Saladin 7E
Answer Key
Chapter 17, The Endocrine System

Testing Your Comprehension

1. One steroid hormone molecule activates gene transcription and the synthesis of multiple molecules of mRNA mirroring that gene locus. Each mRNA is translated by many ribosomes and therefore results in the synthesis of many enzyme molecules. Each enzyme molecule may catalyze the same chemical reaction millions of times. Therefore, millions of molecules of a metabolic product may be produced in response to a single molecule of a steroid hormone. The diagrammatic answer to this question should resemble figure 17.22 with the levels, from top down, labeled something like steroid, mRNA, enzyme, enzyme (or metabolic) product.

2. First of all, of course, the claim would be almost certainly false. But even if it were true, the whole principle behind it would be misguided. Cholesterol is the precursor of all our steroid hormones, so if the body were totally purged of cholesterol, we also would have no sex steroids, aldosterone, or glucocorticoids, and one's metabolism would be seriously and fatally deranged. Not that this would matter much, because one would probably die even more quickly of widespread hemorrhaging and other cellular and tissue breakdown as a result of weakened plasma membranes, which depend on cholesterol as a structural entity.

3. Toxic goiter is characterized by thyroid hormone hypersecretion. The calorigenic effect of thyroid hormone elevates the body temperature, and the hypothalamus attempts to compensate for this and thermoregulate by inducing sweating.

4. Neither the peptide hormones nor the metabotropic neurotransmitters (such as the catecholamines) can enter their target cells. They bind to surface receptors, which then activate second-messenger systems in the cell.

5. His sphenoid fracture has evidently severed the stalk that connects the hypothalamus to the posterior lobe of the pituitary gland. As a result, the hypothalamus cannot convey antidiuretic hormone to the pituitary or stimulate the pituitary to release ADH into the blood. In the absence of ADH, the kidneys conserve relatively little water, producing a copious output of urine. Excessive water loss from the body, in turn, stimulates intense thirst. The occipital bone does not lie near the pituitary gland, so an occipital bone fracture is unlikely to affect pituitary function. The hormone imbalance resulting from the sphenoid bone fracture is ADH hyposecretion. Diabetes insipidus is not associated with elevated glucose in the urine because ADH is not involved in glucose metabolism. The urine is abundant and dilute, but there is no glycosuria in diabetes insipidus.