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内容概要

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章节摘录

版权页： 插图： are electrically charged particles. Consider the situation in Figure 3.9, where wires from the two terminals of a battery are placed in a solution containing dissolved NaCl. Remember, opposite charges attract and like charges repel. Consequently, there will be a net movement of Na+ toward the negative terminal （the cathode） and of Cl- toward the positive terminal （the anode）. The movement of electrical charge is called electrical current, represented by the symbol I and measured in units called amperes （amps）. According to the convention established by Benjamin Franklin, current is defined as being positive in the direction of positive-charge movement. In this example, therefore, positive current flows in the direction of Na+ovement,from the anode to the cathode. Two important factors determine how much current will flow: electrical potential and electrical conductance. Electrical potential, also called voltage, is the force exerted on a charged particle, and it reflects the difference in charge between the anode and the cathode. More current will flow as this difference is increased. Voltage is represented by the symbol V and is measured in units called volts. As an example, the difference in electrical potential between the terminals of a car battery is 12 volts; that is, the electrical potential at one terminal is 12 volts more positive than that at the other. Electrical conductance is the relative ability of an electrical charge to migrate from one point to another. It is represented by the symbolg and measured in units called siemens （S）. Conductance depends on the number of particles available to carry electrical charge and the ease with which these particles can travel through space. A term that expresses the same property in a different way is electrical resistance, the relative inability of an electrical charge to migrate. It is represented by the symbol R and measured in units called ohms （Ω）. Resistance is simply the inverse of conductance （i.e., R = l/g）. There is a simple relationship between potential （V）, conductance （g）,and the amount of current （I） that will flow. This relationship, known as Ohm's law, may be written I = gV: Current is the product of the conductance and the potential difference. Notice that if the conductance is zero, no current will flow even when the potential difference is very large. Likewise, when the potential difference is zero, no current will flow even when the conductance is very large. Consider the situation illustrated in Figure 3.10a, in which NaCl has been dissolved in equal concentrations on either side of a phospholipid bilayer. If we drop wires from the two terminals of a battery into the solution on either side, we will generate a large potential difference across this membrane. No current will flow, however, because there are no channels to allow migration of Na+ and Cl- across the membrane; the conductance of the membrane is zero. Driving an ion across the membrane electrically, therefore, requires that （1） the membrane possesses channels permeable to thation, and （2） there is an electrical potential difference across the membrane （Figure 3.10b）.

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