

Rms values, transformers and power lines

Physics grades 11-12 (A Level · IB · Class 11-12) · Lab answers

The sample data show V_s proportional to N_s , with a gradient slightly below the ideal value because of losses. Your readings will differ, but they should again be directly proportional to the number of secondary turns.

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Question 1 Plotting

The four points lie on a straight line through the origin, so **V_s is proportional to N_s** .

Question 2 Gradient

gradient = $\Sigma NV / \Sigma N^2 = \mathbf{0.0232 \text{ V per turn}}$ (23.2 mV per turn).

Question 3 Ideal gradient

Ideal gradient = $V_p / N_p = 6.0 / 240 = \mathbf{0.0250 \text{ V per turn}}$. The measured gradient is 93 % of this.

Question 4 Energy losses

Flux leakage (not all flux from the primary links the secondary), eddy currents in the core and resistance of the coils. **Each makes the secondary emf smaller than predicted.**

Question 5 Why ac?

A dc supply gives a constant flux, so $\Delta\Phi/\Delta t = 0$ and the secondary voltage is **zero** apart from a brief pulse at switch-on.

Question 6 Uncertainty

$0.1 / 1.4 = \mathbf{7 \text{ \%}}$, the largest uncertainty. Use a higher input voltage, or a voltmeter with finer resolution, to make readings larger.