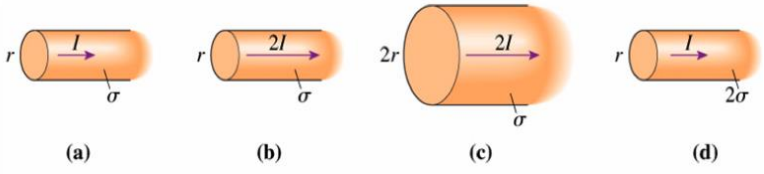
Name: _____ **Problems Solved __/ 10**

1. Rank in order, from largest to smallest, the current densities J_a to J_d in these four wires, which carry currents ranging from I to 2I.
   a. $J_b = J_d > J_a > J_c$
   b. $J_b > J_a > J_c > J_d$
   c. $J_b > J_a = J_d > J_c$
   d. $J_c > J_b > J_a > J_d$
   e. $J_c > J_b > J_a = J_d$



2. A wire carrying a current I has two equal length segments that have equal diameters. If the conductivities of the material in the two segments have a ratio $\sigma_1:\sigma_2$=2:1, what is the ratio $E_1:E_2$ of the electric field strengths in the two segments of the wire.
   a. $E_1:E_2$=4:1
   b. $E_1:E_2$=2:1
   c. $E_1:E_2$=1:1
   d. $E_1:E_2$=1:2
   e. $E_1:E_2$=1:4

3. What is the ratio of the change in potential $\Delta V_1:\Delta V_2$?
   a. $\Delta V_1: \Delta V_2$=4:1
   b. $\Delta V_1: \Delta V_2$ =2:1
   c. $\Delta V_1: \Delta V_2$=1:1
   d. $\Delta V_1: \Delta V_2$=1:2
   e. $\Delta V_1: \Delta V_2$=1:4

4. What is the ratio of the resistances $R_1:R_2$?
   a. $R_1: R_2$=4:1
   b. $R_1: R_2$ =2:1
   c. $R_1: R_2$=1:1
   d. $R_1: R_{22}$=1:2
   e. $R_1: R_2$=1:4

5. What is the ratio of the power dissipated in each segment P_1:P_2?
   a. P_1: P_2=4:1
   b. P_1: P_2 =2:1
   c. P_1: P_2=1:1
   d. P_1: P_2=1:2
   e. P_1: P_2=1:4

6. Two light bulbs operate on the same potential difference. Bulb A has four times the power output of bulb B. Which bulb has the greater current?
   a. Bulb A
   b. Bulb B
   c. Neither - they both have the same current

There is a potential difference of 2.5 V between opposite ends of a 6.0 m long iron wire.
Note: there is a table with resistivities in Wolfson.

a) Assuming a uniform electric field in the wire, what is the current density?
b) If the wire diameter is 1.0 mm, what is the total current?

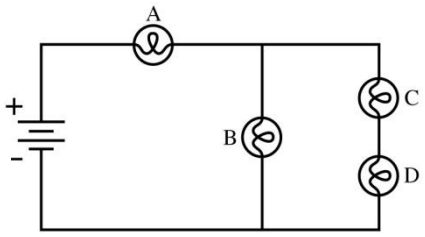
The maximum safe current in 12-gauge (1.2 mm diameter) copper wire is 20 A.
a) What is the maximum current density?
b) What is the maximum electric field?

Engineers call for a power line with a resistance per unit length of 50 mΩ/km.

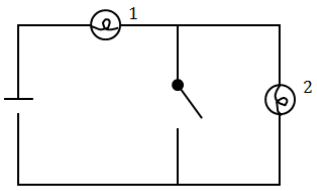
a) What wire diameter is required if the line is made of copper?
b) What wire diameter is required if the line is made of aluminum?
c) If the costs of copper and aluminum wire are $4.65/kg and $2.30/kg, respectively, which material is more economical? The densities of copper and aluminum are 8.9 g/cm^3 and 2.7 g/cm^3, respectively.

1. If a large resistor and a small resistor are connected in parallel, the equivalent resistance will be closer in value to that of the:
   a. large resistor
   b. small resistor
   c. Neither; it will be exactly between the two values
   d. None of the above

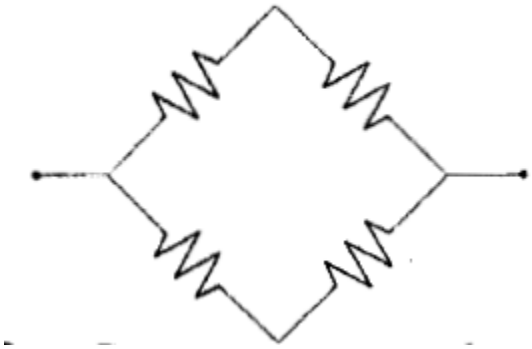
2. Refer to the diagram. When the switch is closed the total power dissipated in the circuit will:
   a. increase
   b. decrease
   c. remain the same
   d. None of the above

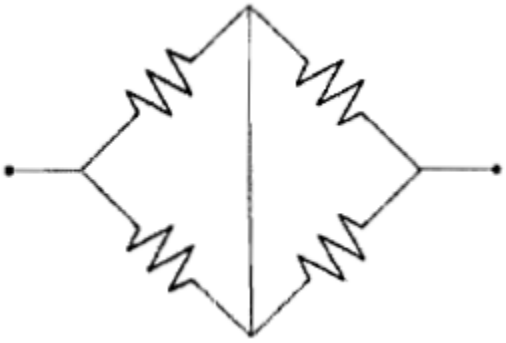


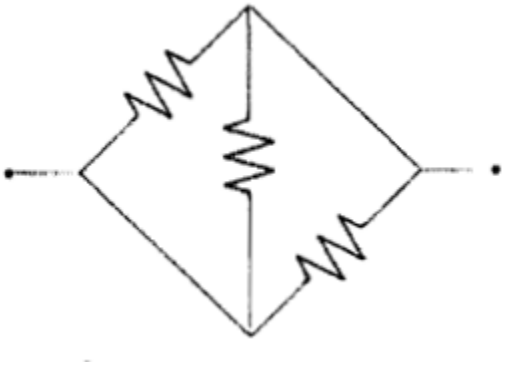
3. Rank in order, from brightest to dimmest, the identical bulbs A to D.
   a. A = B = C = D
   b. A > B > C = D
   c. A > C > B > D
   d. A > C = D > B
   e. C = D > B > A



Find the equivalent resistance of the following systems. All resistors have a resistance R.



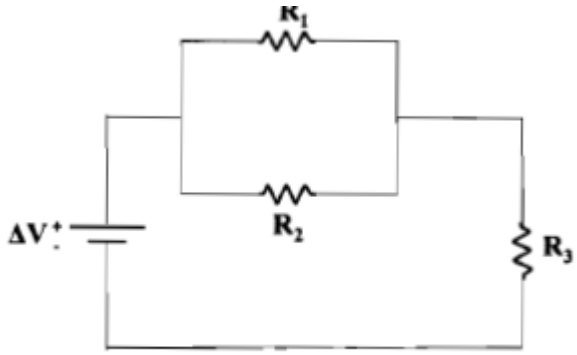




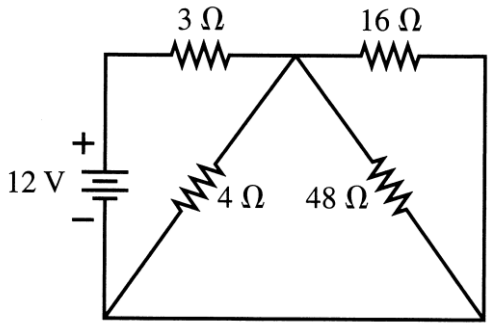
In this circuit, $R_1 = 1.0\ k\Omega$, $R_2 = 3.0\ k\Omega$ $R_3 = 2.0\ k\Omega$, and $\Delta V = 30\ V$

Find the:

a) Equivalent Resistance
b) Total Current delivered by the battery
c) Voltage across each resistor
d) Power dissipated by each resistor
e) Total power dissipated in the circuit.



For the circuit shown in the figure, find the current through and the potential difference across each resistor.



Wolfson, 25.37

Wolfson 25.42