Answer on Question#55890 - Physics - Electromagnetism

An air-cored transformer is assumed to be 100% efficient. The ratio of the secondary turns N_S to the primary turns N_P is 1:20. A $V_P = 240V$ ac supply is connected to the primary coil and a $R = 6\Omega$ load is connected to the secondary coil. What is the current in the primary coil?

0.10A

0.14A

2.0A

40.0A

Solution:

According to the ideal transformer identity

$$\frac{V_S}{V_P} = \frac{I_P}{I_S} = \frac{N_S}{N_P}$$

Therefore

$$V_S = \frac{N_S}{N_P}V_P = \frac{1}{20}240V = 12V$$

The current in the primary coil is

$$I_S = \frac{V_S}{R} = \frac{12V}{6\Omega} = 2A$$

The current in the primary coil

$$I_P = \frac{N_S}{N_P}I_S = \frac{1}{20}2A = 0.1A$$

Answer: 0.10A.