

OCR A Physics A-Level

PAG 11.1

Techniques and procedures used to investigate transformers



Equipment

- 2 C cores (laminated iron cores in a C shape)
- Wire
- Low voltage AC supply
- 2 voltmeters
- 2 ammeters
- Variable resistor

Method

1. Put the 2 C cores together and wrap 5 turns round the primary coil and 10 round the secondary for a 1:2 ratio.
2. Connect a voltmeter across both coils and also connect the primary coil to the low voltage AC supply.
3. Turn on the AC supply and record the voltage across each coil.
4. Keeping the same AC supply repeat the experiment with different turns ratios.
5. Now to investigate the relationship between current and voltage for the number of turns of coil, add a variable resistor to the primary coil circuit and an ammeter to both circuits.
6. Keeping the number of turns constant, turn on the power supply and record the voltages and output current for a range of input currents determined by the variable resistor.

Calculations

- For the turn ratios, divide the number of turns on the secondary coil (N_s) by the number on the primary (N_p).
- Calculate the ratio in voltage across the secondary coil (V_s) to voltage across the primary (V_p).
- You should find that $N_s/N_p = V_s/V_p$.
- For the current investigation you should find that $N_s/N_p = V_s/V_p = I_p/I_s$.
- The efficiency (e) of the transformer can be found using the circuit with ammeters by the formula $e = I_s V_s / I_p V_p$.

Safety

- As transformers increase voltage use a low input voltage to keep it at a safe level.

Notes

- The formulas won't quite work as the transformer is not 100% efficient, to increase the efficiency of the transformer:
 - Use a laminated core to reduce the energy loss by eddy currents.
 - Use low resistance thick copper wire for the coils.
 - Use a magnetically soft material so less energy is needed to magnetise and demagnetise the core.
 - To increase the amount of magnetic flux generated by the primary coil that cuts through the secondary, put the coils close together.

