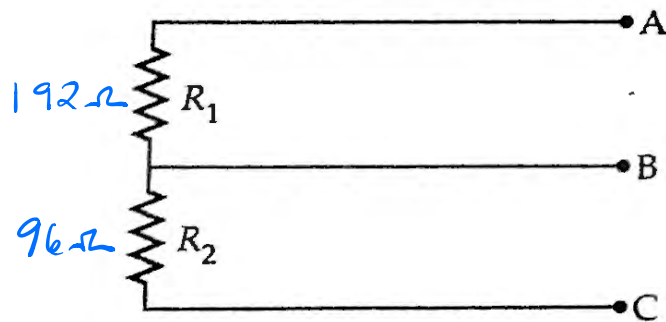
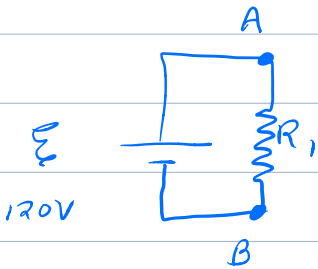


106. •• **A Three-Way Lightbulb** A three-way lightbulb has two filaments with resistances R_1 and R_2 connected in series. The resistors are connected to three terminals, as indicated in **Figure 21-49**, and the light switch determines which two of the three terminals are connected to a potential difference of 120 V at any given time. When terminals A and B are connected to 120 V the bulb uses 75.0 W of power. When terminals A and C are connected to 120 V the bulb uses 50.0 W of power. (a) What is the resistance R_1 ? (b) What is the resistance R_2 ? (c) How much power does the bulb use when 120 V is connected to terminals B and C?

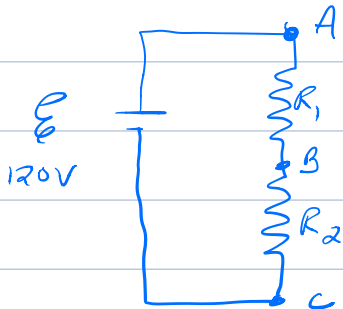


▲ **FIGURE 21-49** Problem 106



$$P_{AB} = 75.0\text{W} = \frac{E^2}{R_1}$$

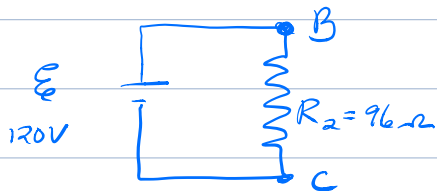
$$R_1 = \frac{E^2}{75.0\text{W}} = \frac{(120\text{V})^2}{75.0\text{W}} = \boxed{192\ \Omega}$$



$$P_{AC} = 50.0\text{W} = \frac{E^2}{R_1 + R_2}$$

$$R_1 + R_2 = \frac{E^2}{50.0\text{W}} = \frac{(120\text{V})^2}{50.0\text{W}} = 288\ \Omega$$

$$R_2 = 288\ \Omega - R_1 = 288\ \Omega - 192\ \Omega = \boxed{96\ \Omega}$$



$$P_{BC} = \frac{E^2}{R_2} = \frac{(120\text{V})^2}{96\ \Omega} = \boxed{150\text{W}}$$