

Transformer problem Solution:

A portable x-ray unit plugs into a wall socket (120 volts). It requires 100 kVs to operate the X-ray tube. If the transformer's primary has 50 winds in it and draws 10.0 amps when in use:

a.) Is this a step-up or step-down transformer?

What determine the kind of transformer is what the voltage is doing in the secondary coil, versus in the primary. In this case, the voltage coming out in the secondary is higher than the voltage coming in in the primary (100 kV versus 120 V), so the voltage is being stepped up and it's a *step-up transformer*.

b.) What is the number of winds in the secondary?

$$\frac{N_s}{N_p} = \frac{\epsilon_s}{\epsilon_p}, \text{ so } \frac{N_s}{50} = \frac{100 \times 10^3}{120} \Rightarrow N_s = 41667$$

c.) Determine the current output of the secondary.

$$\frac{N_s}{N_p} = \frac{i_p}{i_s}, \text{ so } \frac{41667}{50} = \frac{10}{i_s} \Rightarrow i_s = .012 \text{ A}$$