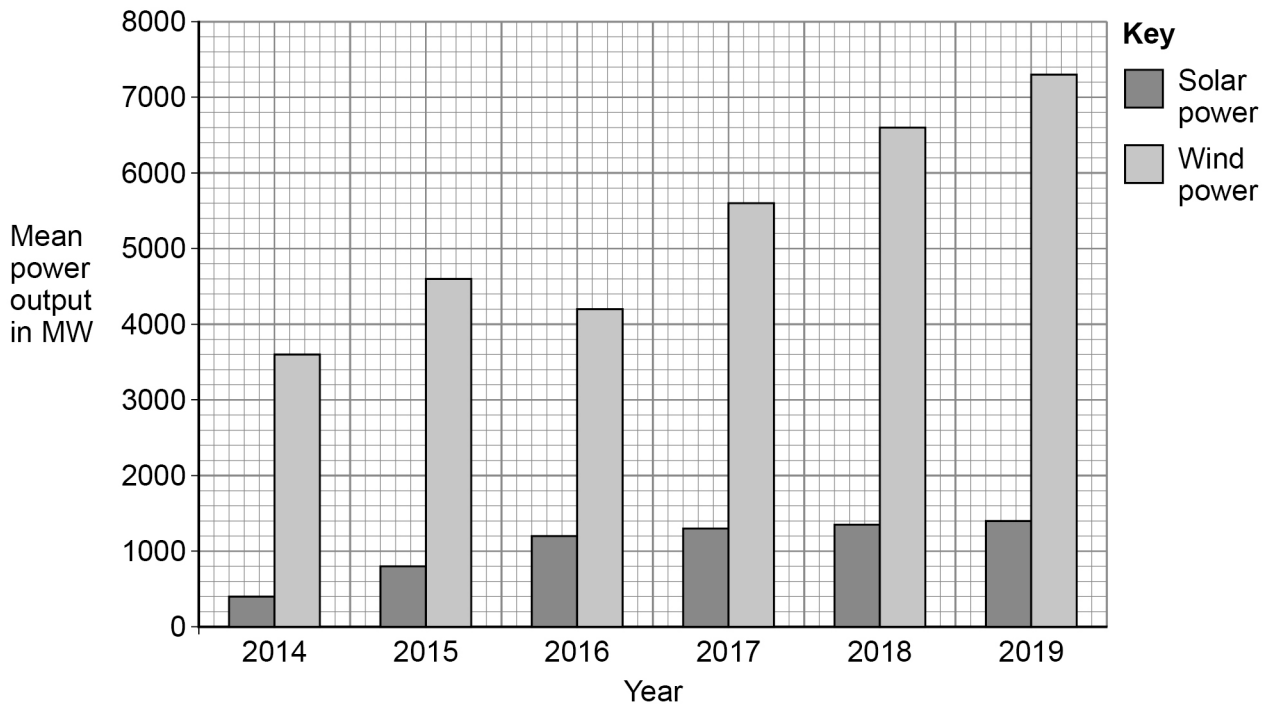
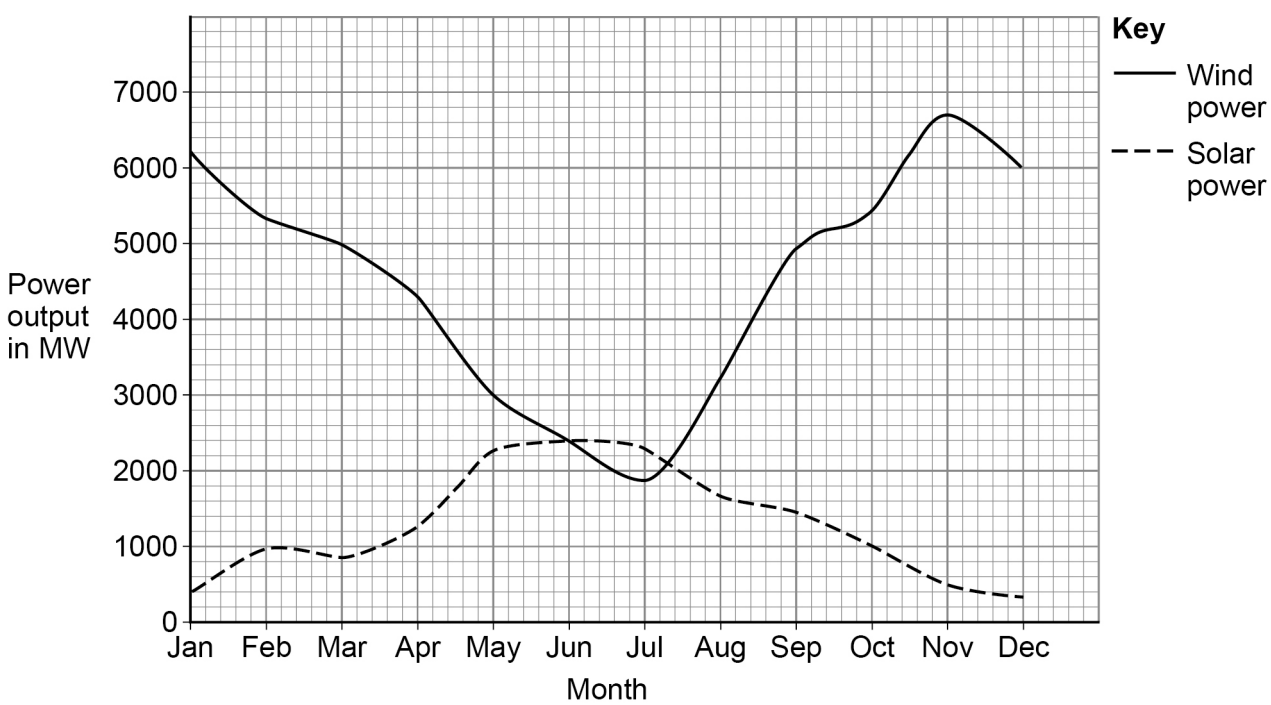


Figure 2 shows how the power output from solar and wind energy resources varies in a typical year.

Figure 2



6.2.4.3 The National Grid

Question 01 · continued

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]

8

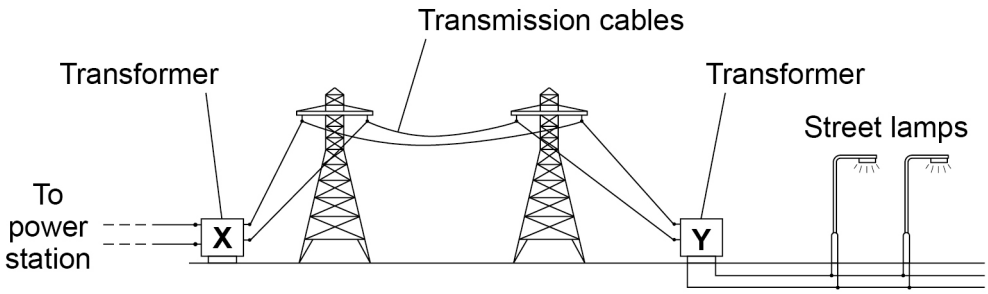
6.2.4.3 The National Grid

Question 02

June 2023 | 8464/P/1H | Original Q3

0 3 **Figure 7** shows how the National Grid transfers energy from a power station to some street lamps.

Figure 7



0 3 . 1 Explain how transformer **X** increases the efficiency of the National Grid.

[3 marks]

6.2.4.3 The National Grid

Question 02 · continued

0 3 . 2 The potential difference across the primary coil in transformer **Y** is 400 000 V.

The potential difference across the secondary coil is 11 000 V.

The current in the primary coil is 660 A.

Calculate the current in the secondary coil of transformer **Y**.

Use the Physics Equations Sheet.

[3 marks]

Current in the secondary coil = _____ A

0 3 . 3 Why is the current in each street lamp less than the current in the secondary coil in transformer **Y**?

[1 mark]

Tick (✓) **one** box.

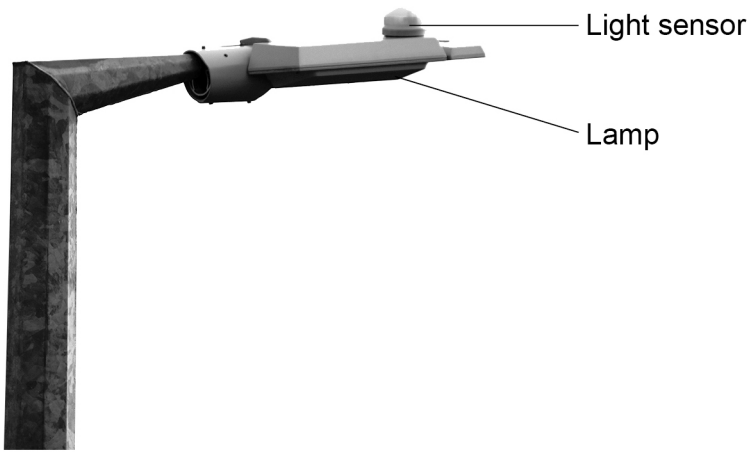
- Current is used up in the cables between **Y** and each street lamp. ☐
- Some of the current is dissipated to the surroundings. ☐
- The cables between **Y** and the street lamps have electrical resistance. ☐
- The street lamps are connected in parallel. ☐

6.2.4.3 The National Grid

Question 02 · continued

0 3 . 4 **Figure 8** shows the top of a street lamp.

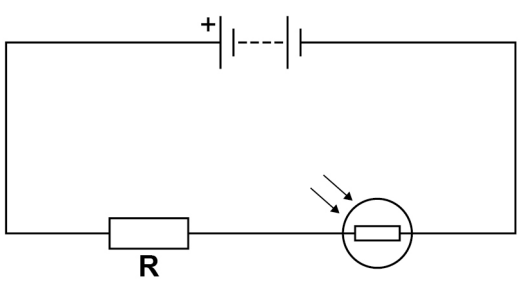
Figure 8



The light sensor detects if it is day or night.

Figure 9 shows part of the circuit in the light sensor.

Figure 9



Explain what happens to the potential difference across resistor **R** as the light intensity decreases.

[3 marks]

6.2.4.3 The National Grid

Question 02 · continued

0 3 . 5 When the current in resistor **R** is 20 mA, the power transferred by resistor **R** is 6.0 W.

Calculate the resistance of resistor **R**.

Use the Physics Equations Sheet.

[4 marks]

Resistance = _____ Ω

14

6.2.4.3 The National Grid

Question 03

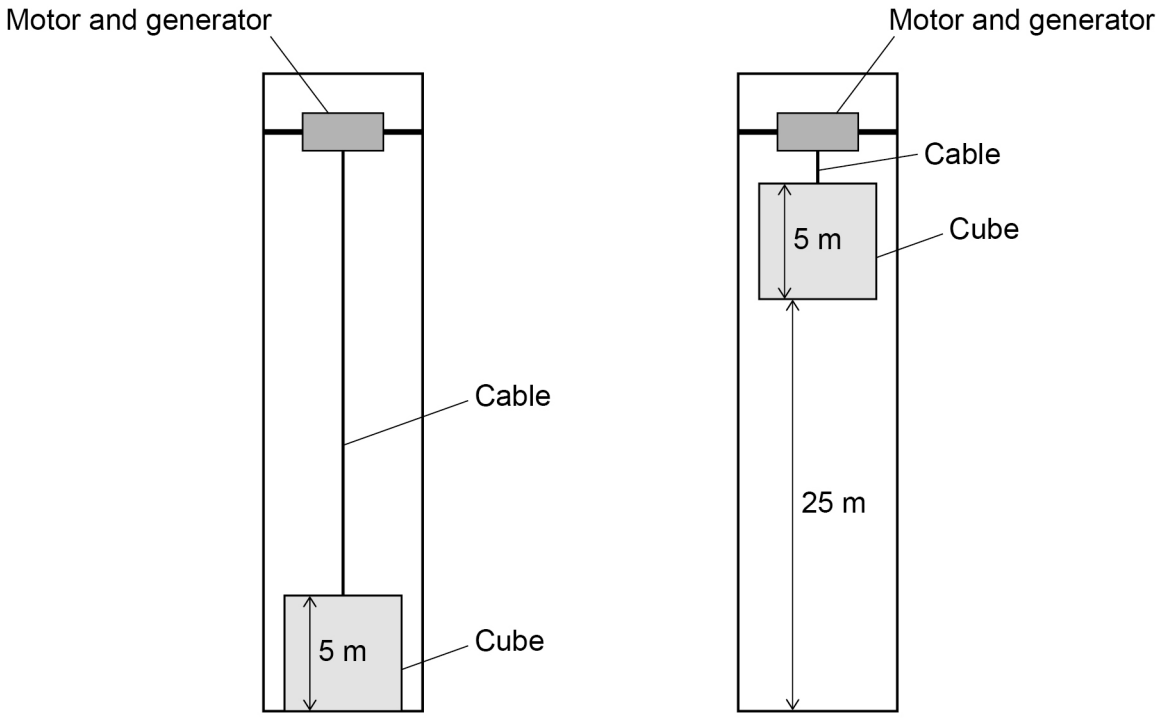
June 2025 | 8464/P/1H | Original Q6

0 6 A system is designed to store excess energy from the National Grid.

- Excess energy from the National Grid powers a motor that lifts a large cube.
- To transfer the energy back to the National Grid, the cube is allowed to fall.
- The falling cube turns a generator which produces electricity.

Figure 6 shows the cube before it is lifted and after it is lifted.

Figure 6



Before cube is lifted **After cube is lifted**

6.2.4.3 The National Grid

Question 03 · continued

0 6 . 1 The cube has a density of 4200 kg/m^3.

Determine the mass of the cube.

Use the Physics Equations Sheet.

[4 marks]

Mass = _____ kg

0 6 . 2 Explain why the cube is made from a material with a high density.

[2 marks]

Question 6 continues on the next page

6.2.4.3 The National Grid

Question 03 · continued

0 6 . 3 The system is designed to store excess energy from the National Grid.

Explain how the efficiency of the system could be determined.

[2 marks]

0 6 . 4 The system in **Figure 6** on page 20 needs to be able to store excess energy as quickly as possible.

Explain **one** change to this system that would allow the same amount of energy to be stored more quickly.

Do **not** refer to efficiency in your answer.

[2 marks]

10