

CHAPTER 12 PRACTICE QUESTIONS

Directions: Complete the following problems as specified by each question, and then check your work using the solutions that follow. For extended, step-by-step solutions, access your Student Tools online.

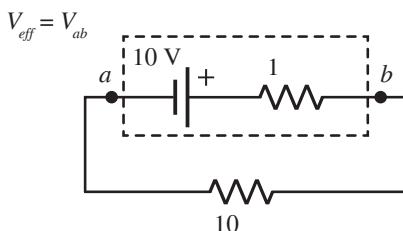
1. You have two cylindrical pieces of copper. One is short and fat while the other is long and thin. Which piece of copper has a higher resistivity? Which piece has a higher resistance?

2. You set up an experiment to measure the amount of charge entering a piece of copper in a certain amount of time. The copper is cylindrical with a radius of 2 cm and a length of 10 cm. You measure that 5 C of charge enters the piece of copper in 2 s. Answer the following questions. Note that the resistivity of copper is $1.68 \times 10^{-8} \Omega \cdot \text{m}$.

- (a) What is the current through this piece of copper?
- (b) What is the resistance of this piece of copper?
- (c) What is the voltage across this piece of copper?
- (d) What is the electric field within this piece of copper?

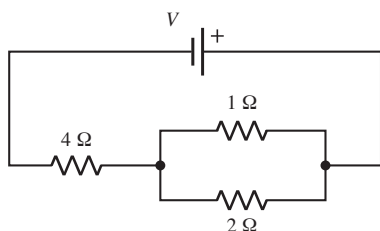
3. A resistor is connected to a battery by conductive wiring, forming a circuit. If the battery's voltage is 5 V, and it produces a current of 3 A, what is the resistance in the circuit?

4. A 10Ω resistor is connected to a battery with an internal resistance of 1Ω . If the idealized voltage of the battery is 10 V, what is the effective voltage of the battery? This situation is diagrammed in the following figure.

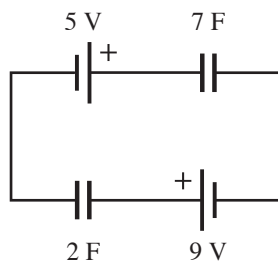


5. A 10Ω resistor is connected to a 5 V battery. What is the change in potential energy that an electron passing through the resistor undergoes? Note that the charge of an electron is $-1.6 \times 10^{-19} \text{ C}$.
6. An incandescent bulb is about 10% efficient, meaning about 90% of the energy dissipated by it is dissipated as heat and only about 10% as light. If you can treat a light bulb as a simple resistor connected to your outlet (which is at 120 V), what resistance of the light bulb is needed to produce 100 W of light?

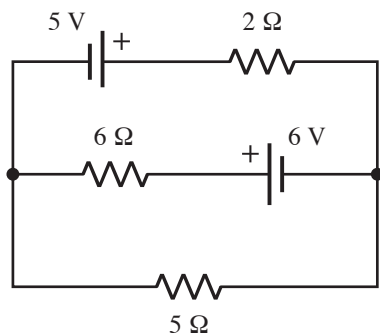
7. What is the voltage of the battery in the following circuit if the current through the $2\ \Omega$ resistor is 1 A ?



9. What is the charge on each capacitor in the following circuit?



8. What is the current through the $5\ \Omega$ resistor in the following circuit?



10. A 9 F capacitor and $20\ \Omega$ resistor are connected in series to a 5 V battery, that has an open switch in the circuit. If the battery is initially uncharged, how long after the switch is closed does it take the current to drop by 50%?