

Eduqas Physics GCSE
Topic 1.3: Energy transfers
Questions by topic

1.

Drax is a large coal-fired power station with a generating capacity of 3950 MW. This power is transmitted through the National Grid to consumers with an efficiency of 92%.

- (i) Explain how this high efficiency is achieved by the National Grid system. [3]

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- (ii) Use an equation from page 2 to calculate the power available for use by consumers. [2]

power = MW

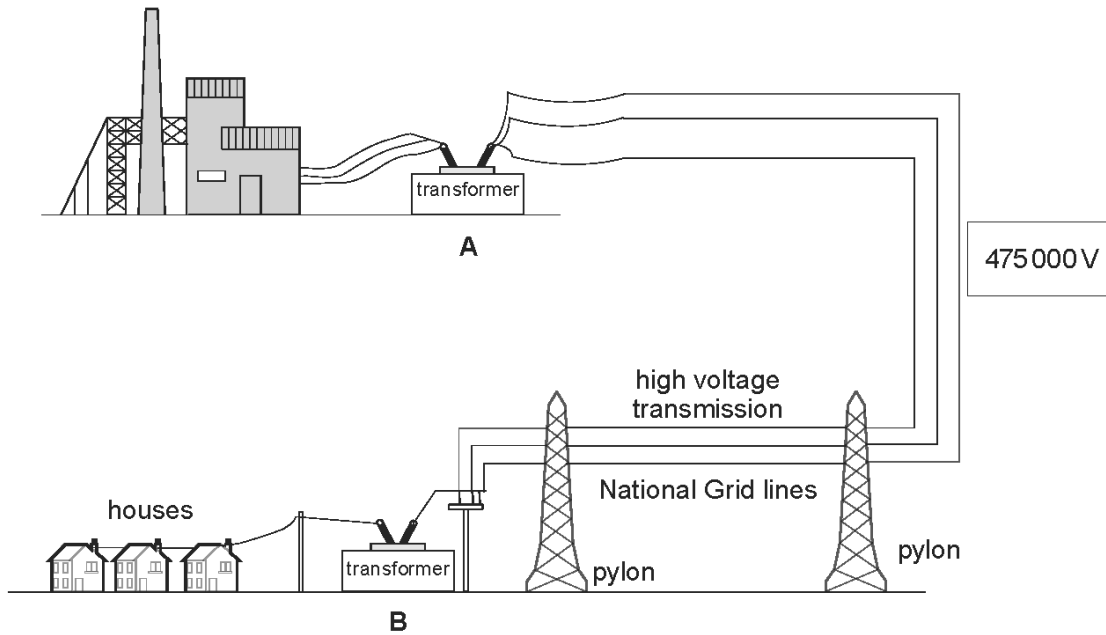
- (iii) Mains electricity is supplied to a home at 230 V at a maximum current of 80 A.
Use an equation from page 2 and your answer to part (ii) to calculate the minimum number of homes that could be supplied by the Drax power station. [3]

number of homes =

8

2.

A diagram of the National Grid is shown below.



(a) Explain how transformer A makes the National Grid more efficient. [2]

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(b) Transformer A supplies 950 MW to the National Grid at 475 000 V.

(i) Write down the input power to the National Grid in watts. [1]

power = W

(ii) Use an equation from page 2 to calculate the current. [2]

current = A

(c) Explain the purpose of transformer B. [2]

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(d) Discuss how the National Grid maintains a reliable supply of electricity to consumers. [6 QWC]

Include in your answer:

- how the demand for electricity changes through the day;
- which types of power stations generate electricity continuously;
- why hydroelectric power stations are so useful to the National Grid.

3.

(a) What is the purpose of the National Grid? [2]

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(b) A large wind turbine can supply a mean power of 0.95 MW to the National Grid. The table shows the length of time during a typical week when the turbine generated electricity.

Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Length of time electricity generated (minutes)	495	0	1 440	900	600	1 440	525

(i) Using an equation from page 2 calculate the energy output (in MWh) of the wind turbine for the week. [3]

energy output = MWh

(ii) The cost of commissioning the wind turbine is £650 000. The electricity it produces is sold to the National Grid at 5 p per kWh. Calculate the expected payback time. (Payback time is the time taken to repay the £650 000 cost.) [4]
Assume the energy output for a typical week is constant.

payback time = weeks

- (c) Discuss the advantages and disadvantages of using wind turbines such as in part (b) for the large scale production of electricity for distribution by the National Grid. [6 QWC]

Consider the following information when writing your answer:

- power demand from the National Grid is typically 40GW;
- a nuclear power station typically produces an output of 2.5GW;
- reliability of output;
- environmental considerations.

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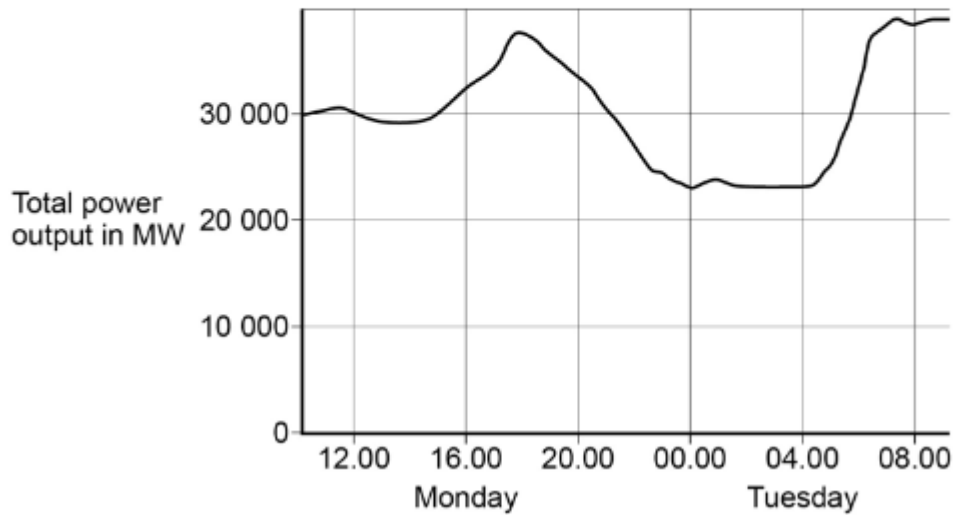
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4. The National Grid ensures that the supply of electricity always meets the demand of the consumers.

Figure 2 shows how the output from fossil fuel power stations in the UK varied over a 24-hour period.

Figure 2



- 1** Suggest **one** reason for the shape of the graph between 15.00 and 18.00 on Monday.

[1 mark]

- 2** Gas fired power stations reduce their output when demand for electricity is low.

Suggest **one** time on **Figure 2** when the demand for electricity was low.

[1 mark]

- 3** The National Grid ensures that fossil fuel power stations in the UK only produce about 33% of the total electricity they could produce when operating at a maximum output.

Suggest **two** reasons why.

[2 marks]

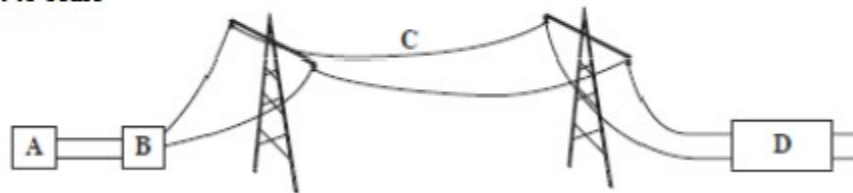
1 _____

2 _____

5.

The diagram shows part of the National Grid.
Electricity is generated at power station **A**.

Not to scale



- (a) Use a word from the box to complete the sentences that follow.
Each word may be used once, more than once or not at all.

transformer	pylon	generator	power	current
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- (i) At **B**, a increases the voltage. [1]
- (ii) Increasing the voltage makes the at **C** smaller. [1]
- (iii) At **D**, the voltage is decreased using a [1]
- (b) (i) Explain why the electricity distribution system is designed so that the voltage is boosted at **B**. [2]

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- (ii) Why is the voltage reduced at **D** for use in homes? [1]

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6.

Most electrical appliances are connected to the mains electricity using three-core cables.

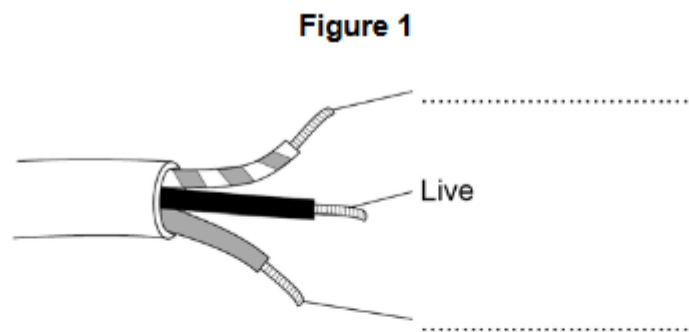
- 1 What is the approximate value of the potential difference of the UK mains electricity supply?

Tick **one** box.

[1 mark]

- 23 V
- 230 V
- 300 V
- 350 V

Figure 1 shows a three-core cable.



- 2 Use answers from the box to label the wires and complete **Figure 1**.

[2 marks]

Earth	Negative	Neutral
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- 3** In the UK the three wires in a three-core cable are always the same colours.

Why are the wires always the same colours?

Tick **one** box

[1 mark]

Each wire is made by a different company.

It is easy to identify each wire.

They are cheaper to manufacture.

- 4** Touching the live wire is dangerous.

Use answers from the box to complete the sentences.

[2 marks]

current

resistance

shock

force

voltage

Touching the live wire causes a large potential difference to exist across the body.

This causes a _____ through the body,

which results in an electric _____

- 5** What is the approximate frequency of the UK mains electricity supply?

Tick **one** answer.

[1 mark]

50 Hz

75 Hz

100 Hz

150 Hz