

Q- A high intensity desk lamp uses a bulb rated 40W but requires only 12V. It contains a transformer that converts 120V household voltages.

a) Is the transformer step-up or step-down?

As the potential difference is reduced by the transformer hence it is a step down transformer.

b) What is the current in the secondary when the lamp is switched on?

The current in the lamp is given by $I = P/V = 40/12 = 3.33 \text{ A}$

Hence the current in the secondary of the transformer is also 3.33 A

c) What is the current in the primary when the lamp is switched on?

For an ideal transformer the power is not lost hence the power in primary and secondary are equal. So we have

$$V_p * I_p = V_s * I_s$$

Or $120 * I_p = 12 * 3.33$

Gives $I_p = 0.333 \text{ A}$

d) What is the resistance of the bulb?

The resistance of the bulb will be $R = V/I = 12/3.33 = 3.6 \Omega$