

Combined Science - Physics - Key Stage 4 - Electricity

The National Grid Worksheet

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Q1.

The voltage of electricity used in the home is 230 V.

The voltage of electricity used for some power lines is more than 110 000 V.

Transformers are used as part of the National Grid.

Explain why transformers improve the transfer of electricity to the home. **[2]**

Answers as discussed in the next slide have not been seen or verified by OCR.

OCR, Gateway Physics A, Paper B752/01, June 2015



Answers



Q1.

1) Any two from:

- transformers can be used to change voltage or increase voltage or decrease voltage (1) *You might have mentioned a step up transformer here.*
- 110 000 V is dangerous or make the **voltage** safer for people (in their homes) (1) *You might have mentioned a step down transformer here.*
- less power loss (at high voltages) or more efficient (at high voltages) (1) **Or** this increases the efficiency as the the current is lower.

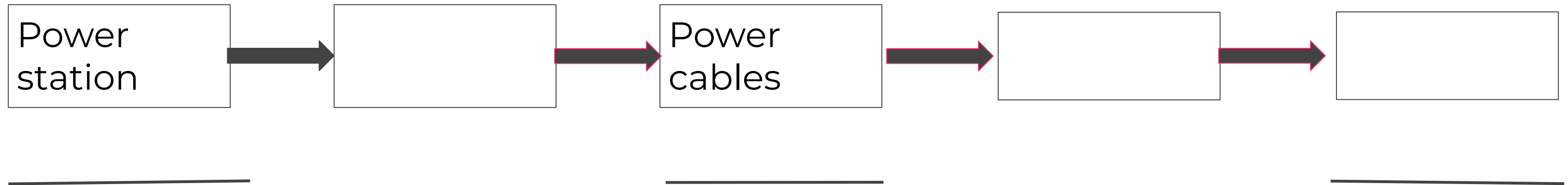


In lesson questions



Independent Task: The National Grid

1) The diagram below shows the structure of the National Grid. Fill in the boxes.



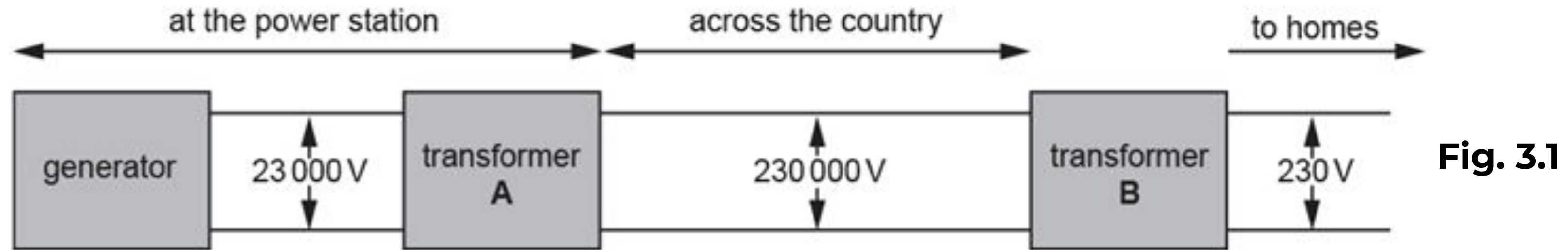
1) Add the potential difference at each stage on the lines above.



Worked Example - Examination Question

The generator in a power station is connected to the National Grid through a transformer. Near a town, other transformers are used to transfer power into homes.

Fig. 3.1 is a simplified diagram showing just one transformer near the homes.



All power stations use step-up transformers like transformer A between the generator and the National Grid power cables. Explain how using 230 000 V instead of 23 000 V for the cables across the country makes energy transfer more efficient.

Answers as discussed in the next slide have not been seen or verified by OCR.

OCR, Twenty First Century Physics B, Paper J259/02, June 2018



Worked Example - Examination Question

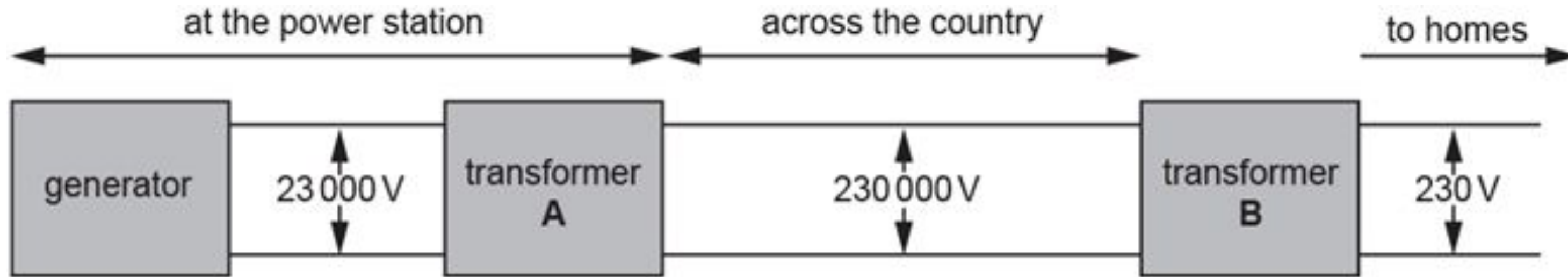


Fig. 3.1

All power stations use step-up transformers like transformer A between the generator and the National Grid power cables. Explain how using $230\,000\text{ V}$ instead of $23\,000\text{ V}$ for the cables across the country makes energy transfer more efficient. **[2]**



Independent Task: Energy Transfer in the National Grid

The potential difference across National Grid power cables is 400,000 V.

Explain why it is important to distribute electricity through power cables at a high potential difference.

When the potential difference is high, the current is

This means that the energy wasted due ...



Independent Task: Underground and overhead cables.

- 1) Write a list of advantages of underground cables.
- 2) Write a list of advantages of overhead cables.
- 3) Write at least one disadvantages of underground cables.
- 4) Write at least one disadvantage of overhead cables.

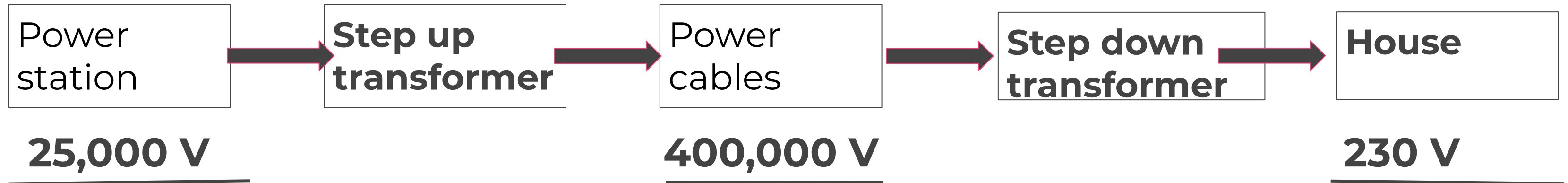


Answers



Review - Independent Task: The National Grid

1) The diagram below shows the structure of the National Grid. Fill in the boxes.



1) Add the potential difference at each stage on the lines above.



Review - Independent Task: Energy Transfer in the National Grid

The potential difference across National Grid power cables is 400,000 V.

Explain why it is important to distribute electricity through power cables at a high potential difference.

*When the potential difference is high, the current is **low**.*

*This means that the energy wasted due to **heating the wires, is reduced**. With a **low current** this **energy loss** is as **low** as possible.*



Review - Independent Task: Underground and overhead cables.

1) Write a list of advantages of underground cables.

They are: cheaper and easier to fix.

1) Write a list of advantages of overhead cables.

They are: less of an eyesore, they are out of the way, they aren't damaged by bad weather, and they aren't a danger to aircraft.

1) Write at least one disadvantages of underground cables. They are expensive and they are difficult to fix.

2) Write at least one disadvantage of overhead cables. They could be damaged by bad weather, they look unsightly and they could be a danger to aircraft.

