Potential difference across a load equals the terminal voltage

When charges move within a battery from one terminal to the other, the chemical energy of the battery is converted to the electrical potential energy of the charges. As charges move through the circuit, their electrical potential energy is converted to other forms of energy. For instance, when the load is a resistor, the electrical potential energy of the charges is converted to the internal energy of the resistor and dissipated as thermal energy and light energy.

Because energy is conserved, the energy gained and the energy lost must be equal for one complete trip around the circuit (starting and ending at the same place). Thus, the electrical potential energy gained in the battery must equal the energy dissipated by the load. Because the potential difference is the measurement of potential energy per amount of charge, the potential increase across the battery must equal the potential decrease across the load.

SECTION REVIEW

1. Identify the types of elements in the schematic diagram illustrated in **Figure 4** and the number of each type.

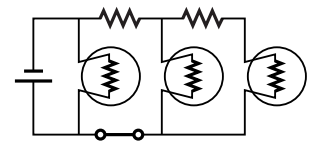

Figure 4

2. Using the symbols listed in **Table 1,** draw a schematic diagram of a working circuit that contains two resistors, an emf source, and a closed switch.

3. In which of the circuits pictured below will there be no current?

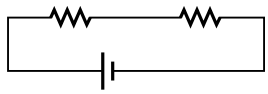

Figure 5

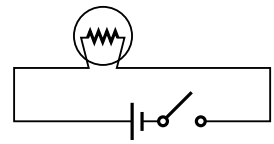

Figure 6

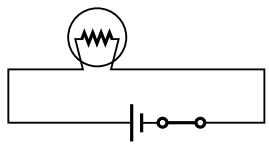

Figure 7

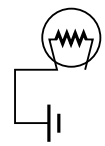

Figure 8

4. If the potential difference across the bulb in a certain flashlight is 3.0 V, what is the potential difference across the combination of batteries used to power it?

5. **Critical Thinking** In what forms is the electrical energy that is supplied to a string of decorative lights dissipated?