Saladin 7e
Answer Key
Chapter 12, Nervous Tissue

Testing Your Comprehension

1. Dopamine is an inhibitory neurotransmitter that suppresses unwanted muscle contractions and contributes to smoother, more coordinated muscular action. Parkinson disease involves a dopamine deficiency. By blocking dopamine receptors, chlorpromazine prevents dopamine from acting and sometimes producing the same effects as a dopamine deficiency.

2. Such a change in the K^+ gradient across the plasma membrane results in less net diffusion of K^+ out of neurons. The K^+ concentration in the cytoplasm increases, partially depolarizing the membrane and making neurons more excitable. (Paradoxically, hyperkalemia can also make them *less* excitable, depending on how rapidly the hyperkalemia develops, but this is not discussed until chapter 24 and would not normally be known to students studying chapter 13.)

3. Because the Na^+–K^+ pump removes three positive charges from the cell for every two it brings in, it contributes to the negative membrane potential. If the activity of the Na^+–K^+ pumps was reduced, ion leakage would make the plasma membrane less polarized and more excitable.

4. One reason for unidirectional transmission across synapses is that only the presynaptic neuron has synaptic vesicles and releases neurotransmitters, and another is that only the postsynaptic neuron has neurotransmitter receptors that can produce cellular excitation (discounting receptors in the presynaptic cell for neurotransmitter reuptake). If these structural differences did not exist and signals traveled in both directions, as happens in some simple animals such as hydras, the behavioral responses to stimuli would be much less specific or precise. Signals would spread randomly through the nervous system and effectors everywhere would respond to a sufficiently strong stimulus anywhere.

5. The production of action potentials involves Na^+ inflow into a neuron through these voltage-gated Na^+ channels. If these channels were inhibited, then no action potentials and no nerve signals could occur, so tissue damage would not trigger the conduction of pain signals in a nerve.