Saladin 7E
Answer Key
Chapter 15, The Autonomic Nervous System and Visceral Reflexes

Testing Your Comprehension

1. Vapors from the onion irritate nerve endings at the surface of the eye. Signals are conducted through the ophthalmic division of the trigeminal nerve to the pons, then back through the facial nerve to the tear glands.
2. Assuming that the growling dog instilled fear in you, this would act through the limbic system and hypothalamus to activate the sympathetic fight-or-flight response. The sympathetic nervous system would tend to stimulate epinephrine secretion, dilate your pupils and respiratory passages, dilate your coronary arteries and speed up your heart, cause your hair to stand on end, cause a dry mouth, increase blood flow to your skeletal muscles, promote glycogen breakdown and glucose mobilization, and inhibit digestive and urinary function.
3. Vagal (parasympathetic) tone would predominate and the heart would beat more slowly than normal, a condition called bradycardia. In emergency situations, the heart would not speed up as it normally does, and the lack of increased circulation would compromise one's tolerance of physical exertion and reaction to stress.
4. In a fight-or-flight situation, such as a disagreement with another wolf in the pack, the sympathetic nervous system would cause the hair to fluff up and make the wolf look larger and more intimidating to its adversaries. In cold weather, the sympathetic piloerection response would also help to retain warm air near the skin. In humans, the response causes limited piloerection (as when the hair on the back of your neck stands up or your scalp tingles), but mostly this just causes goose bumps.
5. High levels of atropine can cause paralysis of organs that depend on cholinergic stimulation by blocking the muscarinic receptors for ACh. Thus it would strongly inhibit intestinal motility and tend to cause constipation rather than the reverse situation, diarrhea. Some effects of ACh are to constrict the pupils, promote sweating, depress the heart rate, and cause contraction and emptying of the bladder. Since atropine blocks these cholinergic effects, atropine poisoning is marked by pupillary dilation, dry skin, an elevated heart rate, and urine retention. Physostigmine does not remove atropine from the synapses, but it does prolong the effect of ACh by inhibiting its breakdown by acetylcholinesterase. Thus, those muscarinic receptors that are not blocked by atropine are more strongly stimulated by ACh.