Physics 4 Topic 6: Magnetic Fields

Extended Writing Task: **Transformers**

Discuss the principles involved in high voltage transmission systems such as the National Grid. Your discussion should consider:

* A description of a basic transformer
* An explanation of how a transformer is used to increase or decrease the voltage and why a.c. is used in preference to d.c.
* The causes of energy losses in a transformer with a description and explanation of how these energy losses are minimised by suitable design or choice of materials.

Continue this task on lined paper and attach it behind this sheet.

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Physics 4 Topic 6: Magnetic Fields Extended Writing Task: **Transformers**

This work was done by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and was marked by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| P | **Praise. What were the positive aspects of the work? What did they do well? What skills did they demonstrate?** |
|  |
| I | **Improvements. What were the literacy issues in the piece of work?** | *Write in ink.*  |  | *Draw in Pencil.* |  | *Use a ruler.* |  |
| Always use capital letters at the beginning of a sentence. |  | Learn the spellings identified in your work. |  |
| Always use capital letters for proper nouns. |  | Ensure sentences make sense. |  |
| Make sure you write on the line and not above or below it. |  | Use correct punctuation. |  |
| Use scientific vocabulary appropriate to the task. |  | Vary your sentences to demonstrate your understanding. |  |
|  |
| **D answer** | **B answer** | **A\* answer** |
| A transformer is described as a **\*** core with **#** wire wrapped around both sides...*This could be in the form of a labelled diagram*. |  | ...the side with the input (voltage) is called the primary **$** and the side with the output (voltage) is called the secondary **$**. |  | There is a high level of detail in the description or diagram of a transformer:**\*** (typically) iron **#** insulated **$** coil |  |
| To increase the voltage there will be more turns (of wire) on the secondary coil. To decrease the voltage there will be more turns on the primary. |  | The current flowing in the primary coil will generate a magnetic field that will cut through the secondary coil (causing a flux linkage)... |  | ...more turns means more flux (linkage). |  |
| ...the size of the emf/voltage induced is equal to the rate of change of flux linkage. |  |
| Transformers do no work with d.c. so they need to be connected to an a.c. supply, |  | A d.c.(in the primary coil) will set up a constant magnetic field that will not keep cutting through the secondary coil, (hence no emf is induced). |  | A d.c. in the primary coil will set up a constant magnetic field so the (rate of) change of flux linkage will be zero, hence no emf induced (owtte). |  |
| Two causes of energy losses are stated. |  | Three causes of energy loss are stated. |  | Four causes of energy loss are stated. |  |
| A description of how to reduce each (stated) energy loss is given. |  | A description of how to reduce each energy loss is given with at least one of these explained. |  | A description of how to reduce each energy loss is given with an explanation. At least 3 needed. |  |
| Heating of the coils(due to current) – use low resistance wires such as thick copper to reduce the heating effect of the current and so reduce the energy lost.Eddy currents (induced in the core and heat it) – laminate the core (use insulated sections) instead of a continuous solid so current cannot flow and heat the core.Magnetising (& demagnetising) the core – use a material that is magnetically soft (or easily magnetised/demagnetised) such as iron so less energy is lost in the core (as heat).Magnetic loses (flux from primary not cutting secondary) – design the transformer with the coils close together or on top of each other so less flux is lost/more cuts secondary. |
| N | **Next Steps. How can they move their work onto the next grade? What didn’t they include?** | **Grade** | **Effort** |
|  |  |  |