

## electricity - practice problems

1. Electrons drift to the right through a wire. Which way is the conventional current?
2. A small sensor wire in a greenhouse monitor is sending data from a humidity probe. The probe checks the air every 10 seconds, but that timing is not needed here. If 3.6 C of charge passes through the wire in 2.0 minutes, what is the current?
3. During a brief pulse in a doorbell circuit, 0.480 C passes one point in 25 ms. The button cap is about 2.0 cm wide, but the current depends on charge and time. What current flows during the pulse?
4. A light turns on almost instantly when a switch is closed, but electrons drift through the wire slowly. How can both statements be true?

5. A 1.0 m phone cable carries 250 mA for 30 s while a phone first starts charging. How much charge passes one point in the cable?

6. A small motor spins a plastic fan with 7 blades. During one test, 18 C of charge passes through the motor while the current is 0.75 A. How long does the motor run?

7. About  $2.5 \times 10^{15}$  electrons pass one point in a wire in 0.20 s. What is the magnitude of the conventional current?

8. A calculator draws 0.80 mA while showing an 8-digit answer on its display. About how many electrons pass one point each second?

9. A battery is connected to a wire, but the wire is broken at one point. Can there still be voltage across the break? Can there be steady current around the circuit?

10. A 9.0 V battery is connected across a  $330\ \Omega$  resistor on a breadboard. The jumper wires are different colors, but assume they are ideal. What current flows through the resistor?

11. A small lamp uses 20 mA from a 1.5 V battery. What is the lamp's resistance?

12. A current of 18 mA flows through a  $470\ \Omega$  resistor. What voltage is across the resistor?

13. An indicator light needs 3.0 mA when it has 9.0 V across it. What resistance would give that current?

14. A  $220\ \Omega$  resistor is connected to a battery for 5.0 s. What current flows through it?

15. A sensor should have 2.5 mA of current when 5.0 V is across it. What resistance should the sensor have?

16. A low-current display mounted behind a 4 cm window has 3.3 V across it and draws 0.40 mA. What is its resistance?

17. A resistor stays the same. What happens to the current if the voltage across it doubles? What happens if the voltage stays the same but the resistance doubles?

18. A portable radio uses a 12 V battery pack connected across a  $680\ \Omega$  test resistor for 3.0 minutes. The battery pack holds eight small cells, but treat the voltage as 12 V. How much charge passes through the resistor?

19. A 5.0 V source is across a  $1.5\ \text{k}\Omega$  resistor for 10 minutes. How much charge passes through the resistor?

20. A  $2.2\ \text{k}\Omega$  resistor has a current of 1.2 mA. What voltage is across it, and how much charge passes in 45 s?

21. An unknown resistor has 6.0 V across it and 0.015 A through it. What is the resistance?

22. A toy motor draws 0.60 A from a 3.0 V battery while lifting a small paper flag. What is its effective resistance while running?

23. A wire carries 75 mA for 2.0 minutes while a small display warms up and its brightness settles. The display has 12 tiny segments, but only the current and time matter here. How much charge passes one point in the wire?

24. A 24 V source is connected across a resistor. In 15 s, 1.8 C of charge passes through the resistor. What is the resistance?

25. A resistor should allow 0.050 C to pass in 2.0 s when connected to a 6.0 V source. What resistance is needed?