



**HW-6**  
**Electric Current**

**Table 27.1**

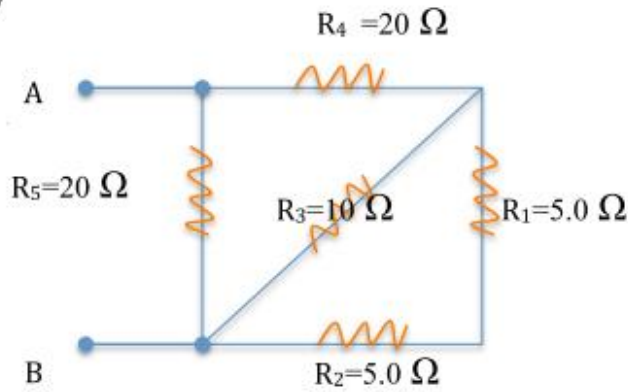
Resistivities and Temperature Coefficients of Resistivity for Various Materials		
Material	Resistivity <sup>a</sup> ( $\Omega \cdot \text{m}$ )	Temperature Coefficient <sup>b</sup> $\alpha[(^{\circ}\text{C})^{-1}]$
Silver	$1.59 \times 10^{-8}$	$3.8 \times 10^{-3}$
Copper	$1.7 \times 10^{-8}$	$3.9 \times 10^{-3}$
Gold	$2.44 \times 10^{-8}$	$3.4 \times 10^{-3}$
Aluminum	$2.82 \times 10^{-8}$	$3.9 \times 10^{-3}$
Tungsten	$5.6 \times 10^{-8}$	$4.5 \times 10^{-3}$
Iron	$10 \times 10^{-8}$	$5.0 \times 10^{-3}$
Platinum	$11 \times 10^{-8}$	$3.92 \times 10^{-3}$
Lead	$22 \times 10^{-8}$	$3.9 \times 10^{-3}$
Nichrome <sup>c</sup>	$1.50 \times 10^{-6}$	$0.4 \times 10^{-3}$
Carbon	$3.5 \times 10^{-5}$	$-0.5 \times 10^{-3}$
Germanium	0.46	$-48 \times 10^{-3}$
Silicon	640	$-75 \times 10^{-3}$
Glass	$10^{10}$ to $10^{14}$	
Hard rubber	$\sim 10^{13}$	
Sulfur	$10^{15}$	
Quartz (fused)	$75 \times 10^{16}$	

<sup>a</sup> All values at 20°C.


1. In a particular cathode ray tube, the measured beam current is  $30.0 \mu\text{A}$ . How many electrons strike the tube screen every 40.0 s?



1. Calculate the effective resistance between the points A and B in the figure below



$R_1=5\Omega$  ,  $R_2=5\Omega$ ,  $R_3=10\Omega$ ,  $R_4=20\Omega$ ,  $R_5=10\Omega$

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15.  A 0.900-V potential difference is maintained across a 1.50-m length of tungsten wire that has a cross-sectional area of  $0.600 \text{ mm}^2$ . What is the current in the wire?
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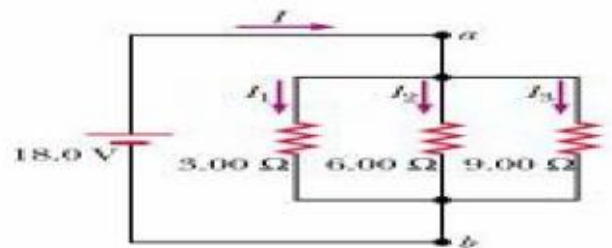
35. The temperature of a sample of tungsten is raised while a sample of copper is maintained at  $20.0^\circ\text{C}$ . At what temperature will the resistivity of the tungsten be four times that of the copper?
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41. Suppose that a voltage surge produces 140 V for a moment. By what percentage does the power output of a 120-V, 100-W lightbulb increase? Assume that its resistance does not change.
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- 51.** A certain toaster has a heating element made of Nichrome wire. When the toaster is first connected to a 120-V source (and the wire is at a temperature of  $20.0^{\circ}\text{C}$ ), the initial current is 1.80 A. However, the current begins to decrease as the heating element warms up. When the toaster reaches its final operating temperature, the current drops to 1.53 A. (a) Find the power delivered to the toaster when it is at its operating temperature. (b) What is the final temperature of the heating element?
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3. Three resistors are connected in parallel as show potential difference of 18.0V is maintained between  
(a). Find the current in each resistor.  
(b). Calculate the power delivered to each resistor.



2. A copper wire has a resistance of  $25\text{ m}\Omega$  at  $20^{\circ}\text{C}$ . When the wire is carrying a current, heat produced by the current causes the temperature of the wire to increase by  $27^{\circ}\text{C}$   
(a). Calculate the change in the wire's resistance.  
(b). If its original current was 10.0 mA and the potential difference across wire remains constant, what is its final current? (Given the temperature coefficient of resistivity for copper is  $6.80 \times 10^{-3}\text{ }^{\circ}\text{C}^{-1}$ ).
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- 47.** Assuming the cost of energy from the electric company is \$0.110/kWh, compute the cost per day of operating a lamp that draws a current of 1.70 A from a 110-V line.