CHAPTER 50—ENDOCRINE SYSTEM

MULTIPLE CHOICE

1. Hormones are
   a. chemicals that stimulate nerve cells during times of stress.
   b. the same as electrical nerve impulses.
   c. transported to their targets by the bloodstream or secreted into extracellular fluid.
   d. neurons along which messages travel.
   
   ANS: C  DIF: 1  OBJ: 50-1.1

2. Hormones are essential to maintaining homeostasis mainly because
   a. they catalyze specific chemical reactions in brain cells.
   b. the body requires them for digesting food.
   c. they cause specific responses in specific targets.
   d. they act faster than nerve impulses.

   ANS: C  DIF: 1  OBJ: 50-1.1

3. In order for a hormone to work,
   a. it must reach its target cell.
   b. it must bind to a receptor protein.
   c. its message must cross a cell membrane.
   d. All of the above

   ANS: D  DIF: 1  OBJ: 50-1.1

4. Which of the following would not be influenced by cyclic AMP?
   a. activation of enzymes within a target cell
   b. inhibition of the chemical activities within a target cell
   c. action of steroid hormones
   d. amplification of the effect of a peptide hormone

   ANS: C  DIF: 1  OBJ: 50-1.4

5. When an amino acid–based hormone attaches to a target cell,
   a. it binds to a receptor in the cytoplasm.
   b. it passes through the cell membrane.
   c. a series of chemical reactions forms a “second messenger.”
   d. the hormone is converted into a steroid.

   ANS: C  DIF: 1  OBJ: 50-1.4

6. If an amino acid–based hormone acts as a “first messenger,” then ____ sometimes acts as a “second messenger.”
   a. steroid hormone  c. receptor protein
   b. cyclic AMP      d. glucagon

   ANS: B  DIF: 1  OBJ: 50-1.4
7. All of the following are nonendocrine chemical signal molecules except
   a. steroids.     c. neurotransmitters.
   b. neuropeptides. d. prostaglandins.

   ANS: A  DIF: 1  OBJ: 50-1.3

8. Which of the following is an example of an amino acid–based hormone?
   a. receptor protein     c. glycogen
   b. estrogen           d. glucagon

   ANS: D  DIF: 1  OBJ: 50-1.3

9. Refer to the illustration above. Which of the hormones shown would activate the receptor protein on the right?
   a. 1  c. 3
   b. 2  d. 4

   ANS: A  DIF: 1  OBJ: 50-1.3

10. Refer to the illustration above. If a hormone attached to the receptor protein shown in the diagram, the receptor protein would
    a. detach and move into the cytoplasm.
    b. trigger events within the cell.
    c. change the shape of the hormone.
    d. become a phospholipid molecule.

    ANS: B  DIF: 1  OBJ: 50-1.4

11. Refer to the illustration above. If one of the steroid hormones were able to activate a cell containing the receptor protein,
    a. the hormone would first have to be chemically converted into a different shape.
    b. a receptor molecule for the steroid would have to be somewhere on the cell membrane.
    c. a receptor molecule for the steroid would have to be found in the cell’s cytoplasm.
    d. None of the above

    ANS: C  DIF: 1  OBJ: 50-1.4

12. The polarity of amino acid–based hormones prevents them from entering cells. Therefore, these hormones
    a. send messages from outside the cell.
    b. are carried into the cell by channel proteins.
    c. combine with steroid hormones in order to activate cells.
    d. cannot dissolve in polar molecules.

    ANS: A  DIF: 1  OBJ: 50-1.3
13. A substance that affects the activities of genes in a target cell is a
   a. prostaglandin.  c. peptide hormone.
   b. steroid hormone. d. second messenger.
   ANS: B  DIF: 1  OBJ: 50-1.3

14. A hormone receptor protein found inside the cytoplasm of a cell may
   a. attach to cyclic AMP.
   b. bind to a steroid hormone.
   c. synthesize DNA.
   d. act as a second messenger.
   ANS: B  DIF: 1  OBJ: 50-1.3

15. Modified lipids that tend to accumulate in areas of tissue disturbance or injury are
   a. endorphins.  c. neuromodulators.
   b. enkephalins.  d. prostaglandins.
   ANS: D  DIF: 1  OBJ: 50-1.5

16. Prostaglandins
   a. are transported throughout the body through the blood.
   b. are produced by the hypothalamus.
   c. act locally on cells.
   d. are not considered hormones since they function very differently from them.
   ANS: C  DIF: 1  OBJ: 50-1.5

17. Which of the following are mismatched?
   a. oxytocin—hypothalamus
   b. insulin—pancreas
   c. glucagon—pancreas
   d. thyroxine—pituitary gland
   ANS: D  DIF: 1  OBJ: 50-2.2
18. Refer to the illustration above. The gland that produces insulin is gland
   a. 1. c. 3.
   b. 2. d. 4.

ANS: B DIF: 1 OBJ: 50-2.2

19. Refer to the illustration above. The gland that is stimulated during emergency situations (causing the
    “fight-or-flight” response) is gland
   a. 1. c. 3.
   b. 2. d. 4.

ANS: C DIF: 1 OBJ: 50-2.2

20. Refer to the illustration above. The pituitary gland is gland
   a. 1. c. 3.
   b. 2. d. 4.

ANS: A DIF: 1 OBJ: 50-2.1

21. Refer to the illustration above. The development and maintenance of female sexual characteristics are
    mainly regulated by secretions of gland
   a. 1. c. 3.
   b. 2. d. 4.

ANS: D DIF: 1 OBJ: 50-2.2

22. Refer to the illustration above. Growth hormone is produced by gland
   a. 1. c. 3.
   b. 2. d. 4.

ANS: A DIF: 1 OBJ: 50-2.1
23. Refer to the illustration above. Diabetes mellitus is associated with a defect in the functioning of gland
   a. 1.  c. 3.
   b. 2.  d. 4.
   ANS: B  DIF: 1  OBJ: 50-2.2

24. Refer to the illustration above. Testosterone is produced by gland
   a. 1.  c. 5.
   b. 2.  d. All of the above
   ANS: C  DIF: 1  OBJ: 50-2.2

25. The body’s normal metabolic rate is regulated by
   a. thyroxine.  c. estrogen.
   b. epinephrine.  d. prolactin.
   ANS: A  DIF: 1  OBJ: 50-2.2

26. Which of the following are mismatched?
   a. oxytocin——uterus
   b. ADH——kidneys
   c. parathyroid hormone——bones
   d. insulin——hypothalamus
   ANS: D  DIF: 1  OBJ: 50-2.2

27. Which of the following organs contain(s) cells that have an endocrine function?
   a. brain  c. small intestine
   b. stomach  d. All of the above
   ANS: D  DIF: 1  OBJ: 50-1.2

28. Thyroxine
   a. stimulates cell metabolism and growth.
   b. slows growth of its target cells.
   c. stimulates synthesis of DNA.
   d. All of the above
   ANS: A  DIF: 1  OBJ: 50-2.2

29. epinephrine : reaction to stress or danger ::
   a. changes in blood pressure : norepinephrine
   b. aldosterone : readiness to “fight”
   c. aldosterone : readiness for “flight”
   d. calcitonin : blood calcium level
   ANS: D  DIF: 2  OBJ: 50-2.2

30. Hormones produced by the anterior pituitary
   a. are regulated by secretions from the hypothalamus.
   b. control the activity of other endocrine glands.
   c. are produced as the result of stimulation by releasing hormones.
   d. All of the above
   ANS: D  DIF: 1  OBJ: 50-2.1
31. The posterior lobe of the pituitary gland
   a. secretes releasing hormones that stimulate the anterior lobe of the pituitary gland.
   b. produces and secretes certain steroid hormones.
   c. stores and releases hormones made in the hypothalamus.
   d. is responsible for producing and secreting seven peptide hormones.

   ANS: C  DIF: 1  OBJ: 50-2.1

32. The adrenal medulla is different from the adrenal cortex in that the adrenal medulla
   a. is stimulated to release its hormones by the nervous system.
   b. produces only steroid hormones.
   c. secretes ACTH.
   d. does not release its hormones into the bloodstream.

   ANS: A  DIF: 1  OBJ: 50-2.2

33. All of the following are produced by the pituitary gland except
   a. prolactin.
   b. growth hormone.
   c. oxytocin.
   d. parathyroid hormone.

   ANS: D  DIF: 1  OBJ: 50-2.1

34. endocrine glands : hormones ::
   a. neurons : neurotransmitters
   b. neurons : hormones
   c. all cells : neurotransmitters
   d. all cells : hormones

   ANS: A  DIF: 2  OBJ: 50-2.2

35. Scientists once thought that the pituitary gland was the regulatory center of the endocrine system. They
   now think that a structure in the brain, the hypothalamus, acts as this regulatory center. Which of the
   following does not provide information supporting this new conclusion?
   a. The hypothalamus can send nerve signals to other parts of the brain.
   b. The hypothalamus produces and secretes hormones.
   c. Hormones produced by the hypothalamus stimulate or inhibit the release of other
      hormones by the pituitary gland.
   d. Blood vessels that connect the hypothalamus with the pituitary gland have been found.

   ANS: A  DIF: 3  OBJ: 50-2.1

36. Which of the following hormones raises the blood sugar level?
   a. glucagon
   b. insulin
   c. oxytocin
   d. ADH

   ANS: A  DIF: 1  OBJ: 50-2.5

37. The islets of Langerhan in the pancreas are responsible for
   a. producing epinephrine and norepinephrine.
   b. making hormones that regulate blood sugar levels.
   c. regulating calcium levels in the blood and in the bones.
   d. controlling the amount of iodine that reaches the thyroid gland.

   ANS: B  DIF: 1  OBJ: 50-2.2
38. When the level of calcium in the blood drops,
   a. one should immediately drink at least two eight-ounce glasses of milk.
   b. the parathyroid glands secrete a hormone that causes the release of calcium from bone into the blood.
   c. the thyroid gland releases calcium into the blood.
   d. All of the above
   ANS: B DIF: 1 OBJ: 50-2.5

39. In a person with diabetes mellitus, even though blood glucose levels may be high,
   a. glycogen is stored in large quantities.
   b. insulin levels still increase.
   c. cells do not receive glucose.
   d. None of the above
   ANS: C DIF: 1 OBJ: 50-2.3

40. Low levels of thyroid hormones cause the disease known as
   a. hypothyroidism. c. hyperthyroidism.
   b. diabetes mellitus. d. gigantism.
   ANS: A DIF: 1 OBJ: 50-2.2

41. Hypothyroidism can cause
   a. nervousness. c. increased blood sugar.
   b. weight loss. d. lack of energy.
   ANS: D DIF: 1 OBJ: 50-2.2

42. Parathyroid hormone is important for survival because it
   a. stimulates the body’s metabolic rate.
   b. regulates the amount of calcium in the blood.
   c. causes the heart to contract and pump blood.
   d. increases the excretion of calcium by the kidneys.
   ANS: B DIF: 1 OBJ: 50-2.2

43. A goiter results from a lack of
   a. iodine. c. ADH.
   b. insulin. d. sodium ions.
   ANS: A DIF: 1 OBJ: 50-2.2

44. parathyroid gland : parathyroid hormone ::
   a. thyroid gland : thyroxine c. pituitary gland : insulin
   b. pancreas : estrogen d. adrenal gland : FSH
   ANS: A DIF: 2 OBJ: 50-2.2
45. increase in blood sugar level : glucagon release ::
   a. calcitonin production : blood calcium level
   b. ADH production : high blood calcium level
   c. hyperthyroidism : overproduction of thyroxine
   d. hypothyroidism : overproduction of thyroxine

   ANS: C  DIF: 2  OBJ: 50-2.3

46. In negative feedback, the
   a. last step stimulates the first step.
   b. first step inhibits the last step.
   c. last step inhibits the first step.
   d. All of the above

   ANS: C  DIF: 1  OBJ: 50-2.4

47. Which of the following structures produces releasing hormones?
   a. thyroid gland  c. hypothalamus
   b. anterior pituitary  d. posterior pituitary

   ANS: C  DIF: 1  OBJ: 50-2.1

48. When the levels of thyroid hormones in the blood are low, which of the following series of events follows?
   a. The hypothalamus secretes thyrotropin releasing hormone (TRH), the anterior pituitary stops secreting thyroid-stimulating hormone (TSH), and the thyroid stops secreting thyroid hormones.
   b. The hypothalamus secretes thyroid-stimulating hormone (TSH), the anterior pituitary also secretes TSH, and the thyroid secretes thyroid hormones.
   c. The hypothalamus secretes thyroid-stimulating hormone (TSH), the anterior pituitary stops secreting TSH, and the thyroid stops secreting thyroid hormones.
   d. The hypothalamus secretes thyrotropin releasing hormone (TRH), the anterior pituitary secretes thyroid-stimulating hormone (TSH), and the thyroid secretes thyroid hormones.

   ANS: D  DIF: 1  OBJ: 50-2.3

**COMPLETION**

1. A hormone affects only its ________________ cells.

   ANS: target
   DIF: 1  OBJ: 50-1.1

2. Hormones that activate specific genes within a target cell are called ________________.

   ANS: steroids
   DIF: 1  OBJ: 50-1.3
3. Fat-soluble lipid hormones that the body makes from cholesterol are ____________________.

   ANS: steroids

   DIF: 1  OBJ: 50-1.3

4. Amino acid–based hormones remain outside their target cells, while ____________________
hormones carry out their function from within their target cells.

   ANS: steroid

   DIF: 1  OBJ: 50-1.4

5. Cyclic AMP is a molecule that amplifies the effect of a hormone by acting as a(n)__________________ in cells that are activated by amino acid–based hormones.

   ANS: second messenger

   DIF: 1  OBJ: 50-1.4

6. A steroid hormone combines with a receptor protein to form a(n)__________________ complex, which enters the nucleus of a cell and binds to DNA.

   ANS: hormone-receptor

   DIF: 1  OBJ: 50-1.4

7. High levels of calcium in the blood stimulate the production of ____________________, a hormone
   that causes more calcium to be deposited in bone tissue, thus lowering the blood calcium level.

   ANS: calcitonin

   DIF: 1  OBJ: 50-2.2

8. A hormone that enables the cells of certain tissues to take in glucose molecules is
   ____________________.

   ANS: insulin

   DIF: 1  OBJ: 50-2.2

9. The ____________________, a structure of the brain, controls much of the endocrine activity of the
   body by regulating the secretions of the pituitary gland.

   ANS: hypothalamus

   DIF: 1  OBJ: 50-2.1
10. The part of the brain that may be considered the “master switchboard” of the endocrine system is the ____________________.
   
   ANS: hypothalamus
   
   DIF: 1  OBJ: 50-2.1

11. The gland that produces oxytocin is the ____________________.
   
   ANS: hypothalamus
   
   DIF: 1  OBJ: 50-2.1

12. The glands responsible for increasing blood levels of calcium ions are the ____________________ glands.
   
   ANS: parathyroid
   
   DIF: 1  OBJ: 50-2.2

13. Cortisol is a steroid hormone that is produced by the ____________________ in response to stress.
   
   ANS: adrenal cortex
   
   DIF: 1  OBJ: 50-2.2

14. Epinephrine and norepinephrine are produced by the adrenal ____________________.
   
   ANS: medulla
   
   DIF: 1  OBJ: 50-2.2

15. A swollen thyroid gland is called a(n) ____________________.
   
   ANS: goiter
   
   DIF: 1  OBJ: 50-2.2

16. The parathyroid glands secrete a hormone that regulates the level of ____________________ in the bloodstream.
   
   ANS: calcium
   
   DIF: 1  OBJ: 50-2.2

17. Secretion of epinephrine during stressful times causes an increase of ____________________ in the bloodstream.
   
   ANS: glucose
   
   DIF: 1  OBJ: 50-2.2
18. An increase in blood glucose stimulates the release of the hormone ____________________, and a decrease in blood glucose stimulates the release of the hormone ____________________.

ANS: insulin, glucagon

DIF: 1 OBJ: 50-2.2

19. Glandular production of a hormone that circulates in the blood and inhibits the release of more of the same hormone from the producing gland is known as ____________________ feedback.

ANS: negative

DIF: 1 OBJ: 50-2.4

ESSAY

1. Why does a hormone not affect cells other than its target cells? Write your answer in the space below.

ANS:
Only target cells have protein receptors that bind to the hormone.

DIF: 1 OBJ: 50-1.1

2. Compare the action mechanisms of amino acid–based hormones and steroid hormones. Write your answer in the space below.

ANS:
Amino acid–based hormones attach to receptor proteins on the surface of a target cell, causing the production of cyclic AMP within the cell. Cyclic AMP in turn activates enzymes within the cell; thus, the cell is “turned on.” Steroid hormones enter the cell, where they combine with receptor proteins in the cytoplasm. The combined hormone-receptor complex enters the cell’s nucleus, where the hormone activates specific genes on the DNA molecules.

DIF: 1 OBJ: 50-1.4

3. Explain why the cells of a person with untreated diabetes mellitus starve due to lack of glucose even though blood glucose levels are higher than normal. Write your answer in the space below.

ANS:
In a person with diabetes mellitus, the pancreas stops making insulin (Type I) or does not make enough insulin (Type II), or the target cell receptors become less responsive to insulin (Type II). Insulin is a hormone that stimulates the cells to take glucose from the bloodstream. In the absence of insulin, even though there may be plenty of glucose in the blood, cells are unable to absorb it. Therefore, the cells cannot conduct cellular respiration, and they starve.

DIF: 1 OBJ: 50-2.3