

kirchhoff's laws - practice problems

1. A small sensor circuit has one side of a resistor at 9.0 V and the other side at 4.0 V. What is the potential difference across the resistor?
2. A battery raises charge from 0.0 V to 12.0 V. What potential difference does the battery provide?
3. A loop has a 9.0 V battery and three voltage changes around the loop. Two resistor drops are -2.0 V and -3.5 V. What must the third voltage change be?
4. At a junction in a model train layout, 2.4 A flows in. Current leaves along three branches. Two branches carry 0.80 A and 0.60 A. How much current leaves in the third branch?
5. Two wires bring current into a junction. One wire brings in 0.50 A. Two wires leave the junction with currents of 1.2 A and 0.70 A. What current must come in through the second incoming wire?

6. A circuit loop has a 9.0 V battery and two resistors labeled $100\ \Omega$ and $220\ \Omega$. What is the current in the $220\ \Omega$ resistor?
7. Three resistors are connected in series: $120\ \Omega$, $330\ \Omega$, and $470\ \Omega$. What is the equivalent resistance?
8. A repair kit has three resistors in series: $1.5\ \text{k}\Omega$, $680\ \Omega$, and $2.2\ \text{k}\Omega$. What is the equivalent resistance in $\text{k}\Omega$?
9. Two resistors, $300\ \Omega$ and $600\ \Omega$, are connected in parallel. What is their equivalent resistance?
10. A dashboard light circuit uses a $4.0\ \text{k}\Omega$ resistor in parallel with a $12\ \text{k}\Omega$ resistor. What is the equivalent resistance?

11. Three identical $150\ \Omega$ resistors are connected in parallel for a small lab demonstration. What is their equivalent resistance?

12. A 12 V battery powers three series resistors: $100\ \Omega$, $200\ \Omega$, and $300\ \Omega$. What is the circuit current, and what is the voltage across the $200\ \Omega$ resistor?

13. A 12 V power supply is connected across two parallel branches. One branch has a $2.0\ \text{k}\Omega$ resistor, and the other has a $3.0\ \text{k}\Omega$ resistor. What is the total current from the supply?

14. Two parallel branches are connected across a 9.0 V battery. One branch has a $1.0\ \text{k}\Omega$ resistor. The total current from the battery is 15 mA. What resistance is in the second branch?

15. A 10 V supply is connected to a $200\ \Omega$ resistor in series with a parallel pair of two $600\ \Omega$ resistors. What is the total current from the supply?

16. A portable speaker uses a 6.0 V battery and draws 0.030 A through its circuit. What power does the battery provide?

17. A 24 V supply powers a series circuit with three resistors: 150 Ω , 250 Ω , and 800 Ω . What is the current, and what voltage drop occurs across the 800 Ω resistor?

18. A lighting control board has three parallel indicator branches connected to a 5.0 V supply. The branch currents are 12 mA, 8.0 mA, and 5.0 mA. What total current leaves the supply?

19. A 9.0 V battery is connected to a 1.0 k Ω resistor in series with a parallel section. The parallel section has a 2.0 k Ω resistor and a 3.0 k Ω resistor. What is the total current?

20. In a parallel circuit, why can the current split into different amounts while each branch still has the same voltage across it?