

Quiz 22.2a

An AC adapter for an electronic device uses a step-down transformer to reduce the input voltage from 120 Volts (rms) to some smaller value of voltage for the laptop. The input voltage goes into the primary coil of a step-down transformer. We use an ammeter to measure the current traveling from the transformer into the laptop and find it to be 0.75 Amps (rms)

We also measure the power supplied to the laptop by the transformer to be 4.5 Watts.

- a) Determine the input current (rms) going into the transformer.
- b) Determine the number of turns in the secondary coil of the transformer.
- c) If the number of turns in the secondary coil were smaller, would the current supplied to the laptop be larger or smaller? Justify your answer mathematically or qualitatively.

$$I_2 \mathcal{E}_2 = 4.5 \quad \Rightarrow \quad \mathcal{E}_2 = \frac{4.5}{0.75} = 6.0 \text{ Volts}$$

$$b) \quad \frac{\mathcal{E}_2}{\mathcal{E}_1} = \frac{N_2}{N_1} \quad \Rightarrow \quad \frac{6}{120} = \frac{N_2}{860} \quad \Rightarrow \quad \boxed{N_2 = 43 \text{ turns}}$$

$$a) \quad I_1 \mathcal{E}_1 = I_2 \mathcal{E}_2 = 4.5$$

$$I_1 = \frac{4.5}{120} = \boxed{0.038 \text{ A}}$$

$$c) \quad \text{If } N_2 \downarrow, \mathcal{E}_2 \downarrow, \text{ so } \boxed{I_2 \uparrow}$$

since $I_2 \mathcal{E}_2 = \text{constant}$