

## Electrical Energy and Current

**Problem D****RESISTANCE****PROBLEM**

A medical belt pack with a portable laser for in-the-field medical purposes has been constructed. The laser draws a current of 2.5 A and the circuitry resistance is  $0.6 \Omega$ . What is the potential difference across the laser?

**SOLUTION**

**Given:**  $I = 2.5 \text{ A}$        $R = 0.6 \Omega$

**Unknown:**  $\Delta V = ?$

Use the definition of resistance.

$$\Delta V = IR = (2.5 \text{ A})(0.6 \Omega) = 1.5 \text{ V}$$

**ADDITIONAL PRACTICE**

1. Electric eels, found in South America, can provide a potential difference of 440 V that draws a current of 0.80 A through the eel's prey. Calculate the resistance of the circuit (the eel and prey).
2. It is claimed that a certain camcorder battery can provide a potential difference of 9.60 V and a current of 1.50 A. What is the resistance through which the battery must be discharged?
3. A prototype electric car is powered by a 312 V battery pack. What is the resistance of the motor circuit when  $2.8 \times 10^5 \text{ C}$  passes through the circuit in 1.00 h?
4. In 1992, engineers built a 2.5 mm long electric motor that can be driven by a very low emf. What is the potential difference if it draws a 3.8 A current through a  $0.64 \Omega$  resistor?
5. A team from Texas A&M University has built an electric sports car with a maximum motor current of  $2.4 \times 10^3 \text{ A}$ . Determine the potential difference that provides this current if the circuit resistance is  $0.30 \Omega$ .
6. Stanford University scientists have constructed the Orbiting Picosatellite Automated Launcher (OPAL). OPAL can launch disposable "picosatellites" the size of hockey pucks. Each picosatellite will be powered by a 3.0 V battery for about an hour. If the satellite's circuitry were to have a resistance of  $16 \Omega$ , what current would be drawn by the satellite?
7. For years, California has been striving for all zero-emission vehicles on its roads. In 1995, a street bus with a range of 120 km was built. This bus is powered by batteries delivering  $6.00 \times 10^2 \text{ V}$ . If the circuit resistance is  $4.4 \Omega$ , what is the current in the bus's circuit?