## PRACTICE D

### Current in and Potential Difference Across a Resistor

Calculate the current in and potential difference across each of the resistors shown in the schematic diagram in **Figure 18.**

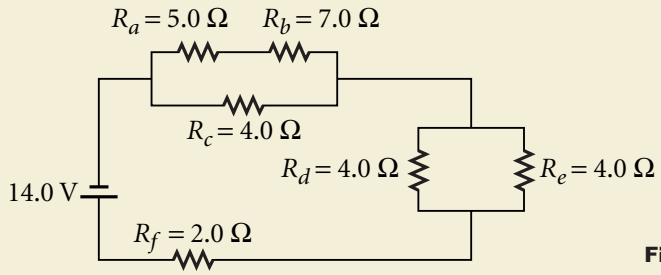



**Figure 18**

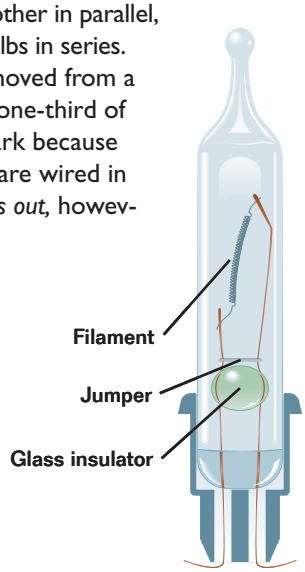
## Why it Matters

# Decorative Lights and Bulbs

Light sets arranged in series cannot remain lit if a bulb burns out. Wiring in parallel can eliminate this problem, but each bulb must then be able to withstand 120 V. To eliminate the drawbacks of either approach, modern light sets typically contain two or three sections connected to each other in parallel, each of which contains bulbs in series.

When one bulb is removed from a modern light set, half or one-third of the lights in the set go dark because the bulbs in that section are wired in series. When a bulb *burns out,* however, all of the other bulbs in the set remain lit. How is this possible?

Modern decorative bulbs have a short loop of insulated wire, called the *jumper,* that is wrapped around the wires connected to the filament, as shown at left. There is no current in the insulated wire when the bulb is functioning properly. When the filament breaks, however, the current in the section is zero and the potential difference across the two wires connected to the broken filament is then 120 V. This large potential difference creates a spark across the two wires that burns the insulation off the small loop of wire. Once that occurs, the small loop closes the circuit, and the other bulbs in the section remain lit.




Because the small loop in the burned-out bulb has very little resistance, the equivalent resistance of that portion of the light set decreases; its current increases. This increased current results in a slight increase in each bulb's brightness. As more bulbs burn out, the temperature in each bulb increases and can become a fire hazard; thus, bulbs should be replaced soon after burning out.