

31.21. Model: Assume ideal connecting wires and an ideal battery.

Solve: As shown in Figure Ex31.21, a potential difference of 5.0 V causes a current of 100 mA through the three series resistors. The situation is the same if we replace the three resistors with an equivalent resistor R_{eq} . That is, a potential difference of 5.0 V across R_{eq} causes a current of 100 mA through it. From Ohm's law,

$$R_{\text{eq}} = \frac{\Delta V_R}{I} \Rightarrow R + 15 \, \Omega + 10 \, \Omega = \frac{5.0 \, \text{V}}{100 \, \text{mA}} \Rightarrow R + 25 \, \Omega = 50 \, \Omega \Rightarrow R = 25 \, \Omega$$