

TEST BANK

PATHOPHYSIOLOGY

THE BIOLOGIC BASIS FOR DISEASE IN ADULTS AND CHILDREN

8th Edition

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Chapter 01: Cellular Biology

MULTIPLE CHOICE

1. Which statement best describes the cellular function of metabolic absorption?
 - a. Cells can produce proteins.
 - b. Cells can secrete digestive enzymes.
 - c. Cells can take in and use nutrients.
 - d. Cells can synthesize fats.

ANS: C

In metabolic absorption, all cells take in and use nutrients and other substances from their surroundings. The remaining options are not inclusive in their descriptions of cellular metabolic absorption.

PTS: 1 DIF: Cognitive Level: Remembering

2. Where is most of a cell's genetic information, including RNA and DNA, contained?
 - a. Mitochondria
 - b. Ribosome
 - c. Nucleolus
 - d. Lysosome

ANS: C

The nucleus contains the **nucleolus**, a small dense structure composed largely of RNA, most of the cellular DNA, and the DNA-binding proteins, such as the histones, which regulate its activity. The mitochondria are responsible for cellular respiration and energy production. Ribosomes' chief function is to provide sites for cellular protein synthesis. Lysosomes function as the intracellular digestive system.

PTS: 1 DIF: Cognitive Level: Remembering

3. Which component of the cell produces hydrogen peroxide (H_2O_2) by using oxygen to remove hydrogen atoms from specific substrates in an oxidative reaction?
 - a. Lysosomes
 - b. Peroxisomes
 - c. Ribosomes
 - d. Endosome

ANS: B

Peroxisomes are so named because they usually contain enzymes that use oxygen to remove hydrogen atoms from specific substrates in an oxidative reaction that produces H_2O_2 , which is a powerful oxidant and potentially destructive if it accumulates or escapes from peroxisomes. Ribosomes are RNA-protein complexes (nucleoproteins) that are synthesized in the nucleolus and secreted into the cytoplasm through pores in the nuclear envelope called *nuclear pore complexes*. Lysosomes are saclike structures that originate from the Golgi complex and contain more than 40 digestive enzymes called *hydrolases*, which catalyze bonds in proteins, lipids, nucleic acids, and carbohydrates. An endosome is a vesical that has been pinched off from the cellular membrane.

PTS: 1 DIF: Cognitive Level: Remembering

4. Which cell component is capable of cellular autodigestion when it is released during cell injury?
- Ribosome
 - Golgi complex
 - Smooth endoplasmic reticulum
 - Lysosomes

ANS: D

The lysosomal membrane acts as a protective shield between the powerful digestive enzymes within the lysosome and the cytoplasm, preventing their leakage into the cytoplasmic matrix. Disruption of the membrane by various treatments or cellular injury leads to a release of the lysosomal enzymes, which can then react with their specific substrates, causing *cellular self-digestion*. The chief function of a ribosome is to provide sites for cellular protein synthesis. The Golgi complex is a network of flattened, smooth vesicles and membranes often located near the cell nucleus. The smooth endoplasmic reticulum is involved in steroid hormone production and removing toxic substances from the cell.

PTS: 1 DIF: Cognitive Level: Remembering

5. Which cAMP-mediated response is related to antidiuretic hormone?
- Increased heart rate and force of contraction
 - Secretion of cortisol
 - Increased retention of water
 - Breakdown of fat

ANS: C

Antidiuretic hormone leads to increased retention of water in the body. Epinephrine causes increases in heart rate and force of contraction. Increased cortisol secretion is due to ACTH. Breakdown of fat is due to glucagon.

PTS: 1 DIF: Cognitive Level: Remembering

6. During which phase of the cell cycle is DNA synthesized?
- G_1
 - S
 - G_2
 - M

ANS: B

The four designated phases of the cell cycle are: (1) the G₁ phase (G = gap), which is the period between the M phase (M = mitosis) and the start of DNA synthesis; (2) the S phase (S = synthesis), during which DNA is synthesized in the cell nucleus; (3) the G₂ phase, during which RNA and protein synthesis occurs, the period between the completion of DNA synthesis and the next phase (M); and (4) the M phase, which includes nuclear and cytoplasmic division.

PTS: 1

DIF: Cognitive Level: Remembering

7. What organic compound facilitates transportation across cell membranes by acting as receptors, transport channels for electrolytes, and enzymes to drive active pumps?
- Lipids
 - Proteases
 - Proteins
 - Carbohydrates

ANS: C

Proteins have several functions, including acting as receptors, transport channels for electrolytes, and enzymes to drive active pumps. Lipids help act as the “glue” holding cell membranes together. Proteases cause the breakdown of protein. Carbohydrates are involved in cellular protection and lubrication and help produce energy via oxidative phosphorylation.

PTS: 1

DIF: Cognitive Level: Remembering

8. Understanding the various steps of proteolytic cascades may be useful in designing drug therapy for which human diseases?
- Cardiac and vascular disorders
 - Autoimmune and malignant disorders
 - Gastrointestinal and renal disorders
 - Endocrine and gastrointestinal disorders

ANS: B

Understanding the various steps involved in this process is crucial for designing drug interventions. Dysregulation of proteases features prominently in many human diseases, including cancer, autoimmunity, and neurodegenerative disorders. Cardiac, vascular, gastrointestinal, renal, and endocrine disorders do not involve this process.

PTS: 1

DIF: Cognitive Level: Remembering

9. Which structure prevents water-soluble molecules from entering cells across the plasma membrane?
- Carbohydrate chains
 - Glycoprotein channels
 - Membrane channel proteins
 - Lipid bilayer

ANS: D

The bilayer's structure accounts for one of the essential functions of the plasma membrane. It is impermeable to most water-soluble molecules (molecules that dissolve in water) because the water-soluble molecules are insoluble in the oily core region. The bilayer serves as a barrier to the diffusion of water and hydrophilic substances while allowing lipid-soluble molecules, such as oxygen (O₂) and carbon dioxide (CO₂), to diffuse through it readily. Carbohydrate chains, glycoprotein channels, and membrane channel proteins do not prevent water-soluble molecules from entering cells across the cell membrane.

PTS: 1 DIF: Cognitive Level: Remembering

10. A student asks for an explanation of the absolute refractory period of the action potential. What response by the professor is best?
- A stronger than normal impulse will evoke another response.
 - No stimulus is able to evoke another response at this time.
 - Multiple stimuli can produce more rapid action potentials.
 - The hyperpolarized state means a weaker stimulus produces a response.

ANS: B

During the absolute refractory state of the action potential, no stimulus is able to evoke another response from the cell. A stronger than normal impulse may generate a response in the relative refractory period. This period of time is not related to the number of stimuli. A hyperpolarized state means a stronger than normal stimulus would be needed to generate a response.

PTS: 1 DIF: Cognitive Level: Remembering

11. Which form of cell communication is used to communicate within the cell itself and with other cells in direct physical contact?
- Protein channel (gap junction)
 - Plasma membrane-bound signaling molecules
 - Hormone secretion such as neurotransmitters
 - Extracellular chemical messengers such as ligands

ANS: B

Cells communicate in three main ways; they display plasma membrane-bound signaling molecules that affect the cell itself and other cells in direct physical contact with it, they affect receptor proteins inside the target cell, and they form protein channels (gap junctions) that directly coordinate the activities of adjacent cells. Neurotransmitters are released by neurons and cross the synaptic cleft to communicate with the cells they innervate. Ligands are involved in binding processes.

PTS: 1 DIF: Cognitive Level: Remembering

12. Which mode of chemical signaling uses blood to transport communication to cells some distance away?
- Paracrine
 - Autocrine
 - Neurotransmitter
 - Hormonal

ANS: D

Chemical signaling can be classified into three categories: (1) local-chemical mediator, (2) hormone, and (3) neurotransmitter. Hormones are released by one set of cells and travel through tissues or the bloodstream to another set of cells where they produce a response by those cells. In paracrine signaling, cells secrete local chemical mediators that are quickly absorbed, destroyed, or immobilized. Paracrine signaling requires close membrane-to-membrane contact. Paracrine signaling usually involves different cell types; however, cells also may produce signals that they, themselves, respond to, which is called autocrine signaling. Neurotransmitters are released by neurons and cross the synaptic cleft to communicate with the cells they innervate.

PTS: 1

DIF: Cognitive Level: Remembering

13. Which mode of chemical signaling uses local chemical mediators that are quickly taken up, destroyed, or immobilized?
- Paracrine
 - Autocrine
 - Neurotransmitter
 - Hormone

ANS: A

In paracrine signaling, cells secrete local chemical mediators that are quickly taken up, destroyed, or immobilized. Autocrine signaling occurs when the target cells produce signals that they themselves respond to. Neurotransmitters are released by neurons and cross the synaptic cleft to communicate with the cells they innervate. Hormones are released by one set of cells and travel through tissues or the bloodstream to another set of cells where they produce a response by those cells.

PTS: 1

DIF: Cognitive Level: Remembering

14. Neurotransmitters affect the postsynaptic membrane by binding to which structure?
- Lipids
 - Ribosomes
 - Amphipathic lipids
 - Receptors

ANS: D

In each type of chemical signaling, the target cell receives the signal by first attaching to its receptors. The other options do not correctly describe this process.

PTS: 1

DIF: Cognitive Level: Remembering

15. How do cells receive communication from the extracellular fluid surrounding them?
- Protein channel (gap junction)
 - Plasma membrane-bound signaling molecules (involving receptors)
 - Hormone secretion such as neurotransmitters
 - Chemical messengers such as ligands

ANS: D

Signal transduction involves incoming signals or instructions from extracellular chemical messengers (ligands) that are conveyed to the cell's interior for execution. The other options do not correctly describe how cells receive communication from the surrounding extracellular fluid.

PTS: 1 DIF: Cognitive Level: Remembering

16. Which molecule provides the second messenger necessary for extracellular communication to be activated?
- Guanosine triphosphate (GTP)
 - Adenosine monophosphate (AMP)
 - Adenosine triphosphate (ATP)
 - Guanosine diphosphate (GDP)

ANS: B

The two major second-messenger pathways are cyclic AMP (cAMP) and calcium (Ca^{++}). GTP, ATP, and GDP are not major second-messenger pathways. GTP and GDP are "middlemen" or intermediaries. Nutrients are transformed into energy in the form of ATP.

PTS: 1 DIF: Cognitive Level: Remembering

17. Under anaerobic conditions, what process provides energy for the cell?
- Oxidative phosphorylation
 - Glycolysis
 - Lactolysis
 - Passive transport

ANS: B

Glycolysis provides energy to the cells when oxygen delivery is insufficient or delayed. Oxidative phosphorylation is the process by which energy produced from nutrients is transferred to ATP. Lactolysis is the breakdown of lactose. Passive transport is the movement of water and small, nonelectrically charge molecules across plasma membranes.

PTS: 1 DIF: Cognitive Level: Remembering

18. What is the mechanism by which the energy produced from carbohydrates, proteins, and lipids is transferred to adenosine triphosphate (ATP)?
- Anaerobic glycolysis
 - Oxidative cellular metabolism
 - Oxidative phosphorylation
 - Tricarboxylic acid phosphorylation

ANS: C

Oxidative phosphorylation occurs in the mitochondria and is the mechanism by which the energy produced from carbohydrates, fats, and proteins is transferred to ATP. Glycolysis provides energy to the cells when oxygen delivery is insufficient or delayed. Oxidative cellular metabolism and tricarboxylic acid phosphorylation are not involved in transferring energy to ATP.

PTS: 1 DIF: Cognitive Level: Remembering

19. Passive transport is best described with which statement?
- Being driven by osmosis, hydrostatic pressure, and diffusion
 - Involving receptors that can bind with substances being transported
 - Being capable of transporting macromolecules
 - Requiring energy generated by the cell

ANS: A

Water and small electrically uncharged molecules move easily through pores in the plasma membrane's lipid bilayer. This process, called *passive transport*, naturally occurs through any semipermeable barrier. It is driven by osmosis, hydrostatic pressure, and diffusion, all of which depend on the laws of physics and do not require life. The other options do not correctly describe passive transport.

PTS: 1 DIF: Cognitive Level: Remembering

20. Which is the best example of active transport?
- Movement across a membrane due to differences in solute concentration
 - Movement requiring the expenditure of metabolic energy
 - Movement of two molecules simultaneously in one direction
 - Movement of two molecules simultaneously in opposite directions

ANS: B

Active transport requires a life, biologic activity, and the expenditure of metabolic energy. Movement due simply to differences in concentration gradients is called passive transport. Movement of two molecules in the same direction is called symport, while moving two molecules in opposite directions is called antiport.

PTS: 1 DIF: Cognitive Level: Remembering

21. Which method of transport uses transmembrane proteins with receptors with a high degree of specificity for the substance being transported?
- Active
 - Mediated
 - Transmembranous
 - Passive

ANS: B

Mediated transport (passive and active) involves integral or transmembrane proteins with receptors having a high degree of specificity for the substance being transported. Active and passive transport are opposites with active transport requiring the use of energy and passive transport relying on osmosis, hydrostatic pressure, and diffusion and not energy. Transmembranous means "across membranes."

PTS: 1 DIF: Cognitive Level: Remembering

22. The movement of fluid across the arterial end of capillary membranes into the interstitial fluid surrounding the capillary is an example of which fluid movement process?
- Hydrostatic pressure

- b. Osmosis
- c. Diffusion
- d. Active transport

ANS: A

Hydrostatic pressure is the mechanical force of water pushing against cellular membranes. Osmosis is the movement of water “down” a concentration gradient, that is, across a semipermeable membrane from a region of higher water concentration to a region of lower water concentration. Diffusion is the movement of a solute molecule from an area of greater solute concentration to an area of lesser solute concentration. Active transport requires a life, biologic activity, and the expenditure of metabolic energy.

PTS: 1

DIF: Cognitive Level: Remembering

23. A student asks why osmolality is preferred over osmolarity as the measurement of osmotic activity in the clinical assessment of individuals. What response by the professor is most accurate?
- a. Plasma contains sodium and chloride, which influence the volume of solution.
 - b. Volume affects perfusion more than the weight of solutes.
 - c. More of the weight of plasma is influenced by solutes rather than by water.
 - d. Osmotic activity depends on the concentration of solutes present in plasma.

ANS: C

Osmolality is a measure of the number of milliosmoles per kilogram (mOsm/kg) of water, or the concentration of molecules per *weight* of water. Osmolarity is a measure of the number of milliosmoles per liter (mOsm/L) of solution, or the concentration of molecules per *volume* of solution. Osmolality is a measure of the number of milliosmoles per kilogram (mOsm/kg) of water, or the concentration of molecules per *weight* of water. Osmolarity is a measure of the number of milliosmoles per liter (mOsm/L) of solution, or the concentration of molecules per *volume* of solution. In plasma, less of the plasma weight is water; therefore the overall concentration of particles is greater. The osmolality will be greater than the osmolarity because of the smaller proportion of water. Osmolality is thus the preferred measure of osmotic activity in clinical assessment of individuals.

PTS: 1

DIF: Cognitive Level: Remembering

24. A patient who has diarrhea receives a 3% saline solution intravenously to replace the sodium and chloride lost in the stool. What effect will this fluid replacement have on cells?
- a. Become hydrated
 - b. Swell or burst
 - c. Shrink
 - d. Divide

ANS: C

A hypertonic solution has a concentration of greater than 285 to 294 mOsm/kg. An example of a hypertonic solution is 3% saline solution. Water can be pulled out of the cells by a hypertonic solution; therefore the cells shrink. An isotonic solution will cause the cells to become more hydrated without disrupting the osmolality of either intracellular or extracellular fluid. Hypotonic solutions can cause cells to swell or burst. No solutions lead to cell division.

PTS: 1 DIF: Cognitive Level: Remembering

25. The transport of glucose from the blood to the cell is accomplished by which process?
- Hydrostatic pressure
 - Active diffusion
 - Passive osmosis
 - Mediated transport

ANS: D

Mediated transport is the means by which glucose is transported from the blood to the cells. This process uses transport proteins. Hydrostatic pressure is the force of water pushing against a cell membrane. Diffusion is a passive process, not active. Osmosis is the movement of water “down” a concentration gradient, that is, across a semipermeable membrane from a region of higher water concentration to a region of lower water concentration and is a passive process.

PTS: 1 DIF: Cognitive Level: Remembering

26. What transports potassium and sodium across plasma membranes?
- Passive electrolyte channels
 - Coupled channels
 - Adenosine triphosphatase (ATPase) enzyme
 - Diffusion

ANS: C

The exact mechanism for the transport of Na^+ and K^+ across the membrane is uncertain. One proposal is that ATPase enzyme induces the transporter protein to undergo several conformational changes, causing Na^+ and K^+ to move short distances (see Figure 1-29). The remaining options do not correctly describe the means by which K^+ and Na^+ are transported.

PTS: 1 DIF: Cognitive Level: Remembering

27. What occurs during exocytosis?
- Macromolecules can be secreted across eukaryotic cell membranes.
 - All substances are secreted into the cellular matrix.
 - No repairs in the plasma membrane can take place.
 - Solute molecules flow freely into and out of the cell.

ANS: A

In eukaryotic cells, secretion of macromolecules almost always occurs by exocytosis. The remaining options do not correctly describe exocytosis.

PTS: 1 DIF: Cognitive Level: Remembering

28. The cellular uptake of the nutrient cholesterol depends on which process?
- Receptor-mediated exocytosis
 - Antiport system
 - Receptor-mediated endocytosis
 - Passive transport

ANS: C

The cellular uptake of nutrients, such as cholesterol, for example, depends on receptor-mediated endocytosis. Nutrients are not transported via the other options.

PTS: 1

DIF: Cognitive Level: Remembering

29. What causes the rapid change in the resting membrane potential to initiate an action potential?
- Potassium gates open, and potassium rushes into the cell, changing the membrane potential from negative to positive.
 - Sodium gates open, and sodium rushes into the cell, changing the membrane potential from negative to positive.
 - Sodium gates close, allowing potassium into the cell to change the membrane potential from positive to negative.
 - Potassium gates close, allowing sodium into the cell to change the membrane potential from positive to negative.

ANS: B

When a resting cell is stimulated through voltage-regulated channels, the cell membranes become more permeable to Na^+ . As Na^+ moves into the cell the membrane potential decreases, or *moves forward*, from a negative value (in millivolts) to zero. The Na^+ gates open, and Na^+ rushes into the cell, causing the membrane potential to reduce to zero and then become positive (depolarization). The remaining options do not correctly describe the change that initiates an action potential.

PTS: 1

DIF: Cognitive Level: Remembering

30. The action of platelet-derived growth factor is to stimulate the production of which cells?
- Platelets
 - Epidermal cells
 - Connective tissue cells
 - Fibroblast cells

ANS: C

Different types of cells require different factors to stimulate proliferation; for example, platelet-derived growth factor stimulates the production of connective tissue cells. Platelet-derived growth factor does not stimulate production of platelets, epidermal cells, or fibroblasts.

PTS: 1

DIF: Cognitive Level: Remembering

31. What role do cytokines play in cell reproduction?
- Provide growth factor for tissue growth and development
 - Block progress of cell reproduction through the cell cycle
 - Restrain cell growth and development

- d. Provide nutrients for cell growth and development

ANS: A

Growth factors, also called *cytokines*, stimulate an increase in cell mass or cell growth by promoting the synthesis of proteins and other macromolecules and inhibiting their degradation.

PTS: 1 DIF: Cognitive Level: Remembering

32. What is the process of cellular reproduction?
- The process often takes months or years to complete.
 - Cellular reproduction typically has a short interphase.
 - Two diploid cells, called *daughter cells*, have been formed.
 - The process involves the interaction of male and female cells.

ANS: C

During telophase, the final stage of cellular reproduction, two identical diploid cells, called *daughter cells*, has been formed from the original cell. The process occurs hundreds of times a second. Interphase is the longest phase of the cell cycle. Male and female cells do not interact in cellular reproduction; each cell is responsible for reproducing itself.

PTS: 1 DIF: Cognitive Level: Remembering

33. Which statement is *true* about eukaryotic cells?
- They lack distinct nucleus.
 - They contain compartments called *organelles*.
 - They lack an encasing nuclear membrane.
 - They are smaller than the typical prokaryote cell.

ANS: B

Eukaryotic cells have a characteristic set of membrane-bound intracellular compartments called *organelles* that include a well-defined nucleus encased in a nuclear membrane. Eukaryotic cells are also larger than prokaryotes.

PTS: 1 DIF: Cognitive Level: Remembering

34. Which statement is *true* about phagocytosis?
- Phagocytosis is an example of exocytosis.
 - Phagocytosis is dependent on small vesicles.
 - Phagocytosis involves the ingestion of bacteria.
 - Phagocytosis focuses on solute molecules.

ANS: C

Phagocytosis is the engulfment of large particles in phagocytic cells. Phagocytosis is an example of endocytosis, not exocytosis and does not focus on solutes.

PTS: 1 DIF: Cognitive Level: Remembering

35. A muscle cell possesses which specialized function?
- Movement

- b. Conductivity
- c. Secretion
- d. Respiration

ANS: A

A cell has the potential to differentiation and to gain the ability to perform one of eight specialized functions. Muscle cells can generate forces that produce motion. Nerves cells are capable of conductivity. Cells of the adrenal gland, testis, and ovary can secrete. Respiration is a function that all cells possess.

PTS: 1

DIF: Cognitive Level: Remembering

36. When a mucous gland cell creates a new substance from previously absorbed material, this process is known as which specialized cellular function?
- a. Excretion
 - b. Metabolic absorption
 - c. Reproduction
 - d. Secretion

ANS: D

Certain cells, such as mucous gland cells, can synthesize new substances from substances they absorb and then secrete the new substances to serve elsewhere as needed. Excretion occurs when cells rid themselves of waste products. Reproduction is the process of forming new cells.

PTS: 1

DIF: Cognitive Level: Remembering

37. All cells are capable of what process?
- a. Excretion
 - b. Movement
 - c. Conductivity
 - d. Continuous division

ANS: A

All cells have the capacity to excrete, thus allowing them to rid themselves of waste products resulting from the metabolic breakdown of nutrients. Muscle cells have the property of movement. Conductivity is a property of nerve cells. Many, but not all, cells are capable of reproduction.

PTS: 1

DIF: Cognitive Level: Remembering

38. What is the best description of cell cycle arrest?
- a. The cell cycle is stopped due to damaged DNA.
 - b. Programmed cell death is suppressed.
 - c. Macromolecule degradation is inhibited.
 - d. Production of growth factors is halted.

ANS: A

The DNA damage response occurs when DNA is damaged and several protein kinases are recruited to the site of damage and start a signaling pathway that stops the progression of the cell cycle, or cell cycle arrest. Cell cycle arrest does not involve suppressing programmed cell death, macromolecule degradation, or growth factor production.

PTS: 1

DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. What are the major chemical components of the cell membranes? (*Select all that apply.*)

- a. Lipids
- b. Sodium ions
- c. Carbohydrates
- d. DNA
- e. Proteins

ANS: A, E

The major chemical components of all cell membranes are lipids and proteins. Sodium ions, carbohydrates, and DNA are not major chemical components of cell membranes.

PTS: 1

DIF: Cognitive Level: Remembering

2. Which statements are *true* concerning the process of mediated transport? (*Select all that apply.*)

- a. Can be active or passive
- b. Only moves one molecule at a time
- c. Involves transport proteins
- d. Expends tremendous energy
- e. Occurs only with hormones

ANS: A, C

Mediated transport uses membrane transport proteins and can be either active or passive.

Mediated transport systems can move molecules singly or two at a time and may or may not use energy. Many substances can be moved through mediated transport.

PTS: 1

DIF: Cognitive Level: Remembering

3. What is passive transport dependent on? (*Select all that apply.*)

- a. Semipermeable barrier membrane
- b. The process of osmosis
- c. Diffusion as a driving force
- d. A living host
- e. Hydrostatic pressure

ANS: A, B, C, E

Passive transport naturally occurs through any semipermeable barrier. It is driven by osmosis, hydrostatic pressure, and diffusion, all of which depend on the laws of physics and do not require life.

PTS: 1

DIF: Cognitive Level: Remembering

4. What is the primary function of proteins? (*Select all that apply.*)
- a. Proteins are binding units.
 - b. Proteins are transport channels.
 - c. Proteins are ribonucleoproteins.
 - d. Proteins provide cell surface markers.
 - e. Proteins are chemical reaction catalysts.

ANS: A, B, D, E

Protein functions include (a) recognition and binding units (receptors) for substances moving in and out of the cell; (b) pores or transport channels; (c) enzymes that drive active pumps; (d) cell surface markers, such as glycoproteins; (e) cell adhesion molecules; and (f) catalysts of chemical reactions.

PTS: 1

DIF: Cognitive Level: Remembering

Chapter 02: Altered Cellular and Tissue Biology: Environmental Agents

MULTIPLE CHOICE

1. Which type of cell adaptation occurs when normal columnar ciliated epithelial cells of the bronchial lining have been replaced by stratified squamous epithelial cells?
 - a. Hyperplasia
 - b. Metaplasia
 - c. Dysplasia
 - d. Anaplasia

ANS: B

Metaplasia is the reversible replacement of one mature cell by another, sometimes a less-differentiated cell type. The best example of metaplasia is the replacement of normal columnar-ciliated epithelial cells of the bronchial (airway) lining by stratified squamous epithelial cells. The other options do not accurately describe the event in the question.

PTS: 1

DIF: Cognitive Level: Remembering

2. What does the loss of the adenosine triphosphate (ATP) during ischemia cause cells to do?
 - a. Shrink because of the influx of calcium (Ca)
 - b. Shrink because of the influx of potassium chloride (KCl)
 - c. Swell because of the influx of sodium chloride (NaCl)
 - d. Swell because of the influx of nitric oxide (NO)

ANS: C

A reduction in ATP levels causes the plasma membrane's sodium–potassium ($\text{Na}^+\text{--K}^+$) pump and sodium–calcium exchange to fail, which leads to an intracellular accumulation of sodium and calcium and diffusion of potassium out of the cell. (The $\text{Na}^+\text{--K}^+$ pump is discussed in Chapter 1.) Sodium and water can then freely enter the cell, and cellular swelling results. The other options do not accurately describe the result of ATP at the cellular level.

PTS: 1

DIF: Cognitive Level: Remembering

3. The mammary glands enlarge during pregnancy primarily as a consequence of what hormonal process?
 - a. Atrophy
 - b. Hyperplasia
 - c. Anaplasia
 - d. Dysplasia

ANS: B

Hormonal hyperplasia occurs chiefly in estrogen-dependent organs, such as the uterus and breast. Atrophy is a decrease or shrinkage in cellular size. Anaplasia is a condition of poor cellular differentiation, a characteristic of cancer cells. Dysplasia is a change in the size, shape, and organization of mature cells.

PTS: 1 DIF: Cognitive Level: Remembering

4. Free radicals play a major role in the initiation and progression of which diseases?
- a. Cardiovascular diseases such as hypertension and ischemic heart disease
 - b. Renal diseases such as acute tubular necrosis and glomerulonephritis
 - c. Gastrointestinal diseases such as peptic ulcer disease and Crohn disease
 - d. Muscular disease such as muscular dystrophy and fibromyalgia

ANS: A

Emerging data indicate that reactive oxygen species play major roles in the initiation and progression of cardiovascular alterations associated with hyperlipidemia, diabetes mellitus, hypertension, ischemic heart disease, and chronic heart failure. Free radical damage is not a contributing mechanism for the renal, gastrointestinal, or muscular diseases listed.

PTS: 1 DIF: Cognitive Level: Remembering

5. How do free radicals cause cell damage?
- a. Stealing the cell's oxygen to stabilize the electron, thus causing hypoxia
 - b. Stimulating the release of lysosomal enzymes that digest the cell membranes
 - c. Transferring one of its charged, stabilized atoms to the cell membrane, which causes lysis
 - d. Giving up an electron, which causes injury to the chemical bonds of the cell membrane

ANS: D

A free radical is an electrically uncharged atom or group of atoms having an unpaired electron. Having one unpaired electron makes the molecule unstable; thus to stabilize, the molecule gives up an electron to another molecule or steals one. Therefore it is capable of forming injurious chemical bonds with proteins, lipids, or carbohydrates—key molecules in membranes and nucleic acids. Free radical damage is not caused by hypoxia, lysosomal enzymes, or transferring atoms.

PTS: 1 DIF: Cognitive Level: Remembering

6. What is a consequence of plasma membrane damage to the mitochondria?
- a. Enzymatic digestion halts DNA synthesis.
 - b. Influx of calcium ions halts ATP production.
 - c. Edema from an influx in sodium causes a reduction in ATP production.
 - d. Potassium shifts out of the mitochondria, which destroys the infrastructure.

ANS: B

Calcium alterations are an important mechanism of cell injury and death. Cell membrane injury leads to calcium influx into the cell. An influx of calcium ions from the extracellular compartment activates multiple enzyme systems, resulting in cytoskeleton disruption, membrane damage, activation of inflammation, and eventually DNA degradation. Calcium ion accumulation in the mitochondria causes the mitochondria to swell, which is an occurrence that is associated with irreversible cellular injury. The injured mitochondria can no longer generate ATP, but they do continue to accumulate calcium ions. Mitochondrial consequences of cell membrane damage do not include enzymatic digestion, reduced ATP production due to edema, or infrastructure damage from potassium shifts.

PTS: 1 DIF: Cognitive Level: Remembering

7. What is a consequence of leakage of lysosomal enzymes during chemical injury?
- Enzymatic digestion of the nucleus and nucleolus occurs, halting DNA synthesis.
 - Influx of potassium ions into the mitochondria occurs, halting the ATP production.
 - Edema of the Golgi body prevents the transport of proteins out of the cell.
 - Shift of calcium out of the plasma membrane occurs, destroying the cytoskeleton.

ANS: A

Acid hydrolases from leaking lysosomes are activated in the reduced pH of the injured cell and they digest cytoplasmic and nuclear components. Influx of potassium ions into the mitochondria, edema of Golgi bodies, and calcium destruction of the cytoskeleton are not a consequence of leakage of lysosomal enzymes during chemical injury.

PTS: 1 DIF: Cognitive Level: Remembering

8. Lead causes damage within the cell by interfering with the action of what?
- Sodium and chloride
 - Potassium
 - Calcium
 - ATP

ANS: C

Lead affects many different biologic activities at the cellular and molecular levels, many of which may be related to its ability to interfere with the functions and homeostasis of calcium. Lead does not appear to cause damage by interfering with the action of sodium, chloride, potassium, or ATP.

PTS: 1 DIF: Cognitive Level: Remembering

9. A health professions student asks the professor to explain apoptosis. What response is most accurate?
- Programmed cell death
 - Due to chemical injury
 - Unpredictable patterns of cell death
 - Results in benign malignancies

ANS: A

Apoptosis is an active process of cellular self-destruction, also known as *programmed cell death*, which is implicated in normal and pathologic tissue changes. Apoptosis causes cell death in many pathologic states, not just from chemical injury. A predictable, tightly regulated cellular program leads to apoptosis. Apoptosis does not cause benign malignancies.

PTS: 1 DIF: Cognitive Level: Understanding

10. A healthcare professional is assessing a child whose parents report poor grades in school, trouble paying attention, and “naughty” behaviors that have become so frequent the child is always in trouble. For which health condition should the professional facilitate testing?
- Hypoxic injury
 - Lead poisoning
 - Mercury exposure
 - Cadmium injection

ANS: B

Decreased academic achievement, IQ, and specific cognitive measures; increased incidence of attention-related behaviors and problem behaviors are related to lead exposure. Hypoxic injury is usually caused by ischemia, which is not apparent in this child. Exposure to mercury poisoning in utero can lead to deafness, blindness, intellectual disability, cerebral palsy, and central nervous system (CNS) defects. The main effects of cadmium poisoning are renal tubular disease and obstructive lung disease.

PTS: 1 DIF: Cognitive Level: Applying

11. A student asks why carbon monoxide causes tissue damage. What response by the professor is best?
- Competes with carbon dioxide so that it cannot be excreted
 - Binds to hemoglobin so that it cannot carry oxygen
 - Destroys the chemical bonds of hemoglobin so it cannot carry oxygen
 - Removes iron from hemoglobin so it cannot carry oxygen

ANS: B

Because carbon monoxide’s affinity for hemoglobin is 200 times greater than that of oxygen, it quickly binds with the hemoglobin, preventing oxygen molecules from doing so. Carbon monoxide does not cause tissue damage by competing with carbon dioxide, destroying chemical bonds, or removing iron from hemoglobin.

PTS: 1 DIF: Cognitive Level: Understanding

12. A healthcare professional is working with a person who drinks several 6-packs of beer a week. What testing does the professional encourage the person to get?
- Hepatic function
 - Gastrointestinal function
 - Renal function
 - Central nervous system function

ANS: A

Chronic alcohol use/abuse affects the hepatic system primarily. The gastrointestinal and renal systems are not as significantly impacted. Central nervous system problems are often seen in acute alcohol intoxication, and may be seen in advanced alcoholic liver disease.

PTS: 1 DIF: Cognitive Level: Comprehension

13. During cell injury caused by hypoxia, why does an increase in the osmotic pressure within the cell occur?
- Plasma proteins enter the cell.
 - The adenosine triphosphatase (ATPase)-driven pump is stronger during hypoxia.
 - Sodium chloride enters the cell.
 - An influx of glucose occurs through the injured cell membranes.

ANS: C

In hypoxic injury, movement of fluid and ions into the cell is associated with acute failure of metabolism and a loss of ATP production. Normally, the pump that transports sodium ions out of the cell is maintained by the presence of ATP and ATPase, the active transport enzyme. In metabolic failure caused by hypoxia, reduced ATP and ATPase levels permit sodium to accumulate in the cell, whereas potassium diffuses outward. The increase of intracellular sodium increases osmotic pressure, which draws more water into the cell. (Transport mechanisms are described in Chapter 1.) The remaining options do not accurately describe the cell injury that results in increased osmotic pressure caused by hypoxia.

PTS: 1 DIF: Cognitive Level: Remembering

14. Which statement is *true* regarding the difference between subdural hematoma and epidural hematoma?
- No difference exists, and these terms may be correctly used interchangeably.
 - A subdural hematoma occurs above the dura, an epidural hematoma occurs under the dura.
 - A subdural hematoma is often the result of shaken baby syndrome, whereas an epidural hematoma rapidly forms as a result of a skull fracture.
 - A subdural hematoma usually forms from bleeding within the skull, an epidural hematoma occurs from trauma outside the skull.

ANS: C

A subdural hematoma is a collection of blood between the inner surface of the dura mater and the surface of the brain, resulting from the shearing of small veins that bridge the subdural space. Subdural hematomas can be the result of blows, falls, or sudden acceleration-deceleration of the head, which occurs in the *shaken baby syndrome*. An epidural hematoma is a collection of blood between the inner surface of the skull and the dura and is almost always associated with a skull fracture. The other options do not accurately describe the differences between the two hematomas.

PTS: 1 DIF: Cognitive Level: Remembering

15. A healthcare professional is working at the health tent during a marathon. A runner is brought to the tent complaining of nausea and weakness. What is the first thing the professional should do?

- a. Call 911.
- b. Have the person lie down.
- c. Give the person salt tablets.
- d. Ask about street drug use.

ANS: B

Heat exhaustion is probably the most common heat-related injury. Symptoms include nausea and weakness due to hypovolemia. The person can suddenly collapse due to the loss of fluids, so the first measure the professional should take is to have the runner lie down. This is not a medical emergency so 911 does not yet need to be called. Salt replacement is the treatment for heat cramps. Street drug use could cause nausea or weakness, but since the person is running outside and sweating, a heat-related injury is far more likely.

PTS: 1 DIF: Cognitive Level: Applying

16. In hypoxic injury, why does sodium enter the cell and cause swelling?
- a. The cell membrane permeability increases for sodium during periods of hypoxia.
 - b. ATP is insufficient to maintain the pump that keeps sodium out of the cell.
 - c. The lactic acid produced by the hypoxia binds with sodium in the cell.
 - d. Sodium cannot be transported to the cell membrane during hypoxia.

ANS: B

In hypoxic injury, movement of fluid and ions into the cell is associated with acute failure of metabolism and a loss of ATP production. Normally, the presence of ATP and ATPase, the active transport enzyme, maintains the pump that transports sodium ions out of the cell. In metabolic failure caused by hypoxia, reduced ATP and ATPase levels permit sodium to accumulate in the cell, whereas potassium diffuses outward. The other options do not accurately describe the cause of the swelling caused by hypoxia.

PTS: 1 DIF: Cognitive Level: Remembering

17. What is the most common site of lipid accumulation?
- a. Coronary arteries
 - b. Kidneys
 - c. Liver
 - d. Subcutaneous tissue

ANS: C

Although lipids sometimes accumulate in heart and kidney cells, the most common site of intracellular lipid accumulation, or fatty change, is liver cells. Subcutaneous tissue is not a common site of lipid accumulation.

PTS: 1 DIF: Cognitive Level: Remembering

18. What mechanisms occur in the liver cells as a result of lipid accumulation?
- a. Accumulation of lipids that obstruct the common bile duct, preventing flow of bile from the liver to the gallbladder
 - b. Increased synthesis of triglycerides from fatty acids and decreased synthesis of apoproteins

- c. Increased binding of lipids with apoproteins to form lipoproteins
- d. Increased conversion of fatty acids to phospholipids

ANS: B

Lipid accumulation in liver cells occurs after cellular injury sets the following mechanisms in motion: increased synthesis of triglycerides from fatty acids (increases in the enzyme, β -glycerophosphatase, which can accelerate triglyceride synthesis) and decreased synthesis of apoproteins (lipid-acceptor proteins). Accumulation of lipids does not cause obstruction of bile flow, increased binding of lipids with apoproteins, or conversion of fatty acids to phospholipids.

PTS: 1

DIF: Cognitive Level: Remembering

19. Hemoprotein accumulations are a result of the excessive storage of what?
- a. Iron, which is transferred from the cells to the bloodstream
 - b. Hemoglobin, which is transferred from the bloodstream to the cells
 - c. Albumin, which is transferred from the cells to the bloodstream
 - d. Amino acids, which are transferred from the cells to the bloodstream

ANS: A

Excessive storage of iron, which is transferred to the cells from the bloodstream, causes hemoprotein accumulations in cells. Hemoglobin, albumin, or amino acids will not cause hemoprotein accumulations.

PTS: 1

DIF: Cognitive Level: Remembering

20. A patient suffered multiple traumatic injuries and received many blood transfusions within a few days of the injuries. For which medical condition should the healthcare professional monitor the patient for?
- a. High blood pressure
 - b. HIV infection
 - c. Hemosiderosis
 - d. Kidney damage

ANS: C

Hemosiderosis is a condition that occurs only when excess iron is stored as hemosiderin in the cells of many organs and tissues. This condition is common in individuals who have received repeated blood transfusions or prolonged parenteral administration of iron. While blood transfusions can expose a person to infectious diseases, this is not as likely to be a problem since blood products are tested. Kidney damage may occur in patients with traumatic injuries, but is not directly related to the multiple blood transfusions.

PTS: 1

DIF: Cognitive Level: Applying

21. What is the cause of free calcium in the cytosol that damages cell membranes by uncontrolled enzyme activation?
- a. Activation of endonuclease interferes with the binding of calcium to protein.
 - b. Activation of phospholipases, to which calcium normally binds, degrades the proteins.
 - c. An influx of phosphate ions competes with calcium for binding to proteins.

d. Depletion of ATP normally pumps calcium from the cell.

ANS: D

If abnormal direct damage occurs to membranes or ATP is depleted, then calcium increases in the cytosol. The other options do not accurately describe the cause of free calcium in cytosol to damage cell membranes.

PTS: 1

DIF: Cognitive Level: Remembering

22. What two types of hearing loss are associated with noise?

- a. Acoustic trauma and noise-induced
- b. High frequency and low frequency
- c. High frequency and acoustic trauma
- d. Noise-induced and low frequency

ANS: A

Two types of hearing loss are associated with noise: (1) acoustic trauma or instantaneous damage caused by a single sharply rising wave of sound (e.g., gunfire), and (2) noise-induced hearing loss, the more common type, which is the result of prolonged exposure to intense sound (e.g., noise associated with the workplace and leisure-time activities). The remaining options are not related to noise but rather to the amplitude of the sound.

PTS: 1

DIF: Cognitive Level: Remembering

23. What type of necrosis results from ischemia of neurons and glial cells?

- a. Coagulative
- b. Liquefactive
- c. Caseous
- d. Gangrene

ANS: B

Liquefactive necrosis commonly results from ischemic injury to neurons and glial cells in the brain. Coagulative necrosis commonly occurs in the kidney, heart, and adrenal glands. Caseous necrosis is a combination of coagulative and liquefactive processes and is seen in tuberculosis. Gangrene refers to death of tissue and results from severe hypoxic injury, commonly occurring because of arteriosclerosis, or blockage, of major arteries, especially in the lower leg.

PTS: 1

DIF: Cognitive Level: Remembering

24. What type of necrosis is often associated with pulmonary tuberculosis?

- a. Bacteriologic
- b. Caseous
- c. Liquefactive
- d. Gangrenous

ANS: B

Caseous necrosis, which commonly results from tuberculous pulmonary infection, particularly *Mycobacterium tuberculosis*, is a combination of coagulative and liquefactive necrosis. The other types of necrosis are not observed in pulmonary tuberculosis.

PTS: 1 DIF: Cognitive Level: Remembering

25. What type of necrosis is associated with wet gangrene?
- a. Coagulative
 - b. Liquefactive
 - c. Caseous
 - d. Gangrene

ANS: B

Wet gangrene develops only when neutrophils invade the site, causing liquefactive necrosis.

PTS: 1 DIF: Cognitive Level: Remembering

26. After ovulation, the uterine endometrial cells divide under the influence of estrogen. This process is an example of what hormonal process?
- a. Hyperplasia
 - b. Dysplasia
 - c. Hypertrophy
 - d. Anaplasia

ANS: A

Hormonal hyperplasia chiefly occurs in estrogen-dependent organs, such as the uterus and breast. After ovulation, for example, estrogen stimulates the endometrium to grow and thicken for reception of the fertilized ovum. Dysplasia refers to abnormal changes in the size, shape, and organization of mature cells. Hypertrophy is an increase in the size of cells that consequently increases the size of the affected organ. Anaplasia is a condition of poor cellular differentiation, a characteristic of cancer cells. Dysplasia is a change in the size, shape, and organization of mature cells.

PTS: 1 DIF: Cognitive Level: Remembering

27. What is the abnormal proliferation of cells in response to excessive hormonal stimulation?
- a. Dysplasia
 - b. Pathologic dysplasia
 - c. Hyperplasia
 - d. Pathologic hyperplasia

ANS: D

Pathologic hyperplasia is the abnormal proliferation of normal cells and can occur as a response to excessive hormonal stimulation or the effects of growth factors on target cells. Dysplasia refers to abnormal changes in the size, shape, and organization of mature cells. Hyperplasia is an increase in the number of cells in an organ or tissue resulting from an increased rate of cellular division and is a response to prolonged injury.

PTS: 1 DIF: Cognitive Level: Remembering

28. Removal of part of the liver leads to the remaining liver cells undergoing which compensatory process?

- a. Atrophy
- b. Metaplasia
- c. Hyperplasia
- d. Dysplasia

ANS: C

Compensatory hyperplasia is an adaptive mechanism that enables certain organs to regenerate. For example, the removal of part of the liver leads to hyperplasia of the remaining liver cells (hepatocytes) to compensate for the loss. The other options do not accurately identify the compensatory process described in the question.

PTS: 1 DIF: Cognitive Level: Remembering

29. What is the single most common cause of cellular injury?
- a. Hypoxic injury
 - b. Chemical injury
 - c. Infectious injury
 - d. Genetic injury

ANS: A

Hypoxia, or lack of sufficient oxygen, is the single most common cause of cellular injury. The other options are not as commonly observed as is the correct option.

PTS: 1 DIF: Cognitive Level: Remembering

30. In decompression sickness, emboli are formed by bubbles of what?
- a. Oxygen
 - b. Nitrogen
 - c. Carbon monoxide
 - d. Hydrogen

ANS: B

If water pressure is too rapidly reduced, the gases dissolved in blood bubble out of the solution, forming emboli. Oxygen is quickly redissolved, but nitrogen bubbles may persist and obstruct blood vessels. Ischemia, resulting from gas emboli, causes cellular hypoxia, particularly in the muscles, joints, and tendons, which are especially susceptible to changes in oxygen supply. The remaining options are not involved in the formation of decompression sickness emboli.

PTS: 1 DIF: Cognitive Level: Remembering

31. Which is an effect of ionizing radiation exposure?
- a. Respiratory distress
 - b. Sun intolerance
 - c. DNA aberrations
 - d. Death

ANS: C

The effects of ionizing radiation may be acute or delayed. Acute effects of high doses, such as skin redness, skin damage, or chromosomal aberrations, occur within hours, days, or months. The delayed effects of low doses may not be evident for years. The other options are not commonly considered effects of radiation exposure.

PTS: 1 DIF: Cognitive Level: Remembering

32. What is dysplasia?
- Abnormal increase in the number of a specific cell type
 - True adaptive process at the cellular level
 - Modification in the shape of a specific cell type
 - Lack of oxygen at the cellular level

ANS: C

Dysplasia refers only to abnormal changes in the size, shape, and organization of mature cells, not an increase in number. Dysplasia is not a true adaptive change and is not due to lack of oxygen at the cellular level.

PTS: 1 DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. Which organs are affected by lead consumption? (*Select all that apply.*)
- Bones
 - Muscles
 - Pancreas
 - Nerves
 - Eyes

ANS: A, D

The organ systems that are primarily affected by lead include the nervous system, bones, kidneys, teeth, cardiovascular, and reproductive and immune systems.

PTS: 1 DIF: Cognitive Level: Remembering

2. A healthcare professional is screening children for fetal alcohol syndrome. Which children would the professional assess as possibly suffering from this disorder? (*Select all that apply.*)
- Frequent asthma attacks
 - Cognitive impairment
 - Short stature for age
 - Esophageal stricture
 - Facial anomalies

ANS: B, C, E

Fetal alcohol syndrome (FAS) can lead to specific facial abnormalities, growth deficits, and CNS abnormalities. The children displaying these signs should be suspected of having FAS. FAS does not cause asthma or esophageal strictures.

PTS: 1 DIF: Cognitive Level: Applying

3. What organs are affected by the type of necrosis that results from either severe ischemia or chemical injury? (*Select all that apply.*)
- a. Lungs
 - b. Brain
 - c. Kidneys
 - d. Muscles
 - e. Heart

ANS: C, E

Coagulative necrosis, which occurs primarily in the kidneys, heart, and adrenal glands, is a common result of hypoxia from severe ischemia or hypoxia caused by chemical injury, especially the ingestion of mercuric chloride. The other options do not accurately identify organs affected by necrosis resulting from ischemia or chemical injury.

PTS: 1 DIF: Cognitive Level: Remembering

4. Which statements are true about melanin? (*Select all that apply.*)
- a. Rarely found in epithelial cells
 - b. Found in cells called *keratinocytes*, which are present in the retina
 - c. A factor in the prevention of certain types of cancer
 - d. Most influential in managing the effects of short-term sunlight exposure
 - e. Accumulates in specific cells found in the skin

ANS: B, C, E

Melanin accumulates in epithelial cells (keratinocytes) of the skin and retina and is an extremely important pigment because it protects the skin against long exposure to sunlight and is considered an essential factor in the prevention of skin cancer. Melanin is found in epithelial cells and is not most influential in managing the effects of short-term sunlight exposure.

PTS: 1 DIF: Cognitive Level: Remembering

5. What are examples of adaptive cellular responses? (*Select all that apply.*)
- a. Atrophy
 - b. Dysplasia
 - c. Hypertrophy
 - d. Hyperplasia
 - e. Metaplasia

ANS: A, C, D, E

Atrophy, hypertrophy, hyperplasia, and metaplasia are considered to be adaptive cellular responses. Dysplasia is not a true adaptive response.

PTS: 1 DIF: Cognitive Level: Remembering

6. What are examples of blunt force injuries? (*Select all that apply.*)
- a. Bruise to the upper arm, resulting from a fall
 - b. Simple tibia fracture sustained in a skiing accident

- c. Cut on the finger while slicing vegetables for a salad
- d. Spleen laceration caused by a punch during a physical fight
- e. Small caliber gunshot wound to the foot while target shooting

ANS: A, B, D

Blunt force injuries are the result of tearing, shearing, or crushing types of injuries, resulting in bruises, fractures, and lacerations caused by blows or impacts. Knife wounds and gunshot wounds are considered penetrating injuries.

PTS: 1

DIF: Cognitive Level: Remembering

7. Which statements are *true* regarding the effects of marijuana use? (*Select all that apply.*)
- a. Beneficial effects include decreases in nausea and pain.
 - b. Heavy use can result in psychomotor impairments.
 - c. Possibly causes reproductive changes
 - d. Research does not support marijuana use as a factor in developing lung cancer.
 - e. Fetal development appears to be unharmed by marijuana use.

ANS: A, B, C

Marijuana's effects include psychomotor impairments with heavy use, possible lung cancer (dose not determined), and fetal developmental effects. Reproductive changes have been seen in animal studies and may occur in humans. Beneficial effects include a decrease in nausea and chronic pain.

PTS: 1

DIF: Cognitive Level: Remembering

Chapter 03: The Cellular Environment: Fluids and Electrolytes, Acids and Bases

MULTIPLE CHOICE

1. Why are infants most susceptible to significant losses in total body water?
 - a. High body surface-to-body size ratio
 - b. Slow metabolic rate
 - c. Kidneys are not mature enough to counter fluid losses
 - d. Inability to communicate adequately when he or she is thirsty

ANS: C

Renal mechanisms that regulate fluid and electrolyte conservation are often not mature enough to counter the losses; consequently, dehydration may rapidly develop. Infants can be susceptible to changes in total body water because of their high metabolic rate and the turnover of body fluids caused by their greater body surface area in proportion to their total body size. An infant's ability to communicate is limited and caregivers must become adept at reading their signals.

PTS: 1

DIF: Cognitive Level: Remembering

2. Why does obesity create a greater risk for dehydration in people?
 - a. Adipose cells contain little water because fat is water repelling.
 - b. The metabolic rate of obese adults is slower than the rate of lean adults.
 - c. The rate of urine output of obese adults is higher than in lean adults.
 - d. The thirst receptors of the hypothalamus do not function effectively.

ANS: A

The percentage of total body water (TBW) varies with the amount of body fat and age. Because fat is water repelling (hydrophobic), very little water is contained in adipose cells. Individuals with more body fat have proportionately less TBW and tend to be more susceptible to fluid imbalances that cause dehydration.

PTS: 1

DIF: Cognitive Level: Remembering

3. A patient's blood gases reveal the following findings: pH 7.3; bicarbonate (HCO_3) 27 mEq/L; carbon dioxide (CO_2) 58 mm Hg. What is the interpretation of these gases?
 - a. Respiratory alkalosis
 - b. Metabolic acidosis
 - c. Respiratory acidosis
 - d. Metabolic alkalosis

ANS: C

The values provided in this question characterize only acute uncompensated respiratory acidosis. Respiratory acidosis is characterized by a low pH and high CO_2 . Alkalosis is characterized by higher than normal pH. A metabolic acidosis would have a lower than normal pH with a bicarbonate concentration of <22 mEq/L.

PTS: 1 DIF: Cognitive Level: Remembering

4. Water movement between the intracellular fluid (ICF) compartment and the extracellular fluid (ECF) compartment is primarily a function of what?
- Osmotic forces
 - Plasma oncotic pressure
 - Antidiuretic hormone
 - Hydrostatic forces

ANS: A

The movement of water between the ICF and ECF compartments is primarily a function of osmotic forces.

PTS: 1 DIF: Cognitive Level: Remembering

5. In addition to osmosis, what force is involved in the movement of water between the plasma and interstitial fluid spaces?
- Oncotic pressure
 - Buffering
 - Net filtration
 - Hydrostatic pressure

ANS: D

Water moves between the plasma and interstitial fluid through the forces of only osmosis and hydrostatic pressure, which occur across the capillary membrane. Buffers are substances that can absorb excessive acid or base to minimize pH fluctuations. Net filtration is a term used to identify fluid movement in relationship to the Starling hypothesis. Oncotic pressure encourages water to cross the barrier of capillaries to enter the circulatory system.

PTS: 1 DIF: Cognitive Level: Remembering

6. Venous obstruction is a cause of edema because of an increase in which pressure?
- Capillary hydrostatic
 - Interstitial hydrostatic
 - Capillary oncotic
 - Interstitial oncotic

ANS: A

Venous obstruction can increase the hydrostatic pressure of fluid in the capillaries enough to cause fluid to escape into the interstitial spaces. The remaining options are not causes of edema resulting from venous obstruction.

PTS: 1 DIF: Cognitive Level: Remembering

7. At the arterial end of capillaries, why does fluid move from the intravascular space into the interstitial space?
- Interstitial hydrostatic pressure is higher than the capillary hydrostatic pressure.
 - Capillary hydrostatic pressure is higher than the capillary oncotic pressure.

- c. Interstitial oncotic pressure is higher than the interstitial hydrostatic pressure.
- d. Capillary oncotic pressure is lower than the interstitial hydrostatic pressure.

ANS: B

At the arterial end of capillaries, fluid moves from the intravascular space into the interstitial because capillary hydrostatic pressure is higher than the capillary oncotic pressure.

PTS: 1 DIF: Cognitive Level: Remembering

8. Low plasma albumin causes edema as a result of a reduction in which pressure?
- a. Capillary hydrostatic
 - b. Interstitial hydrostatic
 - c. Plasma oncotic
 - d. Interstitial oncotic

ANS: C

Albumin is the plasma protein that is primarily responsible for the plasma oncotic pressure because it has the highest concentration. Therefore a low concentration of albumin would lower the plasma oncotic pressure, leading to edema.

PTS: 1 DIF: Cognitive Level: Remembering

9. How are secretion of antidiuretic hormone (ADH) and the perception of thirst stimulated?
- a. Decrease in serum sodium
 - b. Increase in plasma osmolality
 - c. Increase in glomerular filtration rate
 - d. Decrease in osmoreceptor stimulation

ANS: B

Secretion of ADH and the perception of thirst are primary factors in the regulation of water balance. Thirst is a sensation that stimulates water-drinking behavior. Thirst is experienced when water loss equals 2% of an individual's body weight or when osmotic pressure increases. A decrease in serum sodium would have the opposite effect. Increased glomerular filtration and decreased osmoreceptor stimulation would not lead to secretion of ADH and the feeling of thirst.

PTS: 1 DIF: Cognitive Level: Remembering

10. Thirst activates osmoreceptors following an increase in which blood plasma component?
- a. Antidiuretic hormone
 - b. Aldosterone
 - c. Hydrostatic pressure
 - d. Osmotic pressure

ANS: D

Thirst is experienced when water loss equals 2% of an individual's body weight or when osmotic pressure increases. Dry mouth, hyperosmolality, and plasma volume depletion activate *osmoreceptors* (neurons located in the hypothalamus that are stimulated by increased osmotic pressure). Increased antidiuretic hormone, aldosterone, and hydrostatic pressure do not activate osmoreceptors.

PTS: 1 DIF: Cognitive Level: Remembering

11. A student asks about natriuretic peptides. Which statement by the professor is most accurate?
- Decrease blood pressure and increase sodium and water excretion.
 - Increase blood pressure and decrease sodium and water excretion.
 - Increase heart rate and decrease potassium excretion.
 - Decrease heart rate and increase potassium excretion.

ANS: A

Natriuretic peptides are hormones that include atrial natriuretic peptide (ANP) produced by the myocardial atria, brain natriuretic peptide (BNP) produced by the myocardial ventricles, and urodilatin within the kidney. Natriuretic peptides decrease blood pressure and increase sodium and water excretion. They do not increase blood pressure, decrease sodium and water excretion, directly affect heart rate, or change potassium excretion.

PTS: 1 DIF: Cognitive Level: Remembering

12. When changes in total body water are accompanied by proportional changes in electrolytes, what type of alteration occurs?
- Isotonic
 - Hypertonic
 - Hypotonic
 - Normotonic

ANS: A

Isotonic alterations occur when proportional changes in electrolytes and water accompany changes in total body water leaving osmolality unchanged. Hypertonic changes develop when the osmolality of the ECF is elevated higher than normal. Hypotonic changes occur when the osmolality of the ECF is lower than normal. Normotonic is not a description of changes in body water.

PTS: 1 DIF: Cognitive Level: Remembering

13. Which enzyme is secreted by the juxtaglomerular cells of the kidney when circulating blood volume is reduced?
- Angiotensin I
 - Angiotensin II
 - Aldosterone
 - Renin

ANS: D

When circulating blood volume or blood pressure is reduced, *renin*, an enzyme secreted by the juxtaglomerular cells of the kidney, is released in response to sympathetic nerve stimulation and decreased perfusion of the renal vasculature. Renin stimulates the formation of angiotensin I, which is an inactive polypeptide. In the presence of angiotensin-converting enzyme, angiotensin I is transformed into angiotensin II, which is a potent vasoconstrictor. Aldosterone promotes sodium and water reabsorption by the kidneys.

PTS: 1

DIF: Cognitive Level: Remembering

14. A patient in the hospital has hypernatremia. What condition should the healthcare professional assess for?
- Syndrome of inappropriate antidiuretic hormone
 - Hypersecretion of aldosterone
 - Brief bouts of vomiting or diarrhea
 - Excessive diuretic therapy

ANS: B

Hypernatremia occurs because of (1) inadequate free water intake, (2) inappropriate administration of hypertonic saline solution (e.g., sodium bicarbonate for treatment of acidosis during cardiac arrest), (3) high sodium levels as a result of oversecretion of aldosterone (as in primary hyperaldosteronism), or (4) Cushing syndrome (caused by the excess secretion of adrenocorticotropic hormone [ACTH], which also causes increased secretion of aldosterone). The other options do not result in hypernatremia. The healthcare professional should assess the patient for hypersecretion of aldosterone.

PTS: 1

DIF: Cognitive Level: Applying

15. A patient has a serum sodium level of 165 mEq/L. The healthcare professional explains that the clinical manifestations of confusion, convulsions, cerebral hemorrhage, and coma are caused by what mechanism?
- High sodium in the blood vessels pulls water out of the brain cells into the blood vessels, causing brain cells to shrink.
 - High sodium in the brain cells pulls water out of the blood vessels into the brain cells, causing them to swell.
 - Low sodium in the blood vessels pulls potassium out of the brain cells, which slows the synapses in the brain.
 - Low sodium in the blood vessels draws chloride into the brain cells followed by water, causing the brain cells to swell.

ANS: A

A normal serum sodium level is 135 to 145 mEq/L so this patient's level is high. Hypernatremia causes manifestations by pulling water out of the brain cells into the blood vessels.

PTS: 1

DIF: Cognitive Level: Applying

16. What does vomiting-induced metabolic alkalosis cause?
- Retained sodium to bind with the chloride
 - Hydrogen to move into the cell and exchange with potassium
 - Retention of bicarbonate to maintain the anion balance
 - Hypoventilation to compensate for the metabolic alkalosis

ANS: C

When vomiting with the depletion of ECF and chloride (hypochloremic metabolic alkalosis) causes acid loss, renal compensation is not effective; the volume depletion and loss of electrolytes (sodium [Na^+], potassium [K^+], hydrogen [H^+], chlorine [Cl^-]) stimulate a paradoxical response by the kidneys. The kidneys increase sodium and bicarbonate reabsorption with the excretion of hydrogen. Bicarbonate is reabsorbed to maintain an anionic balance because the ECF chloride concentration is decreased. Metabolic alkalosis will not lead to retained sodium, hydrogen movement into the cell, or hypoventilation.

PTS: 1 DIF: Cognitive Level: Remembering

17. The pathophysiologic process of edema is related to which mechanism?
- Sodium depletion
 - Decreased capillary hydrostatic pressure
 - Increased plasma oncotic pressure
 - Lymphatic obstruction

ANS: D

The pathophysiologic process of edema is related to an increase in the forces favoring fluid filtration from the capillaries or lymphatic channels into the tissues. The most common mechanisms are increased capillary hydrostatic pressure, decreased plasma oncotic pressure, increased capillary membrane permeability and lymphatic obstruction, and sodium retention.

PTS: 1 DIF: Cognitive Level: Remembering

18. Why is insulin used to treat hyperkalemia?
- Stimulates sodium to be removed from the cell in exchange for potassium
 - Binds to potassium to remove it through the kidneys
 - Transports potassium from the blood into the cell along with glucose
 - Breaks down the chemical components of potassium, inactivating it

ANS: C

Insulin promotes the uptake of K^+ by stimulating the $\text{Na}^+-\text{K}^+-\text{ATPase}$ pump. It does not stimulate the removal of sodium from the cell nor does it bind to K^+ to excrete it. The $\text{Na}^+-\text{K}^+-\text{ATPase}$ pump does facilitate movement of K^+ into liver and muscle cells along with glucose to regulate blood glucose after eating.

PTS: 1 DIF: Cognitive Level: Remembering

19. A major determinant of the resting membrane potential necessary for the transmission of nerve impulses is the ratio between what?
- Intracellular and extracellular Na^+
 - Intracellular and extracellular K^+
 - Intracellular Na^+ and extracellular K^+
 - Intracellular K^+ and extracellular Na^+

ANS: B

The ratio of K^+ in the ICF to K^+ in the ECF is the major determinant of the resting membrane potential, which is necessary for the transmission and conduction of nerve impulses, for the maintenance of normal cardiac rhythms, and for the skeletal and smooth muscle contraction. This is not true of the other options.

PTS: 1 DIF: Cognitive Level: Remembering

20. During acidosis, the body compensates for the increase in serum hydrogen ions by shifting hydrogen ions into the cell in exchange for which electrolyte?
- Oxygen
 - Sodium
 - Potassium
 - Magnesium

ANS: C

In states of acidosis, hydrogen ions shift into the cells in exchange for intracellular fluid potassium; hyperkalemia and acidosis therefore often occur together. This is not true of the other options.

PTS: 1 DIF: Cognitive Level: Remembering

21. A healthcare professional is caring for four patients. Which patient should the professional assess for hyperkalemia?
- Hyperparathyroidism
 - Vomiting
 - Renal failure
 - Hyperaldosteronism

ANS: C

Hyperkalemia should be investigated when a history of renal disease, massive trauma, insulin deficiency, Addison disease, use of potassium salt substitutes, or metabolic acidosis exists. Hyperparathyroidism might lead to hyperphosphatemia. Vomiting is frequently associated with potassium depletion. Hyperaldosteronism also can lead to potassium wasting.

PTS: 1 DIF: Cognitive Level: Applying

22. In hyperkalemia, what change occurs to the cells' resting membrane potential?
- Hypopolarization
 - Hyperexcitability
 - Depolarization
 - Repolarization

ANS: A

In hyperkalemia, the cells' resting membrane potential becomes more positive (i.e., changes from -90 to -80 mV) and the cell membrane is *hypopolarized* (i.e., the inside of the cell becomes less negative or partially depolarized).

PTS: 1 DIF: Cognitive Level: Knowledge

23. A patient's chart indicates Kussmaul respirations. The student asks the healthcare professional what this is caused by. What response by the professional is most accurate?
- Anxiety leads to Kussmaul respirations and is a cause of respiratory acidosis.
 - A compensatory measure is needed to correct metabolic acidosis.
 - Diabetic ketoacidosis is leading to metabolic acidosis.
 - More oxygen is necessary to compensate for respiratory acidosis.

ANS: B

Deep, rapid respirations (Kussmaul respirations) are indicative of respiratory compensation for metabolic acidosis. Anxiety would lead to respiratory alkalosis as carbon dioxide is blown off by the lungs. Kussmaul's respirations may be seen in diabetic ketoacidosis, but they do not diagnose it. Kussmaul's respirations are not present in respiratory acidosis.

PTS: 1

DIF: Cognitive Level: Comprehension

24. A healthcare provider notes that tapping the patient's facial nerve leads to lip twitching. What electrolyte value is correlated with this finding?
- K^+ : 2.8 mEq/L
 - K^+ : 5.4 mEq/L
 - Ca^{++} : 8.2 mg/dL
 - Ca^{++} : 12.9 mg/dL

ANS: C

This patient has a positive Chvostek sign, which is indicative of hypocalcemia. The normal range of Ca^{++} is 9 to 10.5 mg/dL. 12.9 mg/dL indicates hypercalcemia. Potassium imbalances are not related.

PTS: 1

DIF: Cognitive Level: Analyzing

25. A patient has a history of excessive use of magnesium-containing antacids and aluminum-containing antacids. What lab value does the healthcare professional correlate to this behavior?
- Magnesium 1.8 mg/dL
 - Phosphate 1.9 mg/dL
 - Sodium 149 mEq/L
 - Potassium 2.5 mEq/L

ANS: B

Excessive use of magnesium-containing and aluminum-containing antacids can lead to hypophosphatemia, which is a serum level less than 2 mg/dL. The magnesium level is normal, but magnesium is not related. The sodium level is high, but that is not related. The potassium level is low, but this is also not related.

PTS: 1

DIF: Cognitive Level: Analyzing

26. A healthcare professional is caring for four patients. Which patient should the professional assess for hypermagnesemia as a priority?
- Hepatitis
 - Renal failure
 - Trauma to the hypothalamus

d. Pancreatitis

ANS: B

Renal failure usually causes hypermagnesemia, in which magnesium concentration is greater than 2.5 mEq/L. Hypermagnesemia is not a result of the other options.

PTS: 1

DIF: Cognitive Level: Applying

27. Physiologic pH is maintained at approximately 7.4 because bicarbonate (HCO_3) and carbonic acid (H_2CO_3) exist in what ratio?

- a. 20:1
- b. 1:20
- c. 10:2
- d. 10:5

ANS: A

The relationship between HCO_3 and H_2CO_3 is usually expressed as a ratio. When the pH is 7.4, this ratio is 20:1 (HCO_3 : H_2CO_3). The other options do not accurately identify physiologic pH by the correct ratio of HCO_3 and H_2CO_3 .

PTS: 1

DIF: Cognitive Level: Knowledge

28. Where is two thirds of the body's water found?

- a. Interstitial fluid spaces
- b. Vascular system
- c. Intracellular fluid compartments
- d. Intraocular fluids

ANS: C

Two thirds of the body's water is in the intracellular fluid (ICF) compartment, and one third is in the extracellular fluid (ECF) compartment. The two main ECF compartments are the interstitial fluid and the intravascular fluid, which is the blood plasma. Other ECF compartments include the lymph and the transcellular fluids, such as the synovial, intestinal, biliary, hepatic, pancreatic, and cerebrospinal fluids; sweat; urine; and pleural, synovial, peritoneal, pericardial, and intraocular fluids.

PTS: 1

DIF: Cognitive Level: Knowledge

29. A healthcare professional just administered a large dose of insulin to a patient. Which electrolyte value should the professional monitor as a priority?

- a. Sodium
- b. Potassium
- c. Calcium
- d. Magnesium

ANS: B

Insulin contributes to the regulation of plasma potassium levels by stimulating the Na^+ , K^+ -ATPase pump, thereby promoting the movement of potassium into the cells. The professional should monitor this patient's potassium level as a priority. The other electrolytes are not directly influenced by insulin administration.

PTS: 1 DIF: Cognitive Level: Applying

30. Why does increased capillary hydrostatic pressure result in edema?
- Losses or diminished production of plasma albumin
 - Inflammation resulting from an immune response
 - Blockage within the lymphatic channel system
 - Sodium and water retention

ANS: D

Increased capillary hydrostatic pressure can result from venous obstruction or sodium and water retention. The other options do not accurately describe the cause of edema related to increased capillary hydrostatic pressure.

PTS: 1 DIF: Cognitive Level: Knowledge

31. A patient's electrocardiogram (ECG) shows tall, peaked T waves. What lab value or assessment would the healthcare professional correlate with this finding?
- Positive Chvostek sign
 - Serum potassium 6.7 mEq/L
 - Nausea and vomiting
 - Serum sodium 138 mEq/L

ANS: B

Tall peaked T waves on an ECG are indicative of hyperkalemia. Normal potassium is 3.5 to 5.0 mEq/L. A positive Chvostek sign is indicative of hypocalcemia. Nausea and vomiting are not related.

PTS: 1 DIF: Cognitive Level: Analyzing

MULTIPLE RESPONSE

1. Which groups are at risk for fluid imbalance? (*Select all that apply.*)
- Women
 - Infants
 - Men
 - Obese persons
 - Older adults

ANS: B, D, E

Kidney function, surface area, total body water, and the hydrophobic nature of fat cells all contribute to the increased risk for fluid imbalance among obese individuals, infants, and older adults. Gender alone is not a risk factor for fluid imbalance.

PTS: 1 DIF: Cognitive Level: Knowledge

2. A patient is admitted to the hospital with dehydration. For which signs or symptoms would the healthcare professional assess? (*Select all that apply.*)
- a. Moist mucous membranes
 - b. Weak pulses
 - c. Tachycardia
 - d. Polyuria
 - e. Weight loss

ANS: B, C, E

Symptoms of dehydration include weak pulses, tachycardia, and weight loss among others. Moist mucus membranes are normal and indicate normal fluid balance. Polyuria would indicate either a disease state or fluid volume overload.

PTS: 1 DIF: Cognitive Level: Applying

3. What are the causes of hypocalcemia? (*Select all that apply.*)
- a. Repeated blood administration
 - b. Pancreatitis
 - c. Decreased reabsorption of calcium
 - d. Hyperparathyroidism
 - e. Kidney stones

ANS: A, B

Blood transfusions are a common cause of hypocalcemia because the citrate solution used in storing whole blood binds with calcium. Pancreatitis causes a release of lipases into soft-tissue spaces; consequently, the free fatty acids that are formed bind calcium, causing a decrease in ionized calcium. The other options are not recognized causes of hypocalcemia.

PTS: 1 DIF: Cognitive Level: Knowledge

4. A patient is admitted with hyponatremia. For which clinical manifestations would the healthcare professional assess? (*Select all that apply.*)
- a. Headache
 - b. Seizures
 - c. Paranoia
 - d. Confusion
 - e. Lethargy

ANS: A, B, D, E

Behavioral and neurologic changes characteristic of hyponatremia include lethargy, headache, confusion, apprehension, seizures, and coma. Paranoia is not associated with hyponatremia.

PTS: 1 DIF: Cognitive Level: Applying

5. A patient has been diagnosed with hypercalcemia. Which manifestations does the healthcare professional assess for? (*Select all that apply.*)
- a. Diarrhea

- b. Calcium-based kidney stones
- c. ECG showing narrow T waves
- d. Lethargy
- e. Bradycardia

ANS: B, D, E

Fatigue, weakness, lethargy, anorexia, nausea, and constipation are common. Behavioral changes may occur. Impaired renal function frequently develops, and kidney stones form as precipitates of calcium salts. A shortened QT segment and depressed widened T waves also may be observed on the ECG, with bradycardia and varying degrees of heart block.

PTS: 1 DIF: Cognitive Level: Applying

6. A patient's serum potassium level is 2.7 mEq/L. Which clinical manifestations does the healthcare professional assess for? (*Select all that apply.*)
- a. Paralytic ileus
 - b. Sinus bradycardia
 - c. Atrioventricular block
 - d. Dry mucous membranes
 - e. Tetany

ANS: A, B, C

Normal potassium level is 3.5 to 5.0 mEq/L so this patient has hypokalemia. A variety of dysrhythmias may occur, including sinus bradycardia, atrioventricular block, paroxysmal atrial tachycardia, and paralytic ileus. The other options are not related to hypokalemia.

PTS: 1 DIF: Cognitive Level: Analyzing

7. A third of the body's fluid is contained in the extracellular interstitial fluid spaces that include what? (*Select all that apply.*)
- a. Urine
 - b. Intraocular fluids
 - c. Lymph
 - d. Blood plasma
 - e. Sweat

ANS: A, B, C, E

Two thirds of the body's water is in the intracellular fluid (ICF) compartment, and one third is in the extracellular fluid (ECF) compartments. The two main ECF compartments are the interstitial fluid and the intravascular fluid, such as the blood plasma. Interstitial ECF compartments include the lymph and the transcellular fluids, such as the synovial, intestinal, biliary, hepatic, pancreatic, and cerebrospinal fluids; sweat; urine; and pleural, synovial, peritoneal, pericardial, and intraocular fluids.

PTS: 1 DIF: Cognitive Level: Knowledge

8. An imbalance of potassium can produce which dysfunctions? (*Select all that apply.*)
- a. Weakness of skeletal muscles
 - b. Cardiac dysrhythmias

- c. Smooth muscle atony
- d. Visual impairment
- e. Hearing loss

ANS: A, B, C

Symptoms of hyperkalemia vary, but common characteristics are muscle weakness or paralysis and dysrhythmias with changes in the ECG. A wide range of metabolic dysfunctions may result from hypokalemia. Neuromuscular excitability is decreased, causing skeletal muscle weakness, smooth muscle atony, and cardiac dysrhythmias. Potassium imbalances do not produce visual or hearing problems.

PTS: 1 DIF: Cognitive Level: Knowledge

9. Which statements regarding total body water (TBW) are *true*? (*Select all that apply.*)
- a. During childhood, TBW slowly decreases in relationship to body weight.
 - b. Gender has no influence on TBW until old age.
 - c. Men tend to have greater TBW as a result of their muscle mass.
 - d. Estrogen plays a role in female TBW.
 - e. Older adults experience a decrease in TBW as a result of decreased muscle mass.

ANS: A, C, D, E

During childhood, TBW slowly decreases to 60% to 65% of body weight. At adolescence, the percentage of TBW approaches adult proportions, and gender differences begin to appear. Men eventually have a greater percentage of body water as a function of increasing muscle mass. Women have more body fat and less muscle as a function of estrogens and therefore have less body water. With increasing age, the percentage of TBW declines further still. The decrease is caused, in part, by an increased amount of fat and a decreased amount of muscle, as well as by a reduced ability to regulate sodium and water balance.

PTS: 1 DIF: Cognitive Level: Knowledge

10. The calcium and phosphate balance is influenced by which three substances? (*Select all that apply.*)
- a. Parathyroid hormone
 - b. Vasopressin
 - c. Thyroid hormone
 - d. Calcitonin
 - e. Vitamin D

ANS: A, D, E

Three hormones regulate calcium and phosphate balance: parathyroid hormone (PTH), vitamin D, and calcitonin. Vasopressin and thyroid hormone do not influence calcium and phosphate balance.

PTS: 1 DIF: Cognitive Level: Knowledge

Chapter 04: Genes and Genetic Diseases

MULTIPLE CHOICE

1. In somatic cell gene therapy, what type of vector is most commonly used to alter a specific set of an individual's somatic cells?
 - a. Virus
 - b. Bacteria
 - c. RNA polymerase
 - d. Recombinant DNA

ANS: A

In somatic cell gene therapy, a vector is used to carry a normal copy of the mutated gene into the individual's cells. These vectors are usually viruses, such as retroviruses, lentiviruses, or adenoviruses, which have been genetically modified so that they contain the normal human gene and cannot make copies of themselves (otherwise they could cause a viral infection). Bacteria, RNA polymerase, and recombinant DNA are not used as vectors in somatic cell gene therapy.

PTS: 1

DIF: Cognitive Level: Remembering

2. In DNA replication, what does the enzyme DNA polymerase do?
 - a. Travel along the single DNA strand, adding the correct nucleotide to the new strand
 - b. Move along the double strand of DNA to unwind the nucleotides of the double helix
 - c. Hold the double strand apart while the correct nucleotides are added to the strand
 - d. Transport the double strand of DNA from the nucleus to the cytoplasm for protein formation

ANS: A

The DNA polymerase enzyme travels along the single DNA strand, adding the correct nucleotides to the free end of the new strand (see Figure 4-3, B). The correct option is the only one that accurately describes the process involved in DNA replication using DNA polymerase.

PTS: 1

DIF: Cognitive Level: Remembering

3. How is transcription best defined?
 - a. DNA polymerase binds to the promoter site on ribonucleic acid (RNA).
 - b. RNA directs the synthesis of polypeptides for protein synthesis.
 - c. RNA is synthesized from a DNA template.
 - d. A base pair substitution results in a mutation of the amino acid sequence.

ANS: C

Transcription is the process by which RNA is synthesized from a DNA template. The correct option is the only one that accurately defines the term *transcription*.

PTS: 1 DIF: Cognitive Level: Remembering

4. What is the purpose of using a Giemsa staining technique on chromosomes?
- Permit the mitotic process to be followed and monitored for variations.
 - Allow for the numbering of chromosomes and the identification of variations.
 - Identify new somatic cells formed through mitosis and cytokinesis.
 - Distinguish the sex chromosomes from the homologous chromosomes.

ANS: B

One of the most commonly used stains is Giemsa stain. By using banding techniques, chromosomes can be unambiguously numbered, and individual variation in chromosome composition can be studied. Missing or duplicated portions of chromosomes, which often result in serious diseases, also can be readily identified. The correct option is the only one that accurately describes the purpose of the Giemsa staining technique.

PTS: 1 DIF: Cognitive Level: Remembering

5. An amniocentesis indicates a neural tube defect when an increase in which protein is evident?
- Cytochrome P-450
 - Alpha fetoprotein
 - DNA polymerase
 - Embryonic proteins

ANS: B

Other disorders can be detected with this procedure. These include most neural tube defects, which cause an elevation of alpha fetoprotein in the amniotic fluid, and hundreds of diseases caused by mutations of single genes. Cytochrome P-450 is useful in helping to formulate drug doses more precisely. DNA polymerase travels along the single DNA strand, adding the correct nucleotides to the free end of the new strand during DNA replication. Embryonic proteins are not involved in neural tube defects.

PTS: 1 DIF: Cognitive Level: Remembering

6. Amniocentesis is recommended for pregnant with what history?
- Have a history of chronic illness
 - Have a family history of genetic disorders
 - Have experienced in vitro fertilization
 - Had a late menarche

ANS: B

Amniocentesis is recommended only for pregnancies known to have an elevated risk for a genetic disease or in women older than 30 to 35 years of age because of the slightly higher risk of fetal loss as compared to the general population. Having a chronic illness, previous in vitro fertilization, or late menarche are not reasons to have an amniocentesis.

PTS: 1 DIF: Cognitive Level: Remembering

7. What is the technique for prenatal diagnosis of chromosomal abnormalities at 10 to 12 weeks' gestation?

- a. Gene mapping
- b. Linkage analysis
- c. Amniocentesis
- d. Chorionic villus sampling

ANS: D

Chorionic villus sampling consists of extracting a small amount of villous tissue directly from the chorion. This procedure can be performed at 10 weeks' gestation and does not require in vitro culturing of cells; sufficient numbers are directly available in the extracted tissue. Thus the procedure allows prenatal diagnosis at approximately 3 months' gestation rather than at nearly 4 months' gestation which is generally when amniocentesis is performed. Gene mapping and linkage analysis are not performed exclusively on women who are 10 weeks' pregnant.

PTS: 1 DIF: Cognitive Level: Remembering

8. What is the term for an error in which homologous chromosomes fail to separate during meiosis or mitosis?
- a. Aneuploidy
 - b. Nondisjunction
 - c. Polyploidy
 - d. Translocation

ANS: B

Aneuploidy is usually the result of nondisjunction, an error in which homologous chromosomes or sister chromatids fail to separate normally during meiosis or mitosis. Aneuploidy refers to cells that do not contain a multiple of 23 chromosomes. Polyploidy is when a cell has more than the diploid number of chromosomes, it is said to be a polyploid cell. Translocation refers the interchanging of genetic material between nonhomologous chromosomes.

PTS: 1 DIF: Cognitive Level: Remembering

9. A healthcare professional is assessing a child who has complete trisomy of the twenty-first chromosome. What findings does the professional relate to this condition?
- a. Widely spaced nipples, reduced carrying angle at the elbow, and sparse body hair
 - b. An IQ of 25 to 70, low nasal bridge, protruding tongue, and flat, low-set ears
 - c. High-pitched voice, tall stature, gynecomastia, and an IQ of 60 to 90
 - d. Circumoral cyanosis, edema of the feet, short stature, and mental slowness

ANS: B

This child has Trisomy 21, also known as Down syndrome. These children typically present with IQs ranging from 25 to 70. The facial appearance is distinctive and exhibits a low nasal bridge, epicanthal folds, protruding tongue, and flat, low-set ears. Widely spaced nipples and edema of the newborn's feet are characteristic of Turner syndrome. The high-pitched voice and gynecomastia are characteristic of Klinefelter syndrome.

PTS: 1 DIF: Cognitive Level: Applying

10. What is the most common cause of Down syndrome?
- a. Paternal nondisjunction

- b. Maternal translocations
- c. Maternal nondisjunction
- d. Paternal translocation

ANS: C

Nondisjunction during the formation of one of the parent's gametes or during early embryonic development occurs in approximately 97% of infants born with Down syndrome. In approximately 90% to 95% of infants, the nondisjunction occurs in the formation of the mother's egg cell. Down syndrome is rarely caused by paternal nondisjunction. Robertsonian translocations are responsible for 3% to 5% of cases of Down syndrome. A high-pitched voice and gynecomastia are characteristic of Klinefelter syndrome.

PTS: 1

DIF: Cognitive Level: Remembering

11. What syndrome, characterized by an absent homologous X chromosome with only a single X chromosome, exhibits features that include a short stature, widely spaced nipples, and webbed neck?
- a. Down
 - b. Cri du chat
 - c. Turner
 - d. Klinefelter

ANS: C

In Turner syndrome, a sex chromosome is missing, and the person's total chromosome count is 45. Characteristic signs include short stature, female genitalia, webbed neck, shieldlike chest with underdeveloped breasts and widely spaced nipples, and imperfectly developed ovaries. Children with Down syndrome have an IQ of 25 to 70, low nasal bridge, protruding tongue, and flat, low-set ears. Children with Cri du chat have a characteristic cry and other symptoms include low birth weight, severe intellectual disability, microcephaly (smaller than normal head size), heart defects, and a typical facial appearance. A high-pitched voice and gynecomastia are characteristic of Klinefelter syndrome.

PTS: 1

DIF: Cognitive Level: Remembering

12. A person with 47, XXY karyotype has the genetic disorder resulting in which syndrome?
- a. Turner
 - b. Klinefelter
 - c. Down
 - d. Fragile X

ANS: B

A disorder in the chromosome (47, XXY karyotype) results in a disorder known as *Klinefelter syndrome*. Turner syndrome has a karyotype of 45, X. Down syndrome is caused by Trisomy 21. Fragile X syndrome is caused by microscopically observable breaks and gaps in the X chromosome.

PTS: 1

DIF: Cognitive Level: Remembering

13. What is the second most commonly recognized genetic cause of intellectual disability?

- a. Down syndrome
- b. Fragile X syndrome
- c. Klinefelter syndrome
- d. Turner syndrome

ANS: B

The fragile X syndrome is the second most common genetic cause of intellectual disability (after Down syndrome). Fragile X, Klinefelter, and Turner syndromes not observed with enough frequency are to be recognized as the second most common cause of intellectual disability.

PTS: 1

DIF: Cognitive Level: Remembering

14. What is the blood type of a person who is heterozygous, having A and B alleles as codominant?
- a. A
 - b. B
 - c. O
 - d. AB

ANS: D

When the heterozygote is distinguishable from both homozygotes, the locus is said to exhibit codominance. An example is the ABO blood group, in which heterozygotes having the A and B alleles express both of them as A and B antigens on their red cells (forming blood group AB). Blood types A, B, and O do not demonstrate codominance.

PTS: 1

DIF: Cognitive Level: Remembering

15. A couple has two children diagnosed with an autosomal dominant genetic disease and asks the healthcare professional what the probability is that their next child will have the same genetic disease. What response by the professional is best?
- a. One sixth
 - b. One fourth
 - c. One third
 - d. One half

ANS: D

Affected heterozygous individuals transmit the trait to approximately one half of their children; however, because gamete transmission is subject to chance fluctuations, it is possible that all or none of the children of an affected parent may have the trait. Nevertheless, when large numbers of matings of this type are studied, the proportion of affected children closely approaches one half.

PTS: 1

DIF: Cognitive Level: Understanding

16. When a child inherits a disease that is autosomal recessive, it is inherited from whom?
- a. Father
 - b. Mother
 - c. Both parents
 - d. Grandparent

ANS: C

In most cases of recessive disease, both parents of affected individuals are heterozygous carriers.

PTS: 1

DIF: Cognitive Level: Remembering

17. People diagnosed with neurofibromatosis have varying degrees of the condition because of which genetic principle?
- Penetrance
 - Expressivity
 - Dominance
 - Recessiveness

ANS: B

Expressivity is the extent of variation in phenotype associated with a particular genotype. If expressivity of a disease is variable, then the penetrance may be complete but the severity of the disease can vary greatly. A well-known example of variable expressivity in an autosomal dominant disease is type 1 neurofibromatosis. The penetrance of a trait is the percentage of individuals with a specific genotype who also exhibit the expected phenotype. An allele whose effects are observable is said to be dominant, while one whose effects are hidden is said to be recessive.

PTS: 1

DIF: Cognitive Level: Remembering

18. Which genetic disease has been linked to a mutation of the tumor-suppressor gene?
- Hemochromatosis
 - Retinoblastoma
 - Familial breast cancer
 - Hemophilia A

ANS: B

The gene responsible for retinoblastoma has been mapped to the long arm of chromosome 13, and its DNA sequence has been extensively studied. This gene is known as a tumor-suppressor gene; the normal function of its protein product is to regulate the cell cycle so that cells do not grow uncontrollably. Hemochromatosis, familial breast cancer, and hemophilia A are not caused by a mutation of the tumor-suppressor gene.

PTS: 1

DIF: Cognitive Level: Remembering

19. Cystic fibrosis is caused by what type of gene?
- X-linked dominant
 - X-linked recessive
 - Autosomal dominant
 - Autosomal recessive

ANS: D

Cystic fibrosis is the most common lethal autosomal recessive disease in white children. It is not X linked or dominant.

PTS: 1

DIF: Cognitive Level: Remembering

20. Which is an important criterion for discerning autosomal recessive inheritance?
- Consanguinity is sometimes present.
 - Females are affected more than males.
 - The disease is observed in both the parents, as well as in the siblings.
 - On average, one half of the offspring of the carrier will be affected.

ANS: A

Consanguinity (“inbreeding”) is often an important characteristic of pedigrees for recessive diseases; relatives share a certain proportion of genes received from a common ancestor. The other statements do not describe a criterion important in autosomal recessive inheritance.

PTS: 1 DIF: Cognitive Level: Remembering

21. Consanguinity refers to the mating of people in what situation?
- Who are unrelated
 - When one has an autosomal dominant disorder
 - Having common family relations
 - When one has a chromosomal abnormality

ANS: C

Consanguinity refers to the mating of two related individuals, and the offspring of such matings are said to be “*inbred*.”

PTS: 1 DIF: Cognitive Level: Remembering

22. Males, having only one X chromosome, are said to be what?
- Homozygous
 - Heterozygous
 - Hemizygous
 - Ambizygous

ANS: C

Males, having only one X chromosome, are said to be hemizygous for genes on this chromosome. Homozygous refers to two alleles being identical at a specific locus. When the alleles are not identical at that locus, the individual is said to be heterozygous. Ambizygous is not a term in the text.

PTS: 1 DIF: Cognitive Level: Remembering

23. Males are more often affected by which type of genetic disease?
- Sex-linked dominant
 - Sex-influenced
 - Sex-linked
 - Sex-linked recessive

ANS: D

Males are more frequently affected by X-linked recessive diseases, with the difference becoming more pronounced as the disease becomes rarer. The correct option is the only one that is a characteristic of a male-dominate disease.

PTS: 1 DIF: Cognitive Level: Remembering

24. Why an X-linked recessive disease can skip generations?
- Females are hemizygous for the X chromosome.
 - The disease can be transmitted through female carriers.
 - Mothers cannot pass X-linked genes to their sons.
 - These diseases need only one copy of the gene in females.

ANS: B

Skipped generations are often observed in X-linked recessive disease pedigrees because the gene can be transmitted through female carriers. Males are hemizygous for genes on the X chromosome. Fathers cannot pass X-linked genes to their sons. X-linked recessive diseases are observed significantly more often in males than in females, because males need only one copy of the gene to express the disease.

PTS: 1 DIF: Cognitive Level: Remembering

25. The presence of a zygote having one chromosome with the normal complement of genes and one with a missing gene is characteristic of which genetic disorder?
- Cri du chat
 - Down syndrome
 - Klinefelter syndrome
 - Turner syndrome

ANS: A

This description is only accurate for Cri du chat syndrome.

PTS: 1 DIF: Cognitive Level: Remembering

26. A child with which genetic disorder has a characteristic cry?
- Down syndrome
 - Klinefelter syndrome
 - Turner syndrome
 - Cri du chat

ANS: D

Cri du chat, which literally means “cry of the cat,” describes the characteristic cry of the affected child. The correct option is the only one with the characteristic cry.

PTS: 1 DIF: Cognitive Level: Remembering

27. Which statement is *true* regarding X-linked recessive conditions?
- Such diseases use males as phenotypical carriers.
 - These conditions are passed from affected father to all of his female children.
 - 25% of an affected individual’s grandsons will be affected.

d. Cystic fibrosis is an example of such a condition.

ANS: B

X-linked recessive conditions are passed from an affected father to all of his daughters, who, as phenotypically normal carriers, transmit it to approximately one half of their sons, who are affected. Cystic fibrosis is an autosomal dominant disease.

PTS: 1

DIF: Cognitive Level: Remembering

28. DNA formation occurs in which of the cell's structures?

- a. Nucleus
- b. Cytoplasm
- c. Organelle
- d. Membrane

ANS: A

DNA is formed and replicated only in the cell nucleus.

PTS: 1

DIF: Cognitive Level: Remembering

29. What is the risk for the recurrence of autosomal dominant diseases?

- a. 10%
- b. 30%
- c. 50%
- d. 70%

ANS: C

The recurrence risk for autosomal dominant diseases is usually 50%.

PTS: 1

DIF: Cognitive Level: Remembering

30. What is an individual's genetic makeup called?

- a. Phenotype
- b. Genotype
- c. Heterozygous locus
- d. Homozygous locus

ANS: B

An individual's genotype is his or her genetic makeup. The outward appearance of an individual is the phenotype. A locus refers to the position a gene occupies on a chromosome.

PTS: 1

DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. Which disorders have similar modes of inheritance? (*Select all that apply.*)

- a. Cri du chat syndrome
- b. Duchenne muscular dystrophy
- c. Polycystic kidney disease

- d. Down syndrome
- e. Becker muscular dystrophy

ANS: B, E

Becker muscular dystrophy and Duchenne muscular dystrophy are the only options that are X-linked recessive disorders.

PTS: 1 DIF: Cognitive Level: Remembering

2. The key to accurate DNA replication depends on which complementary base pairs? (*Select all that apply.*)
- a. Adenine with thymine
 - b. Adenine with guanine
 - c. Guanine with cytosine
 - d. Cytosine with thymine
 - e. Guanine with thymine

ANS: A, C

The consistent pairing of adenine with thymine and of guanine with cytosine, known as complementary base pairing, is the key to accurate DNA replication.

PTS: 1 DIF: Cognitive Level: Remembering

3. Chromosomal abnormalities are the leading known cause of what? (*Select all that apply.*)
- a. Mental illness
 - b. Intellectual disability
 - c. Fetal miscarriage
 - d. Cardiovascular disease
 - e. Respiratory disorders

ANS: B, C

Chromosome abnormalities are the leading known cause of intellectual disability and miscarriage. Mental illness, cardiovascular disease, and respiratory disorders are not that frequently caused by chromosomal abnormalities.

PTS: 1 DIF: Cognitive Level: Remembering

4. What are examples of prenatal diagnostic studies? (*Select all that apply.*)
- a. Chorionic villus sampling (CVS)
 - b. Amniocentesis
 - c. Carrier screening
 - d. Preimplantation genetic diagnosis (PGD)
 - e. Drug-sensitivity testing

ANS: A, B, D

Prenatal testing is conducted before or during the pregnancy but not once labor begins. Such diagnostic studies include amniocenteses, CVS, and PGD. Carrier screening is available for many recessive disorders and help couples make reproductive decisions. Drug-sensitivity testing helps healthcare professionals guide drug treatment.

PTS: 1 DIF: Cognitive Level: Remembering

5. What advantage is derived from human genome sequencing on genetic disorders? (*Select all that apply.*)
- a. Identification of the mutated gene
 - b. Reversal of the mutation
 - c. Diagnosis of the existing disorder
 - d. Appropriate treatment
 - e. Prevention of the disorder

ANS: A, C, D

The complete human genome sequence will facilitate gene identification, diagnosis, and disease treatment. The reversal of a mutation is not possible. The mapping has no effect on preventing a genetic disorder.

PTS: 1 DIF: Cognitive Level: Remembering

Chapter 05: Genes, Environment-Lifestyle, and Common Diseases

MULTIPLE CHOICE

1. The data reporting that sickle cell disease affects approximately 1 in 600 American blacks is an example of which concept?
 - a. Incidence
 - b. Prevalence
 - c. Ratio
 - d. Risk

ANS: B

Prevalence rate is the proportion of the population affected by a disease at a specific point in time. Thus both the incidence rate and the length of the survival period in affected individuals determine prevalence. The incidence rate is the number of new cases of a disease reported during a specific period (typically 1 year), divided by the number of individuals in the population. A numerical expression representing a part of a larger whole or proportion is considered a ratio. Any factor that increases the chance of disease or injury is considered a risk.

PTS: 1

DIF: Cognitive Level: Remembering

2. The ratio of the disease among the exposed population to the disease rate in an unexposed population is referred to as what type of risk?
 - a. Attributable
 - b. Contingency
 - c. Causal
 - d. Relative

ANS: D

A common measure of the effect of a specific risk factor is the relative risk. Assuming a factor is the cause of a disease, attributable risk is the amount of risk that is due to that factor. A future event or circumstance that is possible but cannot be predicted with certainty is a contingency risk. The probability of the outcome is termed a causal risk factor.

PTS: 1

DIF: Cognitive Level: Remembering

3. What are empirical risks for most multifactorial diseases based on?
 - a. Chromosomal testing
 - b. Direct observation
 - c. Liability thresholds
 - d. Relative risks

ANS: B

For most multifactorial diseases, empirical risks (i.e., risks based on direct observation of data) have been derived. Chromosomal testing, liability thresholds, and relative risks are not the basis for determining the empirical risk of most multifactorial diseases.

PTS: 1 DIF: Cognitive Level: Remembering

4. What is the cause of familial hypercholesterolemia (FH)?
- Diet high in saturated fats
 - Increased production of cholesterol by the liver
 - Reduction in the number of low-density lipoprotein (LDL) receptors on cell surfaces
 - Abnormal function of lipoprotein receptors circulating in the blood

ANS: C

A reduction in the number of functional LDL receptors on cell surfaces causes FH. Lacking the normal number of LDL receptors, cellular cholesterol uptake is reduced and circulating cholesterol levels increase. High dietary fat intake, increased cholesterol production, and abnormal circulating lipoprotein receptors are not the basis for developing familial FH.

PTS: 1 DIF: Cognitive Level: Remembering

5. Which risk factor for hypertension is influenced by genetic factors and lifestyle?
- Sodium intake
 - Physical inactivity
 - Psychosocial stress
 - Obesity

ANS: D

The most important environmental risk factors for hypertension are increased sodium intake, decreased physical activity, psychosocial stress, and obesity. However, obesity is, itself, influenced by genes and the environment.

PTS: 1 DIF: Cognitive Level: Remembering

6. A student asks, "What is the percentage of all cases of breast cancer that are identified as an autosomal dominant form?" What response by the professor is best?
- <1
 - 5 to 10
 - 15 to 20
 - 20 to 30

ANS: B

An autosomal dominant form of breast cancer accounts for approximately 5% to 10% of breast cancer cases in the United States.

PTS: 1 DIF: Cognitive Level: Understanding

7. When a woman has one first-degree relative with breast cancer, her risk of developing breast cancer is how many times greater?
- 2
 - 3
 - 6

d. 10

ANS: A

If a woman has one affected first-degree relative, her risk of developing breast cancer doubles.

PTS: 1

DIF: Cognitive Level: Remembering

8. Adoption studies have shown that the offspring of an alcoholic parent have what amount of an increased risk of developing alcoholism when raised by a nonalcoholic parent?
- a. Twofold
 - b. Threefold
 - c. Fourfold
 - d. Tenfold

ANS: C

Adoption studies have shown that the offspring of an alcoholic parent, even when raised by nonalcoholic parents, have a fourfold increased risk of developing the disorder.

PTS: 1

DIF: Cognitive Level: Remembering

9. Studies have identified several genes that play a role in the prevention of obesity by affecting what?
- a. Regulation of appetite
 - b. Metabolizing of fat
 - c. Absorption of fat
 - d. Altering the sense of satiety

ANS: A

Clinical trials using recombinant leptin have demonstrated moderate weight loss in a subset of obese individuals. In addition, leptin participates in important interactions with other components of appetite control, such as neuropeptide Y and α -melanocyte-stimulating hormone and its receptor, the melanocortin-4 receptor (MC4R). Currently, no research supports the other options as being genetically regulated.

PTS: 1

DIF: Cognitive Level: Remembering

10. The *BRCA1* and *BRCA2* mutations increase the risk of which cancer in women?
- a. Ovarian
 - b. Lung
 - c. Uterine
 - d. Pancreatic

ANS: A

BRCA1 mutations increase the risk of ovarian cancer among women (20% to 50% lifetime risk), and *BRCA2* mutations also confer an increased risk of ovarian cancer (10% to 20% lifetime prevalence). *BRCA1* and *BRCA2* mutations are not currently believed to be linked with risks of lung, uterine, or pancreatic cancers.

PTS: 1

DIF: Cognitive Level: Remembering

11. What are blood pressure variations associated with?
- β_1 -Adrenergic receptors to increase heart rate
 - The release of an antidiuretic hormone (ADH)
 - The renin-angiotensin system's effect on vasoconstriction
 - Serum bradykinin, causing vasodilation

ANS: C

Studies of blood pressure correlations within families indicate that about 20% to 40% of the variation in both systolic and diastolic blood pressure is caused by genetic factors. Significant research is now focused on specific components that may influence blood pressure variation, such as the renin-angiotensin system (involved in sodium reabsorption and vasoconstriction). β_1 -Adrenergic receptors, ADH, and bradykinin are not the subjects of such research.

PTS: 1 DIF: Cognitive Level: Remembering

12. What are the two most important risk factors for type 2 diabetes?
- Autoantibodies and human leukocyte antigen associations
 - Autoantibodies and obesity
 - Obesity and positive family history
 - HLA associations and positive family history

ANS: C

The two most important risk factors for type 2 diabetes are positive family history and obesity. Autoantibodies and human leukocyte antigen associations are not believed to be important risk factors for this form of diabetes.

PTS: 1 DIF: Cognitive Level: Remembering

13. A parent wants to know how to prevent type 1 diabetes in the newborn. The healthcare professional explains that prevention is not possible, because which of these is a major characteristic of type 1 diabetes mellitus?
- Partial insulin secretion
 - An autoimmune cause factor
 - Insulin resistance
 - Obesity as a common risk factor

ANS: B

A strong association between type 1 diabetes and the presence of several human leukocyte antigen (HLA) class II alleles indicate that type 1 diabetes mellitus is an autoimmune disease. The remaining options are associated with type 2 diabetes.

PTS: 1 DIF: Cognitive Level: Comprehension

14. A patient with several risk factors is concerned about developing type 2 diabetes. The healthcare professional advises the patient to lose weight, explaining that obesity is an important risk factor for type 2 diabetes mellitus because it causes what?
- Reduced insulin production by the pancreas
 - Increased resistance to insulin in the cells

- c. Obstructed outflow of insulin from the pancreas
- d. Stimulation of glucose production by the liver

ANS: B

People with type 2 diabetes mellitus suffer from insulin resistance. Obesity causes this resistance so their cells have difficulty using insulin. Obesity does not lead to reduced insulin production, obstructed insulin outflow, or stimulation of glucose production.

PTS: 1 DIF: Cognitive Level: Remembering

15. Traits caused by the combined effects of multiple genes are referred to by which term?
- a. Polygenic
 - b. Multifocal
 - c. Modifiable
 - d. Involuntary

ANS: A

Traits in which variation is thought to be caused by the combined effects of multiple genes are polygenic, meaning *many genes*. Multifocal means relating to or arising from many points. Modifiable refers to the changeability of something. Involuntary suggests being out of the control of someone or something.

PTS: 1 DIF: Cognitive Level: Remembering

16. Regarding type 2 diabetes, obesity is considered to be what type of risk?
- a. Genetic
 - b. Empirical
 - c. Relative
 - d. Modifiable

ANS: D

A modifiable risk is one a person can change in order to reduce risk. Obesity is a modifiable risk factor for many diseases including heart disease, stroke, hypertension, and type 2 diabetes. Genetic, empirical, and relative risks are not changeable by individuals in order to reduce their chance of developing diseases.

PTS: 1 DIF: Cognitive Level: Remembering

17. Which disease form is associated with identified empirical risks?
- a. Polygenic
 - b. Multifactorial
 - c. Monozygotic
 - d. Genetic

ANS: B

For most multifactorial diseases, empirical risks (i.e., risks based on direct observation of data) have been derived. Traits in which variation is thought to be caused by the combined effects of multiple genes are polygenic. Monozygotic is a term that refers to identical twins. Genetic refers to issues related to genes and their influence on the body.

PTS: 1 DIF: Cognitive Level: Remembering

18. The number of persons living with a specific disease at a specific point in time is referred to by which term?
- Relativity
 - Survivability
 - Prevalence
 - Incidence

ANS: C

The prevalence rate is the proportion of the population affected by a disease at a specific point in time. Thus both the incidence rate and the length of the survival period in affected individuals determine prevalence. The term “relativity” is not related to disease statistics. Survivability would refer to the chances of a person being able to survive a specific disease and is also not related to the question. The incidence rate is the number of new cases of a disease reported during a specific period (typically 1 year) divided by the number of individuals in the population.

PTS: 1 DIF: Cognitive Level: Remembering

19. Which type of cancer is said to aggregate among families?
- Breast
 - Lung
 - Skin
 - Brain

ANS: A

Breast cancer appears to aggregate strongly in families. The other cancers are not believed to be familial in nature.

PTS: 1 DIF: Cognitive Level: Remembering

20. Which dietary lifestyle choice has been associated with a decreased risk for developing colon cancer?
- Increased consumption of dairy products
 - Increased consumption of foods containing vitamin C
 - Decreased consumption of foods high in fat
 - Decreased consumption of artificial food coloring

ANS: C

A low-fat, high-fiber diet is thought to decrease the risk of colon cancer. Consumption of dairy products, vitamin C, and artificial food coloring are not thought to be related to colon cancer.

PTS: 1 DIF: Cognitive Level: Remembering

21. What is currently believed about the risk for developing Alzheimer disease?
- It is not directly related to genetic predisposition.
 - It is higher among men than it is among women.
 - It occurs less among Hispanics than in Asians.

d. It doubles among those with an affected first-degree relative.

ANS: D

The risk of developing Alzheimer disease doubles in individuals who have an affected first-degree relative. There is a genetic link to the disease. It is not true that the risk is higher among men than it is among women. Hispanics have relatively low risk of developing this disease.

PTS: 1

DIF: Cognitive Level: Remembering

22. The number of new cases of a disease reported during a specific period divided by the number of individuals in the population is defined as which characteristic of a disease?
- Prevalence rate
 - Incidence rate
 - Relative risk
 - Frequency

ANS: B

The incidence rate is the number of new cases of a disease reported during a specific period (typically 1 year) divided by the number of individuals in the population. The prevalence rate is the proportion of the population affected by a disease at a specific point in time. The relative risk is a ratio of the increased rate of disease among a population exposed to a risk factor compared with the increased rate of the disease in an unexposed population. Frequency is a simple measure of how often something occurs.

PTS: 1

DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. Which are cancers that cluster strongly in families? (*Select all that apply.*)
- Breast
 - Colon
 - Ovarian
 - Lung
 - Brain

ANS: A, B, C

Although breast, ovarian, and colon cancers have shown a strong familial tendency, lung and brain cancers have not.

PTS: 1

DIF: Cognitive Level: Remembering

2. Which genes are responsible for an autosomal dominant form of breast cancer? (*Select all that apply.*)
- LCAT
 - CHK1
 - CHK2
 - BRCA1
 - BRCA2

ANS: D, E

Women who inherit a mutation in *BRCA1* or *BRCA2* experience a 50% to 80% lifetime risk of developing breast cancer. The other options do not carry this risk.

PTS: 1

DIF: Cognitive Level: Remembering

3. Which lifestyle modifications affect health-related risk factors? (*Select all that apply.*)
- a. Diet
 - b. Exercise
 - c. Education
 - d. Finances
 - e. Stress reduction

ANS: A, B, E

Lifestyle modification (e.g., diet, exercise, stress reduction) can often reduce health risks significantly. Education and finances have not been shown to have an effect on health in a way that involves lifestyle modifications.

PTS: 1

DIF: Cognitive Level: Remembering

4. What factors are typically considered when assessing an individual's risk for developing such common diseases as hypertension? (*Select all that apply.*)
- a. Age
 - b. Diet
 - c. Exercise habits
 - d. Family history
 - e. Spiritual beliefs

ANS: A, B, C, D

Many factors influence the risk of acquiring a common disease, such as cancer, diabetes, or hypertension. These factors can include age, gender, diet, exercise, and family history of the disease. Current research does not support a connection between spiritual beliefs and the development of hypertension.

PTS: 1

DIF: Cognitive Level: Remembering

5. Which are examples of multifactorial diseases associated with adults? (*Select all that apply.*)
- a. Breast cancer
 - b. Coronary heart disease
 - c. Emphysema
 - d. Diabetes mellitus
 - e. Schizophrenia

ANS: A, B, D, E

Multifactorial diseases in adults include coronary heart disease, hypertension, breast cancer, colon cancer, diabetes mellitus, obesity, Alzheimer disease, alcoholism, schizophrenia, and bipolar affective disorder. Emphysema is not considered multifactorial.

PTS: 1

DIF: Cognitive Level: Remembering

Chapter 06: Epigenetics and Disease

MULTIPLE CHOICE

1. What genetic process is likely responsible for the occurrence of asthma in only one of a pair of identical twins?
 - a. Epigenetic modifications
 - b. Genomic imprinting
 - c. Transgenerational inheritance
 - d. Methylation

ANS: A

Epigenetic modifications can cause individuals with the same deoxyribonucleic acid (DNA) sequences (such as identical twins) to have different disease profiles. Imprinting means that either the copy of a gene inherited through the sperm or the copy inherited through the egg is inactivated and remains in this inactive state in all of the somatic cells of the individual. The heritable transmission to future generations of epigenetic modifications is called transgenerational inheritance. DNA methylation occurs through the attachment of a methyl group to the carbon-5 position of a cytosine.

PTS: 1

DIF: Cognitive Level: Remembering

2. Prader-Willi syndrome causes a chromosomal defect that is what?
 - a. Initiated by postnatal exposure to a virus
 - b. Inherited from the father
 - c. Related to maternal alcohol abuse
 - d. Transferred from mother to child

ANS: B

Prader-Willi syndrome can be caused by a 4 Mb deletion of chromosome 15q when inherited from the father. This disorder is not caused by a virus, or related to maternal alcohol abuse. The same gene deletion causes Angelman syndrome when inherited from the mother.

PTS: 1

DIF: Cognitive Level: Remembering

3. What can a malfunction in DNA methylation lead to?
 - a. Hypothyroidism
 - b. Blindness
 - c. Cancer
 - d. Diabetes mellitus

ANS: C

Aberrant methylation can lead to silencing of tumor-suppressor genes in the development of cancer. No research supports a connection between hypothyroidism, blindness, or diabetes mellitus to a malfunctioning of DNA methylation.

PTS: 1 DIF: Cognitive Level: Remembering

4. Which statement is *true* regarding the embryonic development of stem cells?
- They are already differentiated.
 - They are referred to as *housekeeping* genes.
 - They already demonstrate DNA sequencing.
 - They are said to be totipotent.

ANS: D

Early in embryonic development, all cells of the embryo have the potential to become any type of cell in the fetus or adult. These *embryonic stem cells* are said to be totipotent. They are not yet differentiated. Housekeeping genes are necessary for the function and maintenance of all cells. DNA sequencing is not limited to embryonic stem cells.

PTS: 1 DIF: Cognitive Level: Remembering

5. When microRNA (miRNA) are methylated their messenger RNA (mRNA) targets are over-expressed. What would be the resulting effect on existing cancer?
- Cell death
 - Metastasis
 - Remission
 - Relapse

ANS: B

When miRNA genes are methylated, their mRNA targets are over-expressed, and this over-expression has been associated with aberrant function of tumor-suppression genes. This process does not cause cell death, remission, or relapse.

PTS: 1 DIF: Cognitive Level: Remembering

6. What is the difference between DNA sequence mutations and epigenetic modifications?
- DNA sequence mutations can be directly altered.
 - Leukemia is a result of only DNA sequence mutation.
 - Epigenetic modifications potentially can be reversed.
 - No known drug therapies are available for epigenetic modifications.

ANS: C

Unlike DNA sequence mutations, which cannot be directly altered, epigenetic modifications can be reversed. The remaining options are not true statements regarding the difference between DNA sequence mutations and epigenetic modifications.

PTS: 1 DIF: Cognitive Level: Remembering

7. Which term refers to the silenced gene of a gene pair?
- Activated
 - Altered
 - Mutated
 - Imprinted

ANS: D

Gene silencing, a process during which genes are predictably silenced, depending on which parent transmits them, is known as *imprinting*; the transcriptionally silenced genes are then said to be *imprinted*. The remaining options do not accurately identify this process.

PTS: 1

DIF: Cognitive Level: Remembering

8. What is most likely the shape of the face of a child diagnosed with Russell-Silver syndrome?
- Round
 - Square
 - Triangular
 - Elongated

ANS: C

Growth retardation, proportionate short stature, leg-length discrepancy, and a small, triangular-shaped face characterizes Russell-Silver syndrome. The other face shapes are not characteristic of Russell-Silver syndrome.

PTS: 1

DIF: Cognitive Level: Remembering

9. What are genes responsible for the maintenance of all cells referred to as?
- Universal
 - Managerial
 - Housekeeping
 - Executive

ANS: C

A small percentage of genes, termed *housekeeping* genes, are necessary for the function and maintenance of all cells. The remaining options do not accurately refer to these cells.

PTS: 1

DIF: Cognitive Level: Remembering

10. What is the belief regarding twins who adopt dramatically different lifestyles?
- They may experience very different aging processes.
 - They will retain very similar methylation patterns.
 - They will experience identical phenotypes throughout their lifespans.
 - They may never demonstrate similar DNA sequences of their somatic cells.

ANS: A

Twins with significant lifestyle differences (e.g., smoking versus nonsmoking) accumulate large numbers of differences in their methylation patterns. The twins, despite having identical DNA sequences, become more and more different as a result of epigenetic changes, which in turn affect the expression of genes. These results, along with findings generated in animal studies, suggest that changes in epigenetic patterns may be an important part of the aging process. They will not experience identical phenotypes throughout their life spans.

PTS: 1

DIF: Cognitive Level: Remembering

11. What do hypomethylation and the resulting effect on oncogenes result in?

- a. A decrease in the activity of the oncogene, thus suppressing cancer development.
- b. A deactivation of *MLH1* to halt DNA repair.
- c. An increase in tumor progression from benign to malignant.
- d. An over-expression of microRNA, resulting in tumorigenesis.

ANS: C

Tumor cells typically exhibit hypomethylation (decreased methylation), which can increase the activity of oncogenes. Hypomethylation increases as tumors progress from benign neoplasms to malignancy. Hypomethylation does not result in suppressed cancer development, deactivation of *MLH1*, or over-expression of micro-RNA.

PTS: 1 DIF: Cognitive Level: Remembering

12. When a chromosome lacking 4 million base pairs is inherited from the mother, the child is at risk for developing which syndrome?
- a. Prader-Willi
 - b. Angelman
 - c. Beckwith-Wiedemann
 - d. Russell-Silver

ANS: B

This anomaly illustrates the inheritance pattern of Angelman syndrome, which can be caused by a deletion of 4 million base pairs from chromosome 15q when inherited from the mother. The anomaly is not the cause of any of the other syndromes, although the same gene deletion when inherited from the father does lead to Prader-Willi syndrome.

PTS: 1 DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. A child's diagnosis of Beckwith-Wiedemann syndrome is supported by the presence of what? (*Select all that apply.*)
- a. An omphalocele
 - b. Neonatal hypoglycemia
 - c. Creased earlobes
 - d. Low birth weight
 - e. A large tongue

ANS: A, B, C, E

Beckwith-Wiedemann syndrome is usually identifiable at birth because the child exhibits a large size for gestational age, neonatal hypoglycemia, a large tongue, creases on the earlobe, and omphalocele.

PTS: 1 DIF: Cognitive Level: Remembering

2. A diagnosis of Angelman syndrome in a child is supported by which assessment findings? (*Select all that apply.*)
- a. Small feet and hands

- b. Profound intellectual disability
- c. Obesity
- d. Ataxic gait
- e. History of seizures

ANS: B, D, E

A child diagnosed with Angelman syndrome demonstrates profound intellectual disability, seizures, and an ataxic gait.

PTS: 1

DIF: Cognitive Level: Remembering

Chapter 07: Innate Immunity: Inflammation and Wound Healing

MULTIPLE CHOICE

1. Which action is a purpose of the inflammatory process?
 - a. To provide specific responses toward antigens
 - b. To lyse cell membranes of microorganisms
 - c. To prevent infection of the injured tissue
 - d. To create immunity against subsequent tissue injury

ANS: C

If the epithelial barrier is damaged, then a highly efficient local and systemic response (inflammation) is mobilized to limit the extent of damage, to protect against infection, and to initiate the repair of damaged tissue. The response to a specific offending agent is the function of the adaptive immune response. Lysosomes lyse cell membranes. Immunity against a subsequent tissue injury occurs through the action of B cells and T cells.

PTS: 1 DIF: Cognitive Level: Remembering

2. How do surfactant proteins A through D provide innate resistance?
 - a. Initiate the complement cascade.
 - b. Promote phagocytosis.
 - c. Secrete mucus.
 - d. Synthesize lysosomes.

ANS: B

The lung produces and secretes a family of glycoproteins, collectins, which includes surfactant proteins A through D and mannose-binding lectin. Collectin binding facilitates macrophages to recognize the microorganism, enhancing macrophage attachment, phagocytosis, and killing. The complement cascade occurs during the inflammatory phase. These proteins do not secrete mucus or synthesize lysosomes.

PTS: 1 DIF: Cognitive Level: Remembering

3. Which secretion is a first line of defense against pathogen invasion that involves antibacterial and antifungal fatty acids, as well as lactic acid?
 - a. Optic tears
 - b. Oral saliva
 - c. Sweat gland perspiration
 - d. Sebaceous gland sebum

ANS: D

Sebaceous glands in the skin secrete sebum that is made up of antibacterial and antifungal fatty acids and lactic acid that provide the first-line barrier against pathogen invasion. Perspiration, tears, and saliva contain an enzyme (lysozyme) that attacks the cell walls of gram-positive bacteria.

PTS: 1 DIF: Cognitive Level: Remembering

4. Which bacterium grows in the intestines after prolonged antibiotic therapy?
- Lactobacillus*
 - Candida albicans*
 - Clostridium difficile*
 - Helicobacter pylori*

ANS: C

Prolonged antibiotic treatment can alter the normal intestinal flora, decreasing its protective activity and leading to the overgrowth of other microorganisms, such as the bacterium *C. difficile* in the colon. *C. albicans* can overgrow in the vagina but does not usually cause intestinal issues. *Lactobacillus* and *Helicobacter* also do not produce intestinal overgrowth problems with antibiotic use.

PTS: 1 DIF: Cognitive Level: Remembering

5. What causes the edema that occurs during the inflammatory process?
- Vasodilation of blood vessels
 - Increased capillary permeability
 - Endothelial cell expansion
 - Emigration of neutrophils

ANS: B

The increased flow and capillary permeability result in a leakage of plasma from the vessels, causing swelling (edema) in the surrounding tissue and is solely responsible for inflammation-induced edema. Vasodilation (increased size of the blood vessels) causes slower blood velocity and increases blood flow to the injured site. Endothelial cell contraction (not expansion) leads to increased capillary permeability. Emigration of neutrophils to the area of infection/injury leads to increased destruction of the offending agent.

PTS: 1 DIF: Cognitive Level: Remembering

6. What process causes heat and redness to occur during the inflammatory process?
- Vasodilation of blood vessels
 - Platelet aggregation
 - Decreased capillary permeability
 - Endothelial cell contraction

ANS: A

The increased blood flow as a result of vasodilation and increasing concentration of red cells at the site of inflammation cause locally increased warmth and redness. Platelet aggregation is important in the clotting cascade. Decreased capillary permeability would affect local edema. Endothelial cell contraction leads to increased capillary permeability and the formation of edema.

PTS: 1 DIF: Cognitive Level: Remembering

7. What does activation of the classical pathway begin with?
- Viruses
 - Antigen-antibody complexes
 - Mast cells
 - Macrophages

ANS: B

Activation of the *classical pathway* begins only with the activation of protein C1 and is preceded by the formation of a complex between an antigen and an antibody to form an antigen-antibody complex (immune complex). Infection with a virus can lead to the start of the inflammatory process, but is not the specific activation factor. Mast cells release the contents of their granules to initiate synthesis of other mediators of inflammation among other actions. Macrophages are one cell type involved in phagocytosis.

PTS: 1

DIF: Cognitive Level: Remembering

8. What plasma protein system forms a fibrinous meshwork at an inflamed site?
- Complement
 - Coagulation
 - Kinin
 - Fibrinolysis

ANS: B

The coagulation (clotting) system is a group of plasma proteins that form a fibrinous meshwork at an injured or inflamed site. This protein system (1) prevents the spread of infection to adjacent tissues, (2) traps microorganisms and foreign bodies at the site of inflammation for removal by infiltrating cells (e.g., neutrophils and macrophages), (3) forms a clot that stops the bleeding, and (4) provides a framework for future repair and healing. The complement system, kinins, and fibrinolysis do not form a fibrinous meshwork at an inflamed site.

PTS: 1

DIF: Cognitive Level: Remembering

9. Which component of the plasma protein system tags pathogenic microorganisms for destruction by neutrophils and macrophages?
- Complement cascade
 - Coagulation system
 - Kinin system
 - Immune system

ANS: A

C3b (a component of the complement cascade) adheres to the surface of a pathogenic microorganism and serves as an efficient opsonin. Opsonins are molecules that *tag* microorganisms for destruction by cells of the inflammatory system, primarily neutrophils and macrophages. The other options do not accurately identify a component capable of tagging pathogenic microorganisms.

PTS: 1

DIF: Cognitive Level: Remembering

10. What is the vascular effect of histamine released from mast cells?

- a. Platelet adhesion
- b. Initiation of the clotting cascade
- c. Vasodilation
- d. Increased endothelial adhesiveness

ANS: C

Histamine, when released from mast cells, causes vasodilation. It does not cause platelet adhesion, initiation of the clotting cascade, or increased endothelial adhesiveness.

PTS: 1 DIF: Cognitive Level: Remembering

11. What is an outcome of the complement cascade?
- a. Activation of the clotting cascade
 - b. Prevention of the spread of infection to adjacent tissues
 - c. Inactivation of chemical mediators such as histamine
 - d. Lysis of bacterial cell membranes

ANS: D

The complement cascade can be activated by at least three different means, and its products have four functions: (1) anaphylatoxic activity, resulting in mast cell degranulation, (2) leukocyte chemotaxis, (3) opsonization, and (4) cell lysis. The complement cascade does not activate the clotting cascade, prevent spread of infection, or inactivate chemical mediators.

PTS: 1 DIF: Cognitive Level: Remembering

12. What is the function of opsonization related to the complement cascade?
- a. To tag pathogenic microorganisms for destruction by neutrophils and macrophages
 - b. To process pathogenic microorganisms so that activated lymphocytes can be created for acquired immunity
 - c. To destroy glycoprotein cell membranes of pathogenic microorganisms
 - d. To promote anaphylatoxic activity, resulting in mast cell degranulation

ANS: A

Opsonins are molecules that tag microorganisms for destruction by cells of the inflammatory system (opsonization), primarily neutrophils and macrophages. Opsonization does not process pathogenic microorganisms, destroy glycoprotein cell membranes, or promote anaphylatoxic activity.

PTS: 1 DIF: Cognitive Level: Remembering

13. In the coagulation (clotting) cascade, the intrinsic and the extrinsic pathways converge at which factor?
- a. XII
 - b. VII
 - c. X
 - d. V

ANS: C

The coagulation cascade consists of the extrinsic and intrinsic pathways that converge only at factor X.

PTS: 1 DIF: Cognitive Level: Remembering

14. Which chemical interacts among all plasma protein systems by degrading blood clots, activating complement, and activating the Hageman factor?
- Kallikrein
 - Histamine
 - Bradykinin
 - Plasmin

ANS: D

Only plasmin regulates clot formation by degrading fibrin and fibrinogen, and it can activate the complement cascade through components C1, C3, and C5. Plasmin can activate the plasma kinin cascade by activating the Hageman factor (factor XII) and producing prekallikrein activator.

PTS: 1 DIF: Cognitive Level: Remembering

15. How does the chemotactic factor affect the inflammatory process?
- By causing vasodilation around the inflamed area
 - By stimulating smooth muscle contraction in the inflamed area
 - By directing leukocytes to the inflamed area
 - By producing edema around the inflamed area

ANS: C

Two chemotactic factors, neutrophil chemotactic factor (NCF) and eosinophil *chemotactic factor* of anaphylaxis (ECF-A), are released during mast cell degranulation. NCF attracts neutrophils (a type of leukocytes), and ECF-A attracts eosinophils to the site of inflammation. The other options do not accurately describe the affect chemotactic factors have on the inflammatory process.

PTS: 1 DIF: Cognitive Level: Remembering

16. What effect does the process of histamine binding to the histamine-2 (H₂) receptor have on inflammation?
- Inhibition
 - Activation
 - Acceleration
 - Termination

ANS: A

Binding histamine to the H₂ receptor is generally antiinflammatory because it results in the suppression of leukocyte function. Binding to H₂ receptors does not cause activation, acceleration, or termination of the inflammatory process.

PTS: 1 DIF: Cognitive Level: Remembering

17. Frequently when H₁ and H₂ receptors are located on the same cells, they act in what fashion?

- a. Synergistically
- b. Additively
- c. Antagonistically
- d. Agonistically

ANS: C

Both types of receptors are distributed among many different cells and are often present on the same cells and may act in an antagonistic fashion. For instance, neutrophils express both types of receptors, with stimulation of H₁ receptors resulting in the augmentation of neutrophil chemotaxis and H₂ stimulation resulting in its inhibition. The two receptors do not act synergistically, additively, or agonistically.

PTS: 1

DIF: Cognitive Level: Remembering

18. Some older adults have impaired inflammation and wound healing because of which problem?
- a. Circulatory system cannot adequately perfuse tissues.
 - b. Complement and chemotaxis are deficient.
 - c. Underlying chronic illness(es) exists.
 - d. Number of mast cells is insufficient.

ANS: C

In some cases, impaired healing is not directly associated with aging, in general, but can instead be linked to a chronic illness such as cardiovascular disease or diabetes mellitus. Older adults may have circulatory problems, but that would not lead directly to impaired inflammation and wound healing. Older people do not have deficient complement and chemotaxis, nor do they have insufficient mast cell numbers.

PTS: 1

DIF: Cognitive Level: Remembering

19. Which chemical mediator derived from mast cells retracts endothelial cells to increase vascular permeability and to cause leukocyte adhesion to endothelial cells?
- a. Chemokines
 - b. Prostaglandin E
 - c. Platelet-activating factor
 - d. Bradykinin

ANS: C

The biologic activity of platelet-activating factor is virtually identical to that of leukotrienes; namely, it causes endothelial cell retraction to increase vascular permeability, leukocyte adhesion to endothelial cells, and platelet activation. The other options do not accurately identify the chemical mediator derived from the process described in the question. Chemokines function primarily to induce leukocyte chemotaxis. Prostaglandins interact with the kinin system to stimulate nerve endings and cause pain, among other actions. Bradykinin is the most important product of the kinin system and causes vascular permeability, smooth muscle contraction, and pain.

PTS: 1

DIF: Cognitive Level: Remembering

20. What is the inflammatory effect of nitric oxide (NO)?

- a. Increases capillary permeability, and causes pain
- b. Increases neutrophil chemotaxis and platelet aggregation
- c. Causes smooth muscle contraction and fever
- d. Decreases mast cell function, and decreases platelet aggregation

ANS: D

Effects of NO on inflammation include vasodilation by inducing relaxation of vascular smooth muscle, a response that is local and short-lived, and by suppressing mast cell function, as well as platelet adhesion and aggregation. NO does not increase capillary permeability and cause pain, increase neutrophil chemotaxis and platelet aggregation, or cause smooth muscle contraction and fever.

PTS: 1 DIF: Cognitive Level: Remembering

21. What is the correct sequence in phagocytosis?
- a. Engulfment, recognition, fusion, destruction
 - b. Fusion, engulfment, recognition, destruction
 - c. Recognition, engulfment, fusion, destruction
 - d. Engulfment, fusion, recognition, destruction

ANS: C

Once the phagocytic cell enters the inflammatory site, the only correct sequence of phagocytosis involves the following steps: (1) *opsonization, or recognition*, of the target and *adherence* of the phagocyte to it; (2) *engulfment*, or ingestion or endocytosis, and the formation of *phagosome*; (3) *fusion* with lysosomal granules within the phagocyte (phagolysosome); and (4) *destruction* of the target.

PTS: 1 DIF: Cognitive Level: Remembering

22. When considering white blood cell differentials, acute inflammatory reactions are related to elevations of which leukocyte?
- a. Monocytes
 - b. Eosinophils
 - c. Neutrophils
 - d. Basophils

ANS: C

Only neutrophils are the predominant phagocytes in the early inflammatory site, arriving within 6 to 12 hours after the initial injury, they ingest (phagocytose) bacteria, dead cells, and cellular debris at the inflammatory site.

PTS: 1 DIF: Cognitive Level: Remembering

23. In the later stages of an inflammatory response, which phagocytic cell is predominant?
- a. Neutrophils
 - b. Monocytes
 - c. Chemokines
 - d. Eosinophils

ANS: B

Only monocytes and macrophages perform many of the same functions as neutrophils but for a longer time and in a later stage of the inflammatory response.

PTS: 1

DIF: Cognitive Level: Remembering

24. In regulating vascular mediators released from mast cells, the role of eosinophils is to release what?
- Arylsulfatase B, which stimulates the formation of B lymphocytes
 - Histaminase, which limits the effects of histamine during acute inflammation
 - Lysosomal enzymes, which activate mast cell degranulation during acute inflammation
 - Immunoglobulin E, which defends the body against parasites

ANS: B

Eosinophil lysosomes contain several enzymes that degrade vasoactive molecules, thereby controlling the vascular effects of inflammation. These enzymes include histaminase, which mediates the degradation of histamine, and arylsulfatase B, which mediates the degradation of some of the lipid-derived mediators produced by mast cells. The other options do not accurately describe the role of eosinophils.

PTS: 1

DIF: Cognitive Level: Remembering

25. What is a role of a natural killer (NK) cells?
- Initiation of the complement cascade
 - Elimination of malignant cells
 - Binding tightly to antigens
 - Proliferation after immunization with antigen

ANS: B

The main function of NK cells is to recognize and eliminate cells infected with viruses, although they are also somewhat effective at eliminating other abnormal host cells, specifically cancer cells. The complement system is activated in one of three ways (classical, lectin, and alternative), none of which involve NK cells. Antibodies bind tightly to antigens. Immunization leads to the proliferation of antibodies.

PTS: 1

DIF: Cognitive Level: Remembering

26. Which cytokine is produced and released from virally infected host cells?
- IL-1
 - IL-10
 - TNF- α
 - IFN- α

ANS: D

Only interferons (IFNs) are produced and released by virally infected cells in response to viral double-stranded ribonucleic acid (RNA). IFN- α and IFN- β induce the production of antiviral proteins, thereby conferring protection on uninfected cells. IFN- α or IFN- β is released from virally infected cells and attaches to a receptor on a neighboring cell. IFNs also enhance the efficiency of developing an acquired immune response. IL-1 is a proinflammatory interleukin. IL-10 plays a critical role in wound healing. TNF has several systemic effects but is not released from virally infected host cells.

PTS: 1 DIF: Cognitive Level: Remembering

27. Which manifestation of inflammation is systemic?

- a. Formation of exudates
- b. Fever and leukocytosis
- c. Redness and heat
- d. Pain and edema

ANS: B

The only three primary *systemic* changes associated with the acute inflammatory response are fever, leukocytosis (a transient increase in circulating leukocytes), and increased levels in circulating plasma proteins. Exudate, redness, heat, pain, and edema are local signs.

PTS: 1 DIF: Cognitive Level: Remembering

28. The acute inflammatory response is characterized by fever that is produced by the hypothalamus being affected by what?

- a. Endogenous pyrogens
- b. Bacterial endotoxin
- c. Antigen-antibody complexes
- d. Exogenous pyrogens

ANS: A

Fever-causing cytokines are known as *endogenous pyrogens*. These pyrogens act directly on the hypothalamus, which is the portion of the brain that controls the body's thermostat. The hypothalamus is not directly affected by bacterial endotoxins, antigen-antibody complexes, or exogenous pyrogens.

PTS: 1 DIF: Cognitive Level: Remembering

29. What occurs during the process of *repair* after tissue damage?

- a. Nonfunctioning scar tissue replaces destroyed tissue.
- b. Regeneration occurs; the original tissue is replaced.
- c. Resolution occurs; tissue is regenerated.
- d. Epithelialization replaces destroyed tissue.

ANS: A

Repair is the replacement of destroyed tissue with scar tissue. Regeneration is the replacement of damaged tissue with healthy tissue with complete return to normal structure and function. Resolution is synonymous with regeneration. Epithelialization is the process by which epithelial cells grow into the wound from surrounding healthy tissue.

PTS: 1 DIF: Cognitive Level: Remembering

30. What is the role of fibroblasts during the reconstructive phase of wound healing?
- Generate new capillaries from vascular endothelial cells around the wound.
 - Establish connections between neighboring cells and contract their fibers.
 - Synthesize and secrete collagen and the connective tissue proteins.
 - Provide enzymes that débride the wound bed of dead cells.

ANS: C

Fibroblasts are the most important cells during the reconstructive phase of wound healing because they synthesize and secrete collagen and other connective tissue proteins. Macrophage-derived transforming growth factor-beta (TGF- β) stimulates fibroblasts. Fibroblasts do not generate new capillaries, establish connections between neighboring cells, or provide enzymes to debride the wound bed.

PTS: 1 DIF: Cognitive Level: Remembering

31. A keloid is the result of which dysfunctional wound healing response?
- Epithelialization
 - Contraction
 - Collagen matrix assembly
 - Maturation

ANS: C

An imbalance between collagen synthesis and collagen degradation, during which synthesis is increased relative to degradation, causes both keloids and hypertrophic scars. Epithelialization, contraction, and maturation are not involved in keloids production.

PTS: 1 DIF: Cognitive Level: Remembering

32. A student is preparing to irrigate a patient's wound and gathers supplies, including hydrogen peroxide. What response by the health care professional is *best*?
- Help the student gather the rest of the supplies.
 - Instruct the student to dilute the hydrogen peroxide.
 - Tell the student to get some normal saline instead.
 - Ask the patient if pain medication is needed first.

ANS: C

Normal saline is the most innocuous solution that can be used to cleanse or irrigate a wound that is primarily healing by epithelialization. The professional should instruct the student to use it instead of the peroxide to avoid tissue damage. Helping to gather supplies, diluting the solution, or medicating the patient for pain will not avoid the tissue damage that will be caused by the hydrogen peroxide.

PTS: 1 DIF: Cognitive Level: Applying

33. Many neonates have a transient depressed inflammatory response as a result of which condition?
- The circulatory system is too immature to perfuse tissues adequately.

- b. Complement and chemotaxis are deficient.
- c. Mast cells are lacking.
- d. The respiratory system is too immature to deliver oxygen to tissues.

ANS: B

Neonates commonly have transiently depressed inflammatory and immune function partially as a result of a deficiency in components of the alternative pathway. For example, neutrophils and perhaps monocytes may not be capable of efficient chemotaxis. The circulatory system should be adequate to perfuse tissues in a normal neonate and would not contribute to decreased immunity if not. Mast cells are not lacking. The respiratory system should be adequate to oxygenate tissues, and if not, would not contribute to decreased immunity.

PTS: 1 DIF: Cognitive Level: Remembering

34. During *phagocytosis*, what is occurring during the step referred to as *opsonization*?
- a. Phagocytes recognize and adhere to the bacteria.
 - b. Microorganisms are ingested.
 - c. Microorganisms are killed and digested.
 - d. An intracellular phagocytic vacuole is formed.

ANS: A

During phagocytosis, opsonization involves only the recognition and adherence of phagocytes to bacteria.

PTS: 1 DIF: Cognitive Level: Remembering

35. Fusion is the step of phagocytosis during which what happens?
- a. Microorganisms are killed and digested.
 - b. An intracellular phagocytic vacuole is formed.
 - c. Lysosomal granules enter the phagocyte.
 - d. Microorganisms are ingested.

ANS: C

Fusion occurs with lysosomal granules entering the phagocyte (phagolysosome). Fusion does not include killing and digesting microorganisms, forming vacuoles, or ingesting microorganisms.

PTS: 1 DIF: Cognitive Level: Remembering

36. What does the phagosome step result in during the process of endocytosis?
- a. Microorganisms are ingested.
 - b. Microorganisms are killed and digested.
 - c. Phagocytes recognize and adhere to bacteria.
 - d. An intracellular phagocytic vacuole is formed.

ANS: D

Small pseudopods that extend from the plasma membrane and surround the adherent microorganism, forming an intracellular phagocytic vacuole or phagosome, carry out engulfment (endocytosis). The membrane that surrounds the phagosome consists of inverted plasma membrane. After the formation of the phagosome, lysosomes converge, fuse with the phagosome, and discharge their contents, creating a phagolysosome.

PTS: 1 DIF: Cognitive Level: Remembering

37. When cellular damage occurs and regeneration is minor with no significant complications, what is the process of returning the cells to preinjury function referred to as?
- Restoration
 - Resolution
 - Regrowth
 - Replacement

ANS: B

If damage is minor with no complications and destroyed tissues are capable of regeneration, then returning the injured tissues to an approximation of their original structure and physiologic function is possible. This restoration is called *resolution*. Resolution is the restoration of the original tissue structure and function. Regrowth and replacement are not part of resolution.

PTS: 1 DIF: Cognitive Level: Remembering

38. Newborns often have deficiencies in collectin-like proteins, making them more susceptible to what type of infection?
- Cardiac
 - Urinary
 - Respiratory
 - Gastrointestinal

ANS: C

Neonates may also be deficient in some of the collectins and collectin-like proteins. This deficiency is especially true of preterm neonates. Some preterm infants with respiratory distress syndrome are deficient in at least one collectin, which negatively affects its innate defense against respiratory infections. The other options are not necessarily related to collectin deficiencies.

PTS: 1 DIF: Cognitive Level: Remembering

39. Which cell is the body's primary defense against parasite invasion?
- Eosinophil
 - Neutrophils
 - T lymphocytes
 - B lymphocytes

ANS: A

Eosinophils serve as the body's primary defense against parasites. T lymphocytes and B lymphocytes are involved in acquired immunity. Neutrophils are the predominant phagocytes in the early inflammatory site.

PTS: 1

DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. Which chemical mediators induce pain during an inflammatory response? (*Select all that apply.*)
- a. Prostaglandins
 - b. Leukotrienes
 - c. Tryptase
 - d. Phospholipase
 - e. Bradykinin

ANS: A, E

The only chemical mediators that induce pain during an inflammatory response are the prostaglandins and bradykinin. Leukotrienes produce smooth muscle contraction, increased vascular permeability, and perhaps neutrophil and eosinophil chemotaxis. Tryptase is a proteinase released from mast cells during an inflammatory response. Phospholipase cleaves phospholipids.

PTS: 1

DIF: Cognitive Level: Remembering

2. What do sebaceous glands secrete in order to protect the body from infection? (*Select all that apply.*)
- a. Antibacterial fatty acids
 - b. Antifungal fatty acids
 - c. Ascorbic acid
 - d. Lactic acid
 - e. Hydrochloric acid

ANS: A, B, D

Sebaceous glands secrete only antibacterial and antifungal fatty acids and lactic acid. They do not secrete ascorbic acid (which is vitamin C) or hydrochloric acid.

PTS: 1

DIF: Cognitive Level: Remembering

3. Which body fluids have the ability to attack the cell walls of gram-positive bacteria? (*Select all that apply.*)
- a. Perspiration
 - b. Semen
 - c. Tears
 - d. Saliva
 - e. Urine

ANS: A, C, D

Only perspiration, tears, and saliva contain an enzyme (lysozyme) that attacks the cell walls of gram-positive bacteria.

PTS: 1

DIF: Cognitive Level: Remembering

4. What do the main functions of NK cells include? (*Select all that apply.*)
- a. Recognizing virus-infected cells
 - b. Eliminating virus-infected cells
 - c. Recognizing bacteria-infected cells
 - d. Eliminating bacteria-infected cells
 - e. Eliminating previously identified cancer cells

ANS: A, B, E

The main functions of NK cells are recognizing and eliminating cells infected with viruses, not bacteria. They are also somewhat effective at eliminating other abnormal host cells, specifically cancer cells.

PTS: 1 DIF: Cognitive Level: Remembering

5. An individual's acquired immunity is dependent on the function of which cells? (*Select all that apply.*)
- a. T lymphocytes
 - b. B lymphocytes
 - c. Macrophages
 - d. Opsonins
 - e. Neutrophils

ANS: A, B, C

T lymphocytes, B lymphocytes, macrophages, and dendritic cells are involved in acquired immunity. Opsonins are molecules that *tag* microorganisms for destruction by cells of the inflammatory system; these cells are primarily neutrophils. Neutrophils are white blood cells.

PTS: 1 DIF: Cognitive Level: Remembering

6. Examples of pathogens capable of surviving and even multiplying inside a macrophage include what? (*Select all that apply.*)
- a. *Mycobacterium tuberculosis* (tuberculosis)
 - b. *Mycobacterium leprae* (leprosy)
 - c. *Salmonella typhi* (typhoid fever)
 - d. *Clostridium difficile*
 - e. *Brucella abortus* (brucellosis)

ANS: A, B, C, E

Several bacteria are resistant to killing by granulocytes and can even survive inside macrophages. Microorganisms such as *M. tuberculosis* (tuberculosis), *M. leprae* (leprosy), *S. typhi* (typhoid fever), *B. abortus* (brucellosis), and *Listeria monocytogenes* (listeriosis) can remain dormant or even multiply inside the phagolysosomes of macrophages. *C. difficile* is said to be resistant to antibiotics, making it difficult to control.

PTS: 1 DIF: Cognitive Level: Remembering

7. An older adult is particularly susceptible to infections of which body parts? (*Select all that apply.*)
- a. Lungs

- b. Skin
- c. Liver
- d. Eyes
- e. Bladder

ANS: A, B, E

Older adults have increased susceptibility to bacterial infections of the lungs, urinary tract, and skin. Other infections may occur but on an individualized basis.

PTS: 1

DIF: Cognitive Level: Remembering

Chapter 08: Adaptive Immunity

MULTIPLE CHOICE

1. Which primary characteristic is unique for the immune response?
 - a. The immune response is similar each time it is activated.
 - b. The immune response is specific to the antigen that initiates it.
 - c. The response to a specific pathogen is short term.
 - d. The response is innate, rather than acquired.

ANS: B

Unlike inflammation, which is nonspecifically activated by cellular damage and pathogenic microorganisms, the immune response is primarily designed to afford long-term specific protection (i.e., immunity) against particular invading microorganisms; that is, it has a *memory* function. The inflammatory response is similar each time it is activate. Passive immunity is short term or temporary. The inflammatory process is innate.

PTS: 1 DIF: Cognitive Level: Remembering

2. In which structure does B lymphocytes mature and undergo changes that commit them to becoming B cells?
 - a. Thymus gland
 - b. Regional lymph nodes
 - c. Bone marrow
 - d. Spleen

ANS: C

B lymphocytes mature and become B cells in specialized (primary) lymphoid organs—the thymus gland for T cells and the bone marrow for B cells. Neither regional lymph nodes nor the spleen are involved in changing B lymphocytes into B cells.

PTS: 1 DIF: Cognitive Level: Remembering

3. What is the term for the process during which lymphoid stem cells migrate and change into either immunocompetent T cells or immunocompetent B cells?
 - a. Clonal diversity
 - b. Clonal differentiation
 - c. Clonal selection
 - d. Clonal competence

ANS: A

The process is called the *generation of clonal diversity* and occurs in specialized (primary) lymphoid organs—the thymus gland for T cells and the bone marrow for B cells. Clonal differentiation, selection, and competence do not describe this process.

PTS: 1 DIF: Cognitive Level: Remembering

4. Which type of immunity is produced by an individual after either natural exposure to the antigen or after immunization against the antigen?
- Passive-acquired immunity
 - Active-acquired immunity
 - Passive-innate immunity
 - Active-innate immunity

ANS: B

An individual produces active-acquired immunity (active immunity) after natural exposure to an antigen or after immunization, whereas passive-acquired immunity (passive immunity) does not involve the host's immune response at all. The innate immune system, also known as nonspecific immune system and the first line of defense, is composed of the cells and mechanisms that defend the host from infection by other organisms in a nonspecific manner, which means that the cells of the innate system recognize and respond to pathogens in a generic way.

PTS: 1

DIF: Cognitive Level: Remembering

5. What type of immunity is produced when an immunoglobulin crosses the placenta?
- Passive-acquired immunity
 - Active-acquired immunity
 - Passive-innate immunity
 - Active-innate immunity

ANS: A

Passive-acquired immunity (passive immunity) does not involve the host's immune response at all. Rather, passive immunity occurs when preformed antibodies or T lymphocytes are transferred from a donor to the recipient. This transfer can occur naturally, as in the passage of maternal antibodies across the placenta to the fetus, or artificially, as in a clinic using immunotherapy for a specific disease. The remaining options do not produce immunity via immunoglobulin transfer across the placenta.

PTS: 1

DIF: Cognitive Level: Remembering

6. The portion of the antigen that is configured for recognition and binding is referred to as what type of determinant?
- Immunotope
 - Paratope
 - Epitope
 - Antigenitope

ANS: C

The precise portion of the antigen that is configured for recognition and binding is called its *antigenic determinant* or *epitope*. The other terms are not discussed in the text.

PTS: 1

DIF: Cognitive Level: Remembering

7. Which characteristic is the most important determinant of immunogenicity when considering the antigen?

- a. Size
- b. Foreignness
- c. Complexity
- d. Quantity

ANS: B

Foremost among the criteria for immunogenicity is the antigen's foreignness. A self-antigen that fulfills all of these criteria *except* foreignness does not normally elicit an immune response. Thus most individuals are tolerant of their own antigens. The immune system has an exquisite ability to distinguish self (self-antigens) from nonself (foreign antigens). Size, complexity, and quantity are considered when determining immunogenicity but not to the extent that foreignness is.

PTS: 1

DIF: Cognitive Level: Remembering

8. A student asks why some vaccinations are given orally and some are given by injection. What response by the professor is best?
- a. Different routes allow the speed of onset of the antigen to be varied, with the intravenous route being the fastest.
 - b. Some individuals appear to be unable to respond to an antigen by a specific route, thus requiring the availability of different routes for the same antigen.
 - c. Antigen-presenting cells are highly specialized and thus require stimulation by different routes.
 - d. Each route stimulates a different lymphocyte-containing tissue, resulting in different types of cellular and humoral immunity.

ANS: D

Each route preferentially stimulates a different set of lymphocyte-containing (lymphoid) tissues and therefore results in the induction of different types of cell-mediated or humoral immune responses. The speed of onset of the antigen, individual differences in response, and the requirement for different routes to stimulate different antigen-presenting cells are not accurate descriptions of why different routes of immunization are used.

PTS: 1

DIF: Cognitive Level: Understanding

9. The functions of the major histocompatibility complex (MHC) and CD1 molecules are alike because both do what?
- a. Are antigen-presenting molecules
 - b. Bind antigens to antibodies
 - c. Secrete interleukins during the immune process
 - d. Are capable of activating cytotoxic T lymphocytes

ANS: A

MHC and CD1 molecules are both antigen presenting molecules (APCs). Antigen binding fragments bind antigens to antibodies. Interleukins have many sources, but they are not secreted by MHCs and CD1 molecules. Activating cytotoxic T lymphocytes requires the presence of antigen presentation and effector Th cells.

PTS: 1

DIF: Cognitive Level: Remembering

10. Where are antibodies produced?
- Helper T lymphocytes
 - Thymus gland
 - Plasma cells
 - Bone marrow

ANS: C

An antibody or immunoglobulin is a serum glycoprotein produced only by plasma cells in response to a challenge by an immunogen. Antibodies are not produced by the thymus gland, bone marrow, or by helper T lymphocytes.

PTS: 1 DIF: Cognitive Level: Remembering

11. Which immunoglobulin is present in blood, saliva, breast milk, and respiratory secretions?
- IgA
 - IgE
 - IgG
 - IgM

ANS: A

IgA can be divided into two subclasses, IgA1 and IgA2. IgA1 molecules are predominantly found in the blood, whereas IgA2 is the predominant class of antibody found in normal body secretions.

PTS: 1 DIF: Cognitive Level: Remembering

12. Which antibody initially indicates a typical primary immune response?
- IgG
 - IgM
 - IgA
 - IgE

ANS: B

Typically, IgM is produced first (primary immune response), followed by IgG against the same antigen. IgA and IgE are not involved in the typical primary immune response.

PTS: 1 DIF: Cognitive Level: Remembering

13. An individual is more susceptible to infections of mucous membranes when he or she has a seriously low level of which immunoglobulin antibody?
- IgG
 - IgM
 - IgA
 - IgE

ANS: C

The IgA molecules found in bodily secretions are dimers anchored together through a J-chain and secretory piece. This secretory piece is attached to the IgA antibodies inside the mucosal epithelial cells and may function to protect these immunoglobulin antibodies against degradation by enzymes also found in the secretions, thus decreasing the risk of infections in the mucous membrane. The other options do not accurately identify the immunoglobulin antibody involved in mucous membrane infections.

PTS: 1 DIF: Cognitive Level: Remembering

14. How does the B-cell receptor (BCR) complex function?
- Communicating information about the antigen to the helper T cell
 - Secreting chemical signals to communicate between cells
 - Releasing histamine and other vasoactive substances
 - Communicating information about the antigen to the cell nucleus

ANS: D

The role of the BCR is to recognize the antigen; however, unlike circulating antibodies, the receptor must communicate that information to the cell's nucleus. The BCR does not communicate information about the antigen to the helper T cell or secrete chemical signals to communicate between cells. The release of histamine and other vasoactive substances is part of inflammation, not adaptive immunity.

PTS: 1 DIF: Cognitive Level: Remembering

15. The generation of clonal diversity occurs primarily during which phase of life?
- Fetal
 - Neonatal
 - Infancy
 - Puberty

ANS: A

Generation of clonal diversity primarily occurs in the fetus and probably continues to a low degree throughout most of adult life.

PTS: 1 DIF: Cognitive Level: Remembering

16. A student is confused about the process of the generation of clonal diversity. What description by the professor is best?
- It involves antigens that select those lymphocytes with compatible receptors.
 - It allows the differentiation of cells into antibody-secreting plasma cells or mature Peyer patches.
 - It takes place in the primary (central) lymphoid organs.
 - It causes antigens to expand and diversify their populations.

ANS: C

This process occurs in central lymphoid organs—the thymus gland for T cells and bone marrow for B cells. It does not involve antigens selecting lymphocytes or expanding and diversifying. It does allow the differentiation of lymphoid stem cells into B and T lymphocytes. Peyer patches are lymphoid organs found in the intestines.

PTS: 1 DIF: Cognitive Level: Understanding

17. Which is an example of an endogenous antigen?

- a. Yeast
- b. Cancer cells
- c. Bacteria
- d. Fungus

ANS: B

Of the options provided, endogenous antigens include only those uniquely produced by cancerous cells.

PTS: 1 DIF: Cognitive Level: Remembering

18. Which cytokine is needed for the maturation of a functional helper T cell?

- a. IL-1
- b. IL-2
- c. IL-4
- d. IL-12

ANS: B

Of the options provided, IL-2 production is critical for the Th cell to mature efficiently into a functional helper cell.

PTS: 1 DIF: Cognitive Level: Remembering

19. Th2 cells produce IL-4 and suppress which cells?

- a. B lymphocytes
- b. Cytotoxic T lymphocytes
- c. Th1 cells
- d. Memory T lymphocytes

ANS: C

Th2 cells produce IL-4, which suppresses only Th1 and Th17 cells through their IL-4 receptors.

PTS: 1 DIF: Cognitive Level: Remembering

20. Which statement is believed to be *true* concerning Th1 cells?

- a. Th1 cells are induced by antigens derived from allergens.
- b. They are induced by antigens derived from cancer cells.
- c. Th1 cells produce IL-4, IL-5, IL-6, and IL-13.
- d. They assist in the development of humoral immunity.

ANS: B

Antigens derived from viral or bacterial pathogens and those derived from cancer cells are hypothesized to induce a greater number of Th1 cells relative to Th2 cells. The other statements are not true regarding Th1 cells.

PTS: 1 DIF: Cognitive Level: Remembering

21. Which statement is believed to be *true* concerning Th2 cells?
- Th2 cells are induced by antigens derived from allergens.
 - They are induced by antigens derived from cancer cells.
 - Th2 cells produce IL-2, TNF- β , and IFN- γ .
 - They assist in the development of cell-mediated immunity.

ANS: A

Antigens derived from multicellular parasites and allergens are hypothesized to be involved in the production of more Th2 cells. Th1 cells are induced by antigens derived from cancer cells. Th2 cells produce IL-4, IL-5, IL-6, and IL-13.

PTS: 1 DIF: Cognitive Level: Remembering

22. When a person is exposed to most antigens, antibodies can be usually detected in their circulation within what timeframe?
- 12 hours
 - 24 hours
 - 3 days
 - 6 days

ANS: D

After approximately 5 to 7 days is an IgM antibody specific for that antigen detected in the circulation.

PTS: 1 DIF: Cognitive Level: Remembering

23. Vaccinations are able to provide protection against certain microorganisms because of what?
- Strong response from IgM
 - Level of protection provided by IgG
 - Memory cells for IgE
 - Rapid response from IgA

ANS: B

Vaccinations provide protection by a secondary response when the individual is exposed to the microorganism to which he or she was vaccinated. At that time, IgG production is considerably increased, making it the predominant antibody class of the secondary response. IgM is more active against the primary exposure. IgE is usually seen in allergies. IgA is the predominant secretory antibody and prevents the attachment and invasion of pathogens through mucosal membranes.

PTS: 1 DIF: Cognitive Level: Remembering

24. The healthcare professional working with older adults teaches general infection-prevention measures as a priority for this age group due to which change in lymphocyte function?
- Increased production of antibodies against self-antigens
 - Decreased number of circulating T cells
 - Decreased production of autoantibodies
 - Increased production of helper T cells

ANS: A

B-cell function is altered with age as shown by decreases in specific antibody production in response to antigenic challenge, with concomitant increases in circulating immune complexes and in circulating autoantibodies (antibodies against self-antigens). Aging does not play a role in either decreasing T cells circulation or increasing helper T cells production.

PTS: 1

DIF: Cognitive Level: Remembering

25. How do antibodies protect the host from bacterial toxins?
- Lysing the cell membrane of the toxins
 - Binding to the toxins to neutralize their biologic effects
 - Inhibiting the synthesis of DNA proteins needed for growth
 - Interfering with the DNA enzyme needed for replication

ANS: B

To cause disease, most toxins must bind to surface molecules on the individual's cells. Protective antibodies can bind to the toxins, prevent their interaction with cells, and neutralize their biologic effects. Antibodies do not lyse the toxin cell membrane, inhibit the synthesis of DNA, or interfere with DNA replication.

PTS: 1

DIF: Cognitive Level: Remembering

26. Which T cell controls or limits the immune response to protect the host's own tissues against an autoimmune response?
- Cytotoxic T cells
 - Th1 cells
 - Th2 cells
 - Regulatory T (Treg) cells

ANS: D

The regulatory T (Treg) cell's role is to control or limit the immune response to protect the host's own tissues against autoimmune reactions. Cytotoxic T cells attack and kill cellular targets directly. Th2 cells provide help for developing B cells and produce IL-4, IL-5, IL-6, and IL-13. Th1 cells are induced by antigens derived from cancer cells.

PTS: 1

DIF: Cognitive Level: Remembering

27. Evaluation of umbilical cord blood can confirm that which immunoglobulin level is near adult levels?
- IgA
 - IgG
 - IgM
 - IgE

ANS: B

At birth, the total IgG level in the umbilical cord is the only immunoglobulin that is near adult levels. This is due to a system of active transport that facilitates the passage of maternal antibodies into the fetal circulation. The other antibodies are not present at this level in the newborn.

PTS: 1 DIF: Cognitive Level: Remembering

28. Which statement is *true* concerning IgM?
- IgM is the first antibody produced during the initial response to an antigen.
 - IgM mediates many common allergic responses.
 - IgM is the most abundant class of immunoglobulins.
 - IgM is capable of crossing the human placenta.

ANS: A

Typically, IgM is produced first (primary immune response), followed by IgG against the same antigen. IgE mediates allergic responses and is active in the defense against parasitic infections. IgG is the most abundant immunoglobulin class and can cross the human placenta to enter into fetal circulation.

PTS: 1 DIF: Cognitive Level: Remembering

29. Which cell has the ability to recognize antigens presented by the MHC class I molecules?
- T cytotoxic
 - CD 4
 - CD 8
 - T helper

ANS: C

CD8 cells recognize antigens presented by the major histocompatibility complex (MHC) class I molecules and become mediators of cell-mediated immunity and directly kill other cells (T-cytotoxic cells). CD4 cells tend to recognize antigen presented by MHC class II molecules and develop into helpers in the later clonal selection process (T-helper cells).

PTS: 1 DIF: Cognitive Level: Remembering

30. Which cell has a role in developing cell-mediated immunity?
- Th1
 - CD4
 - CD8
 - Th2

ANS: A

Only Th1 cells help develop cellular immunity.

PTS: 1 DIF: Cognitive Level: Remembering

31. A student asks the healthcare professional how the aging process of the T-cell activity affects older adults. What response by the professional is best?
- Poor heat regulation abilities

- b. Increased risk for bone fractures
- c. Tendency to develop various infections
- d. Likelihood of experiencing benign skin lesions

ANS: C

T-cell activity is deficient in older adults, and a shift in the balance of T-cell subsets is observed. These changes may result in increased susceptibility to infection. The other issues are not related to T-cell activity.

PTS: 1 DIF: Cognitive Level: Remembering

32. Which statement is *true* regarding maternal antibodies provided to the neonate?
- a. The antibodies enter into the fetal circulation by means of active transport.
 - b. The antibodies are transferred to the fetus via the lymphatic system.
 - c. The antibodies are directly related to the mother's nutritional intake.
 - d. The antibodies reach protective levels after approximately 6 months of age.

ANS: A

To protect the child against infectious agents both in utero and during the first few postnatal months, a system of active transport facilitates the passage of maternal antibodies into the fetal circulation. The antibodies are transmitted via the placenta and are related to the mother's immune system. The infant's own IgG-related antibodies reach protective levels by 6 months of age. The antibodies are not transferred via the lymphatic system, are not directly related to maternal nutrition, or reach protective levels after 6 months of age.

PTS: 1 DIF: Cognitive Level: Remembering

33. Antibodies that are associated with mucosal immune system, such as immunoglobulins, function to prevent which type of infections?
- a. Infections that attack the respiratory system
 - b. Infections that tend to be chronic in nature
 - c. Infections likely to be resistant to antibiotics
 - d. Infections that focus on epithelial surfaces of the body

ANS: D

Antibodies of the systemic immune system function throughout the body, whereas antibodies of the secretory (mucosal) immune system—primarily immunoglobulins of the IgA class—are associated with bodily secretions and function to prevent pathogenic infection on epithelial surfaces. The other options are not necessarily true when considering the immunoglobulins.

PTS: 1 DIF: Cognitive Level: Remembering

34. Cytokines are vital to a cell's ability to do which function?
- a. Excrete
 - b. Reproduce
 - c. Metabolize
 - d. Communicate

ANS: D

During their interactions, cells must communicate with each other through soluble cytokines. The other options are not so rigidly related to cytokines.

PTS: 1 DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. Which is an example of a bacterial toxin that has been inactivated but still retains its immunogenicity to protect the person? (*Select all that apply.*)
- Poliomyelitis
 - Measles
 - Tetanus
 - Gonorrhea
 - Diphtheria

ANS: C, E

The symptoms of tetanus or diphtheria are mediated by specific toxins. To prevent harming the recipient of the immunization, bacterial toxins are chemically inactivated so that they have lost most of their harmful properties but still retain their immunogenicity. These agents are referred to as *toxoids*. Poliomyelitis, measles, and gonorrhea are not examples.

PTS: 1 DIF: Cognitive Level: Remembering

2. Which statements are *true* concerning the humoral immune response? (*Select all that apply.*)
- The humoral immune response is divided into major and minor phases.
 - The response has IgG and IgM produced during each of its phases.
 - It has a greater presence of IgG than IgM in one of its phases.
 - The humoral immune response is produced in reaction to the presence of an antigen.
 - Phases differ in their response time as a result of the effect of memory cells.

ANS: B, C, D, E

The humoral immune response is divided into two phases, primary and secondary. These phases differ in the relative amounts of IgG produced—the secondary response having a significantly higher proportion of IgG relative to IgM. The two phases also differ in the speed with which each occurs after the antigen challenge—the secondary phases is significantly more rapid than the primary phase because of the presence of memory cells in the secondary phase.

PTS: 1 DIF: Cognitive Level: Remembering

3. CD4 is a characteristic surface marker and a result of which of these? (*Select all that apply.*)
- Activity in the primary lymphoid organs
 - Process of cellular differentiation
 - Alterations to T cells
 - Changes to B cells
 - Clonal selection

ANS: A, B, C, D

Differentiation of B cells and T cells in the primary lymphoid organs results in the expression of several characteristic surface markers, such as CD4 on helper T cells, CD8 on cytotoxic T cells, and CD21 and CD40 on B cells. Clonal selection is the process during which antigens select those lymphocytes with complementary T-cell receptors (TCRs) or BCRs.

PTS: 1 DIF: Cognitive Level: Remembering

4. What are the necessary components of an adaptive immune response? (*Select all that apply.*)
- a. Antigen
 - b. Gamma IgG
 - c. Lymphocyte surface receptors
 - d. Crystalline fragment
 - e. Antibody

ANS: A, C, E

Antigens are the molecules that can react with components of the adaptive immune system, including antibodies and lymphocyte surface receptors. Gamma IgG and crystalline fragment are not necessary components of an adaptive immune response.

PTS: 1 DIF: Cognitive Level: Remembering

Chapter 09: Alterations in Immunity and Inflammation

MULTIPLE CHOICE

1. *How is hypersensitivity best defined?*
 - a. A disturbance in the immunologic tolerance of self-antigens
 - b. An immunologic reaction of one person to the tissue of another person
 - c. An altered immunologic response to an antigen that results in disease
 - d. An undetectable immune response in the presence of antigens

ANS: C

Hypersensitivity is an altered immunologic response to an antigen that results in disease or damage to the host. Autoimmunity is a disturbance in the immunologic tolerance of self-antigens. Alloimmunity is the immunologic reaction of one person to the tissue of another person. An immune deficiency of some type would cause undetectable immune response in the presence of antigens.

PTS: 1 DIF: Cognitive Level: Remembering

2. What is a hypersensitivity reaction that produces an allergic response called?
 - a. Hemolytic shock
 - b. Anaphylaxis
 - c. Necrotizing vasculitis
 - d. Systemic erythematosis

ANS: B

Examples of systemic anaphylaxis are allergic reactions to bee stings, peanuts, and fish. Hemolytic shock would be a state in which erythrocytes are destroyed by complement-mediated lysis to the point of causing a state of shock. Necrotizing vasculitis is inflammation of blood vessel walls that limits perfusion. Systemic lupus erythematosus (SLE) is a chronic, multisystem, inflammatory disease and is one of the most common, complex, and serious of the autoimmune disorders.

PTS: 1 DIF: Cognitive Level: Remembering

3. The common hay fever allergy is expressed through a reaction that is mediated by which class of immunoglobulins?
 - a. IgE
 - b. IgG
 - c. IgM
 - d. T cells

ANS: A

Type I reactions are mediated by antigen-specific IgE and the products of tissue mast cells. The most common allergies (e.g., pollen allergies) are type I reactions. In addition, most type I reactions occur against environmental antigens and are therefore allergic. Hay fever allergy is not mediated by IgG, IgM, or T cells.

PTS: 1 DIF: Cognitive Level: Remembering

4. What are blood transfusion reactions an example of?
- Autoimmunity
 - Alloimmunity
 - Homoimmunity
 - Hypersensitivity

ANS: B

Alloimmunity (also termed *isoimmunity*) occurs when the immune system of one individual produces an immunologic reaction against tissues of another individual. Autoimmunity is a disturbance in the immunologic tolerance of self-antigens. Homoimmunity refers to the resistance of a lysogenic bacterium that is carrying a phage to an infection by the same type of phage. *Hypersensitivity* is an altered immunologic response to an antigen that results in disease or damage to the host.

PTS: 1 DIF: Cognitive Level: Remembering

5. During an IgE-mediated hypersensitivity reaction, which leukocyte is activated?
- Neutrophils
 - Monocytes
 - Eosinophils
 - T lymphocytes

ANS: C

Of the options provided, only eosinophils are activated during IgE-mediated hypersensitivity reactions.

PTS: 1 DIF: Cognitive Level: Remembering

6. During an IgE-mediated hypersensitivity reaction, what causes bronchospasm?
- Bronchial edema caused by the chemotactic factor of anaphylaxis
 - Bronchial edema caused by binding of the cytotoxic antibody
 - Smooth muscle contraction caused by histamine bound to H₁ receptors
 - Smooth muscle contraction caused by histamine bound to H₂ receptors

ANS: C

During an IgE-mediated hypersensitivity reaction, smooth muscle contraction caused by histamine bound to H₁ receptors results in bronchospasms. The bronchospasm is not caused by edema or by histamine binding to H₂ receptors.

PTS: 1 DIF: Cognitive Level: Remembering

7. A patient is having an IgE-mediated hypersensitivity reaction. What action by the healthcare professional is *best*?
- Give the patient an antihistamine.
 - Prepare to give the patient a blood transfusion.
 - Ask the patient if he/she is having pain at the site.
 - Apply warm, moist heat to the affected area.

ANS: A

Histamine is the most potent mediator in an IgE-mediated hypersensitivity reaction (Type 1). Histamine bound to H₂ results in the degranulation of mast cells with the release of histamine. Blocking histamine receptors with antihistamines can control some type I responses. The healthcare professional would not need to give the patient blood; warm; moist heat; or ask about pain.

PTS: 1

DIF: Cognitive Level: Applying

8. What characteristic do atopic individuals have that make them genetically predisposed to develop allergies?
- Greater quantities of histamine
 - More histamine receptors
 - Greater quantities of IgE
 - A deficiency in epinephrine

ANS: C

Atopic individuals tend to produce higher quantities of IgE and to have more crystalline fragment (Fc) receptors for IgE on their mast cells. Greater quantities of histamine, more histamine receptors, and a deficiency in epinephrine do not lead to a genetic predisposition to allergies.

PTS: 1

DIF: Cognitive Level: Remembering

9. A student asks about the mechanism that results in type II hypersensitivity reactions. What description by the professor is *best*?
- Antibodies coat mast cells by binding to receptors that signal its degranulation, followed by a discharge of preformed mediators.
 - Antibodies bind to soluble antigens that were released into body fluids, and the immune complexes are then deposited in the tissues.
 - Cytotoxic T lymphocytes or lymphokine-producing helper T 1 cells directly attack and destroy cellular targets.
 - Antibodies bind to the antigens on the cell surface.

ANS: D

The mechanism that results in a type II hypersensitivity reaction begins with antibody binding to tissue-specific antigens or antigens that have attached to particular tissues. The cell can be destroyed by antibody IgG or IgM and activation of the complement cascade through the classical pathway.

PTS: 1

DIF: Cognitive Level: Understanding

10. When mismatched blood is administered causing an ABO incompatibility, how are the erythrocytes destroyed?
- Complement-mediated cell lysis
 - Phagocytosis by macrophages
 - Phagocytosis in the spleen
 - Natural killer cells

ANS: A

Erythrocytes are destroyed by complement-mediated lysis in individuals with autoimmune hemolytic anemia or as a result of an alloimmune reaction to ABO-mismatched transfused blood cells. Erythrocytes are not destroyed by phagocytosis or natural killer cells.

PTS: 1 DIF: Cognitive Level: Remembering

11. When antibodies are formed against red blood cell antigens of the Rh system, how are the blood cells destroyed?
- Complement-mediated cell lysis
 - Phagocytosis by macrophages
 - Phagocytosis in the spleen
 - Neutrophil granules and toxic oxygen products

ANS: C

Antibodies against platelet-specific antigens or against red blood cell antigens of the Rh system coat those cells at low density, resulting in their preferential removal by phagocytosis in the spleen, rather than by complement-mediated lysis. These blood cells are not destroyed by complement-mediated cell lysis, phagocytosis by macrophages, neutrophil granules, or toxic oxygen products.

PTS: 1 DIF: Cognitive Level: Remembering

12. When soluble antigens from infectious agents enter circulation, what is tissue damage a result of?
- Complement-mediated cell lysis
 - Phagocytosis by macrophages
 - Phagocytosis in the spleen
 - Neutrophil granules and toxic oxygen products

ANS: D

Of the options available, only the components of neutrophil granules as well as the several toxic oxygen products produced by these cells, damage the tissue.

PTS: 1 DIF: Cognitive Level: Remembering

13. How are target cells destroyed in a type II hypersensitivity reaction?
- Tissue damage from mast cell degranulation
 - Antigen-antibody complexes deposited in vessel walls
 - Cytotoxic T lymphocytes attack the cell directly.
 - Natural killer cells

ANS: D

The mechanism that results in a type II hypersensitivity reaction involves a subpopulation of cytotoxic cells that are not antigen specific (natural killer [NK] cells). Antibody on the target cell is recognized by Fc receptors on the NK cells, which releases toxic substances that destroy the target cell. Tissue damage from mast cell degranulation occurs in type I hypersensitivity reactions. Antigen-antibody complexes are active in type III hypersensitivity responses. Cytotoxic lymphocytes are involved in type IV hypersensitivity responses.

PTS: 1

DIF: Cognitive Level: Remembering

14. Graves disease (hyperthyroidism) is an example of which type II hypersensitivity reaction?
- Modulation
 - Antibody-dependent cell-mediated cytotoxicity
 - Neutrophil-mediated damage
 - Complement-mediated lysis

ANS: A

The antibody reacts with the receptors on the target cell surface and modulates the function of the receptor by preventing interactions with their normal ligands, replacing the ligand and inappropriately stimulating the receptor or destroying the receptor. For example, in the hyperthyroidism (excessive thyroid activity) of Graves disease, autoantibody binds to and activates receptors for thyroid-stimulating hormone (TSH) (a pituitary hormone that controls the production of the hormone *thyroxine* by the thyroid). Graves disease is not a result of cell-mediated cytotoxicity, neutrophil-mediated damage, or complement-mediated lysis.

PTS: 1

DIF: Cognitive Level: Remembering

15. Type III hypersensitivity reactions are a result of which of these?
- Antibodies coating mast cells by binding to receptors that signal its degranulation, followed by the discharge of preformed mediators
 - Antibodies binding to soluble antigens that were released into body fluids and the immune complexes being deposited in the tissues
 - Tc cells or lymphokine-producing Th1 cells directly attacking and destroying cellular targets
 - Antibodies binding to the antigen on the cell surface

ANS: B

Antigen-antibody (immune) complexes that are formed in the circulation and then deposited later in vessel walls or extravascular tissues cause most type III hypersensitivity diseases. Type III hypersensitivity reactions are not the result of antibodies coating mast cells to signal their degranulation, immune cells directly attacking and destroying targets, or antibodies binding to the antigen on the cell surface.

PTS: 1

DIF: Cognitive Level: Remembering

16. A type IV hypersensitivity reaction causes which result?
- Antibodies coating mast cells by binding to receptors that signal its degranulation, followed by the discharge of preformed mediators

- b. Antibodies binding to soluble antigens that were released into body fluids and the immune complexes being deposited in the tissues
- c. Lymphokine-producing Th1 cells directly attacking and destroying cellular targets
- d. Antibodies binding to the antigen on the cell surface

ANS: C

Type I, II, and III hypersensitivity reactions are mediated by antibody, type IV reactions are mediated by T lymphocytes and do not involve antibody. Type IV mechanisms occur through either Tc cells or lymphokine-producing Th1 cells. Tc cells directly attack and destroy cellular targets.

PTS: 1

DIF: Cognitive Level: Remembering

17. In a type III hypersensitivity reaction, the harmful effects after the immune complexes that are deposited in tissues are a result of what?
- a. Cytotoxic T cells
 - b. Natural killer cells
 - c. Complement activation
 - d. Degranulation of mast cells

ANS: C

Complement activation, particularly through the generation of chemotactic factors for neutrophils, causes the harmful effects of immune complex deposition. The neutrophils bind to antibody and C3b contained in the complexes and attempt to ingest the immune complexes. Type III hypersensitivity reactions as described are not the result of cytotoxic T cells, natural killer cells, or degranulation of mast cells.

PTS: 1

DIF: Cognitive Level: Remembering

18. A healthcare professional is teaching a patient about Raynaud phenomenon and instructs the patient to avoid cold. What is the best explanation of how cold impacts the manifestations of this disease?
- a. Immune complexes that are deposited in capillary beds, blocking circulation
 - b. Mast cells that are bound to specific endothelial receptors, causing them to degranulate and creating a localized inflammatory reaction that occludes capillary circulation
 - c. Cytotoxic T cells that attack and destroy the capillaries so that they are unable to perfuse local tissues
 - d. Antibodies that detect the capillaries as foreign protein and destroy them using lysosomal enzymes and toxic oxygen species

ANS: A

Raynaud phenomenon is a condition (type III hypersensitivity reaction) caused by the temperature-dependent deposition of immune complexes in the capillary beds of the peripheral circulation. The healthcare professional should teach the patient to avoid cold or to wear gloves to mitigate the cold. None of the other options are involved in causing this condition.

PTS: 1

DIF: Cognitive Level: Remembering

19. Deficiencies in which element can produce depression of both B- and T-cell function?
- Iron
 - Zinc
 - Iodine
 - Magnesium

ANS: B

Of the options available, only deficient zinc intake can profoundly depress T- and B-cell function.

PTS: 1

DIF: Cognitive Level: Remembering

20. An Rh-negative woman gave birth to an Rh-positive baby. When discussing Rho[D] immunoglobulin with her, what information should the healthcare professional provide?
- It provides protection against infection from poor immunity in the baby.
 - It prevents alloimmunity and hemolytic anemia of the newborn.
 - It provides necessary antibodies in case the mother doesn't breastfeed.
 - It causes the intestinal tract of the newborn to produce antibodies.

ANS: B

Alloimmunity occurs when an individual's immune system reacts against antigens on the tissues of other members of the same species. This can occur when a woman is Rh-negative and gives birth to an Rh-positive baby, leading to hemolytic anemia of the newborn. Rho[D] immunoglobulin does not provide protection against infection, provide antibodies to a bottle-fed baby, or cause the intestine to produce antibodies.

PTS: 1

DIF: Cognitive Level: Understanding

21. Tissue damage caused by the deposition of circulating immune complexes containing an antibody against the host DNA is the cause of which disease?
- Hemolytic anemia
 - Pernicious anemia
 - Systemic lupus erythematosus
 - Myasthenia gravis

ANS: C

The deposition of circulating immune complexes containing an antibody against the host DNA produces tissue damage in individuals with systemic lupus erythematosus (SLE). That is not a process in hemolytic anemia, pernicious anemia, or myasthenia gravis.

PTS: 1

DIF: Cognitive Level: Remembering

22. A patient asks the healthcare professional why tissue damage occurs in acute rejection after organ transplantation. What response by the professional is *best*?
- Th1 cells release cytokines that activate infiltrating macrophages, and cytotoxic T cells directly attack the endothelial cells of the transplanted tissue.
 - Circulating immune complexes are deposited in the endothelial cells of transplanted tissue, where the complement cascade lyses tissue.
 - Receptors on natural killer cells recognize antigens on the cell surface of

transplanted tissue, which releases lysosomal enzymes that destroy tissue.

- d. Antibodies coat the surface of transplanted tissue to which mast cells bind and liberate preformed chemical mediators that destroy tissue.

ANS: A

The recipient's lymphocytes interacting with the donor's dendritic cells within the transplanted tissue usually initiate sensitization, resulting in the induction of recipient Th1 and Tc cells against the donor's antigens. The Th1 cells release cytokines that activate infiltrating macrophages, and the Tc cells directly attack the endothelial cells in the transplanted tissue. The other options do not accurately describe how acute rejection after organ transplantation results in tissue damage.

PTS: 1

DIF: Cognitive Level: Understanding

23. Which blood cell carries the carbohydrate antigens for blood type?

- a. Platelets
- b. Neutrophils
- c. Lymphocytes
- d. Erythrocytes

ANS: D

The reaction that causes a blood transfusion recipient's red blood cells to clump together is related to the ABO antigens located on the surface of only erythrocytes.

PTS: 1

DIF: Cognitive Level: Remembering

24. A person with type O blood needs a blood transfusion. What blood type does the healthcare professional prepare to administer to the patient?

- a. A
- b. B
- c. AB
- d. O

ANS: D

Type O individuals have neither A or B antigen but have both anti-A and anti-B antibodies and therefore cannot accept blood from any of the other three types. The healthcare professional would prepare to administer a transfusion of type O blood.

PTS: 1

DIF: Cognitive Level: Remembering

25. Which class of immunoglobulins forms isohemagglutinins?

- a. IgA
- b. IgE
- c. IgG
- d. IgM

ANS: D

Naturally occurring antibodies, called *isohemagglutinins*, are immunoglobulins of only the IgM class.

PTS: 1 DIF: Cognitive Level: Remembering

26. Which component of the immune system is deficient in individuals with infections caused by viruses, fungi, or yeast?
- Natural killer cells
 - Macrophages
 - B cells
 - T cells

ANS: D

Of the available options, deficiencies in T-cell immune responses are suggested when certain viruses (e.g., varicella, vaccinia, herpes, cytomegalovirus), fungi, and yeasts (e.g., *Candida*, *Histoplasma*) or certain atypical microorganisms (e.g., *Pneumocystis jiroveci*) cause recurrent infections.

PTS: 1 DIF: Cognitive Level: Remembering

27. A child in the clinic has an absence of a parathyroid gland, structural heart defects, and a shortened structure of the upper lip. What immune dysfunction does the healthcare professional suspect?
- Partial-to-complete absence of T-cell immunity
 - X-linked recessive microcephaly
 - An autoimmune disease like systemic lupus erythematosus
 - Adenosine deaminase deficiency

ANS: A

This child has the clinical features of DiGeorge disease, which is caused by a partial-to-complete absence of T-cell immunity.

PTS: 1 DIF: Cognitive Level: Analyzing

28. How many months does it take for the newborn to be sufficiently protected by antibodies produced by its own B cells?
- 1 to 2
 - 4 to 5
 - 6 to 8
 - 10 to 12

ANS: C

By 6 to 8 months, the newborn should be efficiently protected by antibodies produced by its own B cells.

PTS: 1 DIF: Cognitive Level: Remembering

29. Considering the effects of nutritional deficiencies on the immune system, severe deficits in calories and protein lead to deficiencies in the formation of which immune cells?
- B cells
 - T cells

- c. Natural killer cells
- d. Neutrophils

ANS: B

Severe deficits in calorie or protein intake lead to deficiencies in T-cell function and numbers. B cells, natural killer cells, and neutrophils are not necessarily affected by nutritional deficits.

PTS: 1 DIF: Cognitive Level: Remembering

30. Urticaria is a manifestation of a which type of hypersensitivity reaction?
- a. IV
 - b. III
 - c. II
 - d. I

ANS: D

Urticaria, or hives, is a dermal (skin) manifestation of only type I allergic reactions.

PTS: 1 DIF: Cognitive Level: Remembering

31. What is Graves disease a result of?
- a. Increased levels of circulating immunoglobulins
 - b. The infiltration of the thyroid with T lymphocytes
 - c. Autoantibodies binding to thyroid-stimulating hormone (TSH)-receptor sites
 - d. Exposure to acetylates in substances such as rubber

ANS: C

In the hyperthyroidism (excessive thyroid activity) of Graves disease, autoantibody binds to and activates receptors for TSH (a pituitary hormone that controls the production of the hormone *thyroxine* by the thyroid). Graves disease is not caused by increased levels of circulating immunoglobulins, infiltration of the thyroid by T lymphocytes, or by exposure to acetylates.

PTS: 1 DIF: Cognitive Level: Remembering

32. Raynaud phenomenon is an example of which type of hypersensitivity?
- a. IV
 - b. III
 - c. II
 - d. I

ANS: B

The characteristics of serum sickness are observed in only systemic type III autoimmune diseases such as Raynaud phenomenon.

PTS: 1 DIF: Cognitive Level: Remembering

33. Which statement is *true* concerning an atopic individual?
- a. They tend to produce less IgE.
 - b. They tend to produce more Fc receptors.

- c. They tend to attract very few mast cells.
- d. They tend to produce very high levels of IgM.

ANS: B

Atopic individuals tend to produce higher quantities of IgE and have more Fc receptors for IgE on their mast cells. Atopic individuals tend to produce more, not less, IgE. Manifestations these individuals display are influenced greatly by the release of histamine from mast cells, which are found in large numbers in the affected tissue. An IgM response is a mainstay of type II responses.

PTS: 1

DIF: Cognitive Level: Remembering

34. Which statement is *true* regarding immunodeficiency?
- a. Immunodeficiency is generally not present in other family members.
 - b. Immunodeficiency is never acquired; rather, it is congenital.
 - c. Immunodeficiency is almost immediately symptomatic.
 - d. Immunodeficiency is a result of a postnatal mutation.

ANS: A

Generally, the genetic mutations that cause immunodeficiency are sporadic and not inherited; a family history exists in only approximately 25% of individuals. The sporadic mutations occur before birth, but the onset of symptoms may be early or later, depending on the particular syndrome. The immunodeficiency can be either congenital or acquired.

PTS: 1

DIF: Cognitive Level: Remembering

35. A person with type O blood is considered to be the universal blood donor because type O blood contains which of these?
- a. No antigens
 - b. No antibodies
 - c. Both A and B antigens
 - d. Both A and B antibodies

ANS: A

Because individuals with type O blood lack both types of antigens, they are considered universal donors, meaning that anyone can accept their red blood cells. Type O individuals, who have neither A or B antigen but have both anti-A and anti-B antibodies, cannot accept blood from any of the other three types.

PTS: 1

DIF: Cognitive Level: Remembering

36. Immunoglobulin E (IgE) is associated with which type of hypersensitivity reaction?
- a. I
 - b. II
 - c. III
 - d. IV

ANS: A

Hypersensitivity reactions have been divided into four distinct types: type I (IgE-mediated) hypersensitivity reactions, type II (tissue-specific) hypersensitivity reactions, type III (immune complex-mediated) hypersensitivity reactions, and type IV (cell-mediated) hypersensitivity reactions.

PTS: 1 DIF: Cognitive Level: Remembering

37. A pregnant woman has Graves disease. What test/s does the healthcare professional advise the woman about?
- Frequent tests of the newborn's muscular strength and movement.
 - Blood test for hyperthyroidism
 - Monthly OB checkups for fetal anomalies or pregnancy loss
 - Serum complete blood count including platelet count

ANS: B

Graves disease is an autoimmune disease in which maternal antibody against the receptor for TSH causes neonatal hyperthyroidism. The healthcare professional should advise the woman that her newborn will need to be tested for hyperthyroidism.

PTS: 1 DIF: Cognitive Level: Applying

MULTIPLE RESPONSE

1. When a tuberculin skin test is positive, the hard center and erythema surrounding the induration are a result of which of these? (*Select all that apply.*)
- Histamine
 - T lymphocytes
 - Immune complexes
 - Products of complement
 - Macrophages

ANS: B, E

The reaction site is infiltrated with T lymphocytes and macrophages, resulting in a clear hard center (induration) and a reddish surrounding area (erythema).

PTS: 1 DIF: Cognitive Level: Remembering

2. Exposure to which of these could result in a type IV hypersensitivity reaction? (*Select all that apply.*)
- Poison ivy
 - Neomycin
 - Dairy products
 - Nickel
 - Detergents

ANS: A, B, D, E

Allergens that primarily elicit type IV allergic hypersensitivities include plant resins (e.g., poison ivy, poison oak); metals (e.g., nickel, chromium); acetylates and chemicals in rubber, cosmetics, detergents; and topical antibiotics (e.g., neomycin). Food products typically result in type I hypersensitivity reactions.

PTS: 1 DIF: Cognitive Level: Remembering

3. Which disorders are considered autoimmune? (*Select all that apply.*)
- a. Crohn disease
 - b. Addison disease
 - c. Rheumatoid arthritis
 - d. Systemic lupus erythematosus
 - e. Type 2 diabetes

ANS: A, B, C, D

Crohn disease, Addison disease, rheumatoid arthritis, and systemic lupus erythematosus are all diseases that result from autoimmune pathologic conditions. Insulin-dependent diabetes is also an autoimmune disorder, but type 2 diabetes is not.

PTS: 1 DIF: Cognitive Level: Remembering

4. Which statements best define acute rejection? (*Select all that apply.*)
- a. Acute rejection is a cell-mediated immune response.
 - b. Acute rejection is usually a type III rejection.
 - c. Immunosuppressive drugs delay or lessen the intensity of an acute rejection.
 - d. Acute rejection is associated with the body's response to an organ transplant.
 - e. Acute rejection is a response against unmatched human leukocyte antigens (HLAs).

ANS: A, C, D, E

Acute rejection is primarily a cell-mediated immune response that occurs within days to months after transplantation. This type of rejection occurs when the recipient develops an immune response against unmatched HLAs after transplantation. A biopsy of the rejected organ usually shows an infiltration of lymphocytes and macrophages characteristic of a type IV reaction. Immunosuppressive drugs may delay or lessen the intensity of an acute rejection.

PTS: 1 DIF: Cognitive Level: Remembering

Chapter 10: Infection

MULTIPLE CHOICE

1. What is a significant cause of morbidity and mortality worldwide?
 - a. Starvation
 - b. Traumatic injury
 - c. Cardiovascular disease
 - d. Infectious disease

ANS: D

Despite the wide-scale implementation of progressive public health and immunization policies, infectious disease remains a significant cause of morbidity and mortality. The other options are not as significant.

PTS: 1 DIF: Cognitive Level: Remembering

2. What is the first stage in the infectious process?
 - a. Invasion
 - b. Colonization
 - c. Spread
 - d. Multiplication

ANS: B

From the perspective of the microorganisms that cause disease, the infectious process undergoes four separate stages of progression: (1) colonization, (2) invasion, (3) multiplication, and (4) spread.

PTS: 1 DIF: Cognitive Level: Remembering

3. Which type of microorganism reproduces on the skin?
 - a. Viruses
 - b. Bacteria and fungi
 - c. Protozoa and *Rickettsiae*
 - d. *Mycoplasma*

ANS: B

Only bacteria and fungi have the capacity to reproduce on the skin.

PTS: 1 DIF: Cognitive Level: Remembering

4. Phagocytosis involves neutrophils actively attacking, engulfing, and destroying which microorganisms?
 - a. Bacteria
 - b. Fungi
 - c. Viruses

d. Yeasts

ANS: A

Invasion is the direct confrontation with an individual's primary defense mechanisms against only bacteria, which include the complement system, antibodies, and phagocytes, such as neutrophils and macrophages. Fungi, viruses, and yeasts are not phagocytosed.

PTS: 1

DIF: Cognitive Level: Remembering

5. Once they have penetrated the first line of defense, which microorganisms do natural killer (NK) cells actively attack?
- Bacteria
 - Fungi
 - Viruses
 - Mycoplasma

ANS: C

NK cells are the principal defenders against only tumor cells or virally infected cells.

PTS: 1

DIF: Cognitive Level: Remembering

6. A student asks the healthcare professional to describe exotoxins. Which statement *by the professional is best*?
- Exotoxins are contained in cell walls of gram-negative bacteria.
 - Exotoxins are released during the lysis of bacteria.
 - Exotoxins are able to initiate the complement and coagulation cascades.
 - Exotoxins are released during bacterial growth.

ANS: D

Exotoxins are proteins released during bacterial growth. Exotoxins are not contained in cell walls of gram-negative bacteria, released during lysis of bacterial, or able to initiate the complement and coagulation cascades.

PTS: 1

DIF: Cognitive Level: Understanding

7. A healthcare professional student is learning about fungal infections. What information should the student use to help another student understand?
- Fungal infections occur only on skin, hair, and nails.
 - Phagocytes and T lymphocytes control fungal infections.
 - Fungal infections release endotoxins.
 - Vaccines prevent fungal infections.

ANS: B

The host defense against fungal infection includes the fungistatic properties of neutrophils and macrophages. T lymphocytes are crucial in limiting the extent of infection and producing cytokines to further activate macrophages. Fungi infect other tissue types such as vaginal or gastrointestinal. Fungi do not release endotoxins; they reside in the cell walls of gram-negative bacteria. Fungal infections are not prevented by current vaccines.

PTS: 1 DIF: Cognitive Level: Understanding

8. Cytokines are thought to cause fevers by stimulating the synthesis of which chemical mediator?
- Leukotriene
 - Histamine
 - Prostaglandin
 - Bradykinin

ANS: C

Cytokines seem to raise the thermoregulatory set point through stimulation of prostaglandin synthesis and turnover in thermoregulatory (brain) and nonthermoregulatory (peripheral) tissues. Leukotrienes, histamine, and bradykinin are not directly related to fever production.

PTS: 1 DIF: Cognitive Level: Remembering

9. Considering the hypothalamus, what is a fever produced by?
- Endogenous pyrogens acting directly on the hypothalamus
 - Exogenous pyrogens acting directly on the hypothalamus
 - Immune complexes acting indirectly on the hypothalamus
 - Cytokines acting indirectly on the hypothalamus

ANS: A

Exogenous pyrogens indirectly affect the hypothalamus through the release of endogenous pyrogens by cells of the host, however; a number of cytokines have been identified as endogenous pyrogens and these act directly on the hypothalamus. Neither immune complexes nor cytokines are involved in the process.

PTS: 1 DIF: Cognitive Level: Remembering

10. A healthcare professional is conducting community education on vaccinations. Which statement about vaccines does the professional include in the presentation?
- Most bacterial vaccines contain attenuated organisms.
 - Most viral vaccines are made by using dead organisms.
 - Vaccines require booster injections to maintain life-long protection.
 - Vaccines provide effective protection against most infections.

ANS: C

In general, vaccine-induced protection does not persist as long as infection-induced immunity, thus booster injections may be necessary to maintain protection throughout the life. Some common bacterial vaccines are killed microorganisms, extracts of bacterial antigens, or toxoids.

PTS: 1 DIF: Cognitive Level: Understanding

11. What are vaccines against viruses created from?
- Killed organisms or extracts of antigens
 - Live organisms weakened to produce antigens
 - Purified toxins that have been chemically detoxified
 - Recombinant pathogenic protein

ANS: B

Most vaccines against viral infections (e.g., measles, mumps, rubella, varicella [chickenpox], rotavirus) contain live viruses that are weakened (attenuated) to continue expressing the appropriate antigens but are unable to establish more than a limited and easily controlled infection. Vaccines against viruses do not contain extracts of antigens, purified toxins, or recombinant pathogenic proteins.

PTS: 1

DIF: Cognitive Level: Remembering

12. What does the student learn about HIV?
- HIV only infects T-helper (Th) cells.
 - HIV is a retrovirus.
 - HIV carries genetic information in its DNA.
 - HIV has five identified strains.

ANS: B

HIV is a member of the retrovirus family, which carries genetic information in the form of two copies of RNA. The major immunologic finding in AIDS is the striking decrease in the number of CD4+ Th cells. The major surface receptor on the HIV virus binds to the CD4 molecule found mostly on the surface of T-helper cells. There appear to be two strains of HIV: HIV-1 and HIV-2.

PTS: 1

DIF: Cognitive Level: Remembering

13. What is the role of reverse transcriptase in HIV infection?
- Reverse transcriptase converts single-stranded DNA into double-stranded DNA.
 - It is needed to produce integrase.
 - It transports the RNA into the cell nucleus.
 - It converts RNA into double-stranded DNA.

ANS: D

HIV is a retrovirus and carries an enzyme, *reverse transcriptase*, which creates a double-stranded DNA version of the virus. HIV virus does not contain DNA. Reverse transcriptase does not transport the RNA into the cell nucleus.

PTS: 1

DIF: Cognitive Level: Remembering

14. After sexual transmission of HIV, how soon can lab results detect the infection?
- 1 to 2 days
 - 4 to 10 days
 - 4 to 8 weeks
 - 2 to 4 months

ANS: B

HIV RNA may be detected in the plasma by about 4 to 10 days after an acute infection and HIV.

PTS: 1

DIF: Cognitive Level: Remembering

15. Which cells are primary targets for HIV?

- a. CD4⁺ Th cells only
- b. CD4⁺ Th cells, macrophages, and dendritic cells
- c. CD8-positive cytotoxic T (Tc) cells and plasma cells
- d. CD8-positive Tc cells only

ANS: B

The primary cellular targets for HIV include CD4⁺ Th cells, macrophages, and dendritic cells. The other cell types are not the primary target cells of HIV.

PTS: 1

DIF: Cognitive Level: Remembering

16. What area in the body may act as a reservoir in which HIV can be relatively protected from antiviral drugs?
- a. Central nervous system
 - b. Bone marrow
 - c. Thymus gland
 - d. Lungs

ANS: A

HIV may persist in regions where the antiviral drugs are not as effective, such as the central nervous system (CNS). The bone marrow, thymus gland, and lungs are not as protected from antiviral drugs.

PTS: 1

DIF: Cognitive Level: Remembering

17. What is the final stage of the infectious process?
- a. Colonization
 - b. Invasion
 - c. Multiplication
 - d. Spread

ANS: D

From the perspective of the microorganisms that cause disease, the infectious process undergoes four separate stages of progression: (1) colonization, (2) invasion, (3) multiplication, and (4) spread.

PTS: 1

DIF: Cognitive Level: Remembering

18. How is toxigenicity defined?
- a. The ability of the pathogen to invade and multiply in the host
 - b. The pathogen's ability to produce disease by the production of a soluble toxin
 - c. The ability of an agent to produce disease
 - d. The potency of a pathogen measured in terms of the number of microorganisms required to kill the host

ANS: B

Toxigenicity is the ability of a pathogen to produce soluble toxins or endotoxins, which are factors that greatly influence the pathogen's degree of virulence. The other options do not accurately define toxigenicity.

PTS: 1 DIF: Cognitive Level: Remembering

19. What is the ability of the pathogen to invade and multiply in the host referred to as?
- Infectivity
 - Toxigenicity
 - Pathogenicity
 - Virulence

ANS: A

Infectivity is the ability of the pathogen to invade and multiply in the host. The other options do not accurately denote the pathogen's ability to invade and multiply in the host.

PTS: 1 DIF: Cognitive Level: Remembering

20. Some bacterial surface proteins bind with the crystalline fragment (Fc) portion of an antibody to do what?
- Hide in cells to avoid triggering an immune response
 - Form self-protecting toxins
 - Make staining possible for microscopic observation
 - Produce a protective "self" protein

ANS: D

Some bacterial surface proteins (protein A of *Staphylococcus aureus*, protein G of *Streptococcus pyogenes*) bind the Fc portion of the individual's antibody, thus forming a protective coat of "self" protein. The other options do not accurately define the role of bacterial surface proteins as they bind with the Fc portion on an antibody.

PTS: 1 DIF: Cognitive Level: Remembering

21. Which organism is a common sexually transmitted bacterial infection?
- Staphylococcus aureus*
 - Clostridium perfringens*
 - Helicobacter pylori*
 - Treponema pallidum*

ANS: D

Treponema pallidum (spirochete, syphilis) is a sexually transmitted disease. *Staphylococcus aureus* is commonly ingested, causing food poisoning; *Clostridium perfringens* (gas gangrene) is a skin or wound infection; and *Helicobacter pylori* (gastritis, peptic ulcers) is found in the gastrointestinal tract.

PTS: 1 DIF: Cognitive Level: Remembering

22. Which disease is an example of a rickettsial infection?
- Cholera
 - Candida*
 - Sleeping sickness
 - Rocky Mountain spotted fever

ANS: D

Rocky Mountain spotted fever is a result of rickettsiae. Cholera is a bacterial infection, candida is a fungal infection, and sleeping sickness is a protozoal infection.

PTS: 1

DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. Which secretions transmit HIV? (*Select all that apply.*)

- a. Semen
- b. Urine
- c. Saliva
- d. Breast milk
- e. Sweat

ANS: A, D

HIV is a blood-borne pathogen present in specific body fluids (e.g., blood, vaginal fluid, semen, breast milk).

PTS: 1

DIF: Cognitive Level: Remembering

2. Which infections are fungal? (*Select all that apply.*)

- a. Ringworm
- b. *Candida*
- c. Cholera
- d. Athlete's foot
- e. *Aspergillus*

ANS: A, B, D, E

Infection with a fungus is called *mycosis* and includes dermatophytes (e.g., tineas, which refers to several skin mycoses including ringworm, athlete's foot, and others) or yeasts (e.g., *Candida*, *Aspergillus*, *Cryptococcus*). Cholera is a bacterial infection.

PTS: 1

DIF: Cognitive Level: Remembering

3. Which statements are *true* regarding the development of HIV symptoms? (*Select all that apply.*)

- a. Symptoms generally appear in the clinical latency stage.
- b. Symptoms are generally observable within 5 years of the initial infection.
- c. T cells levels, particularly those of memory T cells, progressively decrease.
- d. Untreated infected individuals may remain asymptomatic for up to 10 years.
- e. Secondary lymphoid organs experience damage and resulting malfunction.

ANS: C, D, E

Individuals during the early stages of HIV (*early stage disease* or *clinical latency*) are usually asymptomatic. The early stage may last as long as 10 years in untreated people, during which the viral load increases and the numbers of CD4⁺ cells progressively decrease. As a result of these processes, the level of T cells decreases (particularly memory T cells, which seem more susceptible to HIV infection); thymic production of new T cells is decreased; and the secondary lymphoid organs (particularly the lymph nodes) are damaged.

PTS: 1 DIF: Cognitive Level: Remembering

4. Which statements are *true* regarding endotoxins? (*Select all that apply.*)
- a. Endotoxins are lipopolysaccharides.
 - b. Endotoxins are located in the walls of bacteria.
 - c. Endotoxins are created during the process of lysis.
 - d. Endotoxins are found in gram-negative microorganisms.
 - e. Endotoxins are released during the destruction of its host.

ANS: A, B, D, E

Endotoxins are lipopolysaccharides (LPSs) contained in the cell walls of gram-negative bacteria and released during lysis (or destruction) of the bacteria.

PTS: 1 DIF: Cognitive Level: Remembering

5. Which statements are *true* regarding viruses? (*Select all that apply.*)
- a. Viruses are very complex microorganisms.
 - b. Viruses are referred to as *eukaryotes*.
 - c. Viruses are capable of producing messenger RNA (mRNA).
 - d. Viruses penetrate plasma membranes via endocytosis.
 - e. Viruses are capable of uncoating cytoplasmic nucleocapsid.

ANS: C, D, E

Viruses are extremely simple microorganisms and do not possess any of the metabolic organelles found in prokaryotes (e.g., bacteria) or eukaryotes (e.g., human cells). Once bound, the virus can penetrate the plasma membrane by receptor-mediated endocytosis. Within the cytoplasm, the virus uncoats the protective nucleocapsid and releases viral genetic information. Most RNA viruses directly produce mRNA, which is translated into viral proteins, and genomic RNA, which is eventually packaged into new viruses.

PTS: 1 DIF: Cognitive Level: Remembering

6. Which of these play a role in the control of fungal infections? (*Select all that apply.*)
- a. Cytokines
 - b. Macrophages
 - c. Natural killer cells
 - d. Neutrophils
 - e. T lymphocytes

ANS: A, B, D, E

The host defense against fungal infection includes the fungistatic properties of neutrophils and macrophages. T lymphocytes are crucial in limiting the extent of infection and producing cytokines to further activate macrophages. *Natural killer cells* are a component of innate immune system.

PTS: 1 DIF: Cognitive Level: Remembering

7. Which are complications of AIDS? (*Select all that apply.*)
- a. Kaposi sarcoma
 - b. *Helicobacter pylori*
 - c. Cytomegalovirus retinitis
 - d. Herpes simplex infection
 - e. *Legionella pneumophila*

ANS: A, C, D

Kaposi sarcoma, cytomegalovirus retinitis, and herpes simplex infection are clinical complications characteristically observed in patients with AIDS. *Neither Helicobacter pylori nor Legionella pneumophila are considered classic AIDS opportunistic diseases.*

PTS: 1 DIF: Cognitive Level: Remembering

Chapter 11: Stress and Disease

MULTIPLE CHOICE

1. Exhaustion occurs if stress continues when which stage of the general adaptation syndrome is *not* successful?
 - a. Flight or fight
 - b. Alarm
 - c. Adaptation
 - d. Arousal

ANS: C

Exhaustion occurs if stress continues and adaptation is not successful, ultimately causing impairment of the immune response, heart failure, and kidney failure, leading to death. The other stages occur before the adaptation stage.

PTS: 1 DIF: Cognitive Level: Remembering

2. Which organ is stimulated during the alarm phase of the general adaptation syndrome (GAS)?
 - a. Adrenal cortex
 - b. Hypothalamus
 - c. Anterior pituitary
 - d. Limbic system

ANS: B

The alarm phase of the GAS begins when a stressor triggers the actions of the hypothalamus and the sympathetic nervous system (SNS). The other organs are not stimulated by the alarm phase of GAS.

PTS: 1 DIF: Cognitive Level: Remembering

3. During an anticipatory response to stress, what is the reaction from the limbic system stimulated by?
 - a. The retronucleus of the anterior pituitary
 - b. The anterior nucleus of the hippocampus
 - c. The paraventricular nucleus of the hypothalamus
 - d. The prefrontal nucleus of the amygdala

ANS: C

The paraventricular nucleus (PVN) of the hypothalamus must be stimulated to cause the limbic system to be stimulated. The other areas are not involved in the stimulation of the limbic system.

PTS: 1 DIF: Cognitive Level: Remembering

4. Which hormone prompts increased anxiety, vigilance, and arousal during a stress response?
 - a. Norepinephrine

- b. Epinephrine
- c. Cortisol
- d. Adrenocorticotrophic hormone (ACTH)

ANS: A

The release of norepinephrine promotes arousal, increased vigilance, increased anxiety, and other protective emotional responses. Epinephrine's effects are primarily on the cardiovascular system. Cortisol's chief effects involve metabolic processes. By inhibiting the use of metabolic substances while promoting their formation, cortisol mobilizes glucose, amino acids, lipids, and fatty acids and delivers them to the bloodstream. ACTH binds with specific receptors on the adrenal glands which causes the release of the glucocorticoids.

PTS: 1 DIF: Cognitive Level: Remembering

5. Perceived stress elicits an emotional, anticipatory response that begins where?
- a. Prefrontal cortex
 - b. Anterior pituitary
 - c. Limbic system
 - d. Hypothalamus

ANS: C

The perception of stress initiates a series of events in the central and peripheral nervous systems. In the brain, stress elicits an anticipatory response that activates the limbic system; the brain area is responsible for motivation, emotions, and cognition.

PTS: 1 DIF: Cognitive Level: Remembering

6. A student asks the healthcare professional how immunity is decreased by stress. The professional responds that during a stress response, the helper T (Th) 1 response is suppressed by which hormone?
- a. ACTH
 - b. Cortisol
 - c. Prolactin
 - d. Growth hormone

ANS: B

Cortisol acts to suppress the activity of Th1 cells, which leads to a decrease in innate immunity and the proinflammatory response. Cortisol also stimulates the activity of Th2 cells, which increases adaptive immunity and the antiinflammatory response. ACTH binds with specific receptors on the adrenal glands which causes the release of the glucocorticoids. Prolactin is secreted in response to a variety of stressful stimuli and acts as a second messenger for IL-2 and has a positive influence on B-cell activation and differentiation. Growth hormone affects protein, lipid, and carbohydrate metabolism; counters effects of insulin; and is involved in tissue repair.

PTS: 1 DIF: Cognitive Level: Understanding

7. Stress-induced sympathetic stimulation of the adrenal medulla causes the secretion of what?
- a. Epinephrine and aldosterone
 - b. Norepinephrine and cortisol

- c. Epinephrine and norepinephrine
- d. Acetylcholine and cortisol

ANS: C

The sympathetic nervous system is aroused during the stress response and causes the medulla of the adrenal gland to release catecholamines (80% epinephrine and 20% norepinephrine) into the bloodstream. Sympathetic stimulation of the adrenal medulla does not cause the secretion of aldosterone, cortisol, or acetylcholine.

PTS: 1 DIF: Cognitive Level: Remembering

8. A severely stressed patient has cold, clammy skin. The healthcare professional quizzes the student about this effect. The student correctly answers that this effect is directly from which action?
- a. Epinephrine dilating blood vessels leading to the vital organs
 - b. Norepinephrine constricting blood vessels in the skin
 - c. Dilating the airways to increased oxygenation of the tissues
 - d. Dysfunctional temperature regulation from cortisol secretion

ANS: B

In a stress response, the actions of norepinephrine and epinephrine are complementary. While epinephrine dilates blood vessels to the vital organs (among other things), norepinephrine constricts blood vessels in the viscera and skin, providing more blood supply for those vital organs. The clinical result is cold, clammy skin. Epinephrine can also dilate airways, but this does not produce the skin changes as described. Temperature dysregulation is not the cause of the cold, clammy skin.

PTS: 1 DIF: Cognitive Level: Understanding

9. Released stress-induced cortisol results in the stimulation of gluconeogenesis by affecting which structure?
- a. Adrenal cortex
 - b. Pancreas
 - c. Liver
 - d. Anterior pituitary

ANS: C

One of the primary effects of cortisol is the stimulation of gluconeogenesis through stimulation of the liver. The adrenal cortex, pancreas, and anterior pituitary do not produce stimulation of gluconeogenesis when exposed to cortisol.

PTS: 1 DIF: Cognitive Level: Remembering

10. What effect of increased secretions of epinephrine, glucagon, and growth hormone would the healthcare professional assess for?
- a. Hyperglycemia
 - b. Hypertension
 - c. Bronchodilation
 - d. Pupil dilation

ANS: A

Cortisol enhances the elevation of blood glucose promoted by other hormones, such as epinephrine, glucagon, and growth hormone. Increases in glucagon and growth hormone do not lead to increases in blood pressure, bronchodilation, or pupil dilation although epinephrine does.

PTS: 1

DIF: Cognitive Level: Remembering

11. A severely stressed patient has hypoglycemia each time the patient's blood glucose is checked. The healthcare professional should order laboratory tests to measure which hormone in the patient's blood?
- Epinephrine
 - Norepinephrine
 - Cortisol
 - Growth hormone

ANS: C

One of the primary effects of cortisol is the stimulation of gluconeogenesis or the formation of glucose from noncarbohydrate sources, such as amino or free fatty acids in the liver. Neither reaction is a result of the effects of any of the other hormones.

PTS: 1

DIF: Cognitive Level: Applying

12. What effect do androgens have on lymphocytes?
- Suppression of B-cell responses and enhancement of T-cell responses
 - Suppression of T-cell responses and enhancement of B-cell responses
 - Suppression of B- and T-cell responses
 - Enhancement of B- and T-cell responses

ANS: C

Androgens suppress T- and B-cell responses. Androgens do not enhance either B- or T-cell responses.

PTS: 1

DIF: Cognitive Level: Remembering

13. The action of which hormone helps explain increases in affective anxiety and eating disorders, mood cycles, and vulnerability to autoimmune and inflammatory diseases in women as a result of stimulation of the CRH gene promoter and central norepinephrine system?
- Progesterone
 - Cortisol
 - Estrogen
 - Prolactin

ANS: C

Of the options provided, only estrogen directly stimulates the CRH gene promoter and the central noradrenergic (norepinephrine) system, which may help explain adult women's slight hypercortisolism, increases in affective anxiety and eating disorders, mood cycles, and vulnerability to autoimmune and inflammatory disease, all of which follow estradiol fluctuations.

PTS: 1 DIF: Cognitive Level: Remembering

14. Which statement is *true* concerning the differences between stress-induced hormonal alterations of men and women?
- After injury, women produce more proinflammatory cytokines than men, a profile that is associated with poor outcomes.
 - Androgens appear to induce a greater degree of immune cell apoptosis after injury, creating greater immunosuppression in injured men than in injured women.
 - Psychologic stress associated with some types of competition decreases both testosterone and cortisol, especially in athletes older than 45 years of age.
 - After stressful stimuli, estrogen is increased in women, but testosterone is decreased in men.

ANS: B

Androgens appear to induce a greater degree of immune cell apoptosis after injury, a mechanism that may elicit a greater immunosuppression in injured men vs. injured women. Men produce more proinflammatory cytokines. Competitive stress increases testosterone and cortisol. Estrogen is not increased in women after stressful stimuli.

PTS: 1 DIF: Cognitive Level: Remembering

15. A patient perceives living in a state of chronic stress. What will diagnostic blood work ordered by the healthcare professional likely demonstrate?
- Decreased Th lymphocytes
 - Increased erythrocytes
 - Decreased Tc cells
 - Increased platelets

ANS: C

Illustrating the influence of chronic stress appraisal on the physiologic processes, a meta-analysis of the relationships between stressors and immunity found that a higher *perception* of stress was associated with reduced T cytotoxic (Tc)-cell cytotoxicity, although not with levels of circulating Th or Tc lymphocytes. Research has not shown this relationship with changes in Th lymphocytes, erythrocytes, or platelets.

PTS: 1 DIF: Cognitive Level: Remembering

16. What are the signs that a patient is in the adaptive stage of the general adaptation syndrome?
- He or she begins to experience elevated heart and respiratory rates.
 - He or she finds it difficult to concentrate on a solution for the stress.
 - The patient perceives his or her only options are to run away or fight back.
 - The patient has exceeded his or her ability to cope with the current situation.

ANS: C

Fight-or-flight behaviors are characteristic of the more advanced adaptive stage, whereas the remaining options are noted in the initial alarm stage and are mediated by the sympathetic nervous system.

PTS: 1 DIF: Cognitive Level: Remembering

17. What is the most influential factor in whether a person will experience a stress reaction?
- General state of physical health
 - Spiritual belief system
 - Intellectual abilities
 - Ability to cope

ANS: D

A person does not have a stress reaction unless the stress exceeds his or her coping abilities. General health, spiritual belief systems, and intellectual abilities do not have the same degree of influence on stress reactions.

PTS: 1 DIF: Cognitive Level: Remembering

18. A reduction in an individual's number of natural killer (NK) cells appears to correlate with an increased risk for the development of what?
- Depression
 - Type 1 diabetes
 - Obsessive compulsive disorder (OCD)
 - Gastroesophageal reflux disorder (GERD)

ANS: A

A meta-analysis of studies shows a relationship between depression and the reduction in lymphocyte proliferation and natural killer cell activity. Currently, no research supports correlations between the number of NK cells and type 1 diabetes, OCD, or GERD.

PTS: 1 DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. The effect epinephrine has on the immune system during the stress response is to increase which cells? (*Select all that apply.*)
- NK cells
 - Immunoglobulins
 - Cytokines
 - T cells
 - Th cells

ANS: A, D

The injection of epinephrine into healthy human beings is associated with a transient increase of the number of lymphocytes (e.g., T cells, natural killer (NK) cells) in the peripheral blood. This association is not true of the other options.

PTS: 1 DIF: Cognitive Level: Remembering

2. The increased production of proinflammatory cytokines is associated with which considerations? (*Select all that apply.*)
- Chronic respiratory dysfunction

- b. Elevated anxiety levels
- c. Immune disorders
- d. Age and gender
- e. Dementia

ANS: B, C

Increased levels of proinflammatory cytokines have been shown to have a possible link between stress and immune function. Chronic respiratory dysfunction, age, gender, and dementia are not directly linked to cytokine levels.

PTS: 1

DIF: Cognitive Level: Remembering

3. Which statements are *true* regarding lymphocytes? (*Select all that apply.*)
- a. Lymphocytes are involved in the production of the human growth hormone.
 - b. Elevated catecholamine levels influence lymphocytes.
 - c. Lymphocytes are synthesized in the anterior pituitary gland.
 - d. Lymphocytes have receptors for the hormone prolactin.
 - e. Lymphocytes produce endorphins in large amounts.

ANS: A, B, D

GH is synthesized from the anterior pituitary gland and is produced by lymphocytes and mononuclear phagocytic cells. Several classes of lymphocytes have receptors for prolactin, suggesting a direct effect of prolactin on immune function. Although the effects of acute elevation of catecholamines on the alteration of lymphocyte function are real, they are short-lived, lasting only approximately 2 hours. Lymphocytes are not synthesized in the anterior pituitary gland or produce endorphins in large amounts.

PTS: 1

DIF: Cognitive Level: Remembering

4. Which cytokines initiate the production of corticotropin-releasing hormone (CRH)? (*Select all that apply.*)
- a. IL-1
 - b. IL-6
 - c. TNF- β
 - d. IFN
 - e. IL-12

ANS: A, B

Although a number of stress factors initiate the production of CRH, of the options available, only high levels of IL-1 and IL-6 initiate such a response.

PTS: 1

DIF: Cognitive Level: Remembering

Chapter 12: Cancer Biology

MULTIPLE CHOICE

1. Which cancer originates from connective tissue?
 - a. Osteogenic sarcoma
 - b. Basal cell carcinoma
 - c. Multiple myeloma
 - d. Adenocarcinoma

ANS: A

Cancers arising from connective tissue usually have the suffix *-sarcoma*. Carcinomas arise in epithelial tissue. Myeloma arises in the bone marrow.

PTS: 1 DIF: Cognitive Level: Remembering

2. Carcinoma refers to abnormal cell proliferation originating from which tissue origin?
 - a. Blood vessels
 - b. Epithelial cells
 - c. Connective tissue
 - d. Glandular tissue

ANS: B

Only cancers arising from epithelial cells are called *carcinomas*. Connective tissue cancers are called sarcomas. Glandular tissue cancers are named adenocarcinomas. Malignant cancers can invade blood vessels.

PTS: 1 DIF: Cognitive Level: Remembering

3. Carcinoma in situ is characterized by which changes?
 - a. Cells have broken through the local basement membrane.
 - b. Cells have invaded immediate surrounding tissue.
 - c. Cells remain localized in the glandular or squamous cells.
 - d. Cellular and tissue alterations indicate dysplasia.

ANS: C

Carcinoma in situ (CIS) refers to preinvasive epithelial malignant tumors of glandular or squamous cell origin. These early stage cancers are localized to the epithelium and have not broken through the local basement membrane or invaded the surrounding tissue. Dysplasia refers to changes in mature cell structure.

PTS: 1 DIF: Cognitive Level: Remembering

4. Which term is used to describe a cell showing a loss of cellular differentiation?
 - a. Dysplasia
 - b. Hyperplasia

- c. Metaplasia
- d. Anaplasia

ANS: D

Anaplasia is defined as the loss of cellular differentiation, irregularities of the size and shape of the nucleus, and the loss of normal tissue structure. In clinical specimens, anaplasia is recognized by a loss of organization and a significant increase in nuclear size with evidence of ongoing proliferation. Dysplasia is the presence of an abnormal cell type within a tissue and often is called “precancerous.” Hyperplasia is an enlargement of an organ or tissue due to increased production of its cells, also often considered precancerous. Metaplasia is an abnormal change in the characteristics of a tissue.

PTS: 1 DIF: Cognitive Level: Remembering

5. What are tumor cell markers?
- a. Hormones, enzymes, antigens, and antibodies that are produced by cancer cells
 - b. Receptor sites on tumor cells that can be identified and marked
 - c. Cytokines that are produced against cancer cells
 - d. Identification marks that are used in administering radiation therapy

ANS: A

Tumor (biologic) markers are substances produced by both benign and malignant cells that are found either in or on the tumor cells or in the blood, spinal fluid, or urine. Tumor markers may include hormones, enzymes, genes, antigens, and antibodies. Tumor markers are not receptor sites, cytokines, or identification marks for radiation.

PTS: 1 DIF: Cognitive Level: Remembering

6. What is one function of the tumor cell marker?
- a. To provide a definitive diagnosis of cancer
 - b. To treat certain types of cancer
 - c. To predict where cancers will develop
 - d. To screen individuals at high risk for cancer

ANS: D

Screening and identifying individuals at high risk for cancer are ways tumor markers can be used. The two other uses for these markers are to help diagnosis a specific type of cancer (not give a definitive diagnosis) and to follow the clinical course of a tumor.

PTS: 1 DIF: Cognitive Level: Remembering

7. Which statement supports the hypothesis that intestinal polyps are benign neoplasms and the first stage in the development of colon cancer?
- a. Cancer cells accumulate slower than noncancer cells.
 - b. An accumulation of mutations in specific genes is required to develop cancer.
 - c. Tumor invasion and metastasis progress more slowly in the gastrointestinal tract.
 - d. Apoptosis is triggered by diverse stimuli, including excessive growth.

ANS: B

Multiple genetic mutations are required for the evolution of full-blown cancer. This sequential development of cancer has been well documented in the transformation of benign colon polyps to colon cancer.

PTS: 1 DIF: Cognitive Level: Remembering

8. Autocrine stimulation is the ability of cancer cells to do what?
- Stimulate angiogenesis to create their own blood supply
 - Encourage secretions that turn off normal growth inhibitors
 - Secrete growth factors that stimulate their own growth
 - Divert nutrients away from normal tissue for their own use

ANS: C

Cancer cells must have mutations that enable them to proliferate in the absence of external growth signals. To achieve this, some cancers acquire the ability to secrete growth factors that stimulate their own growth, a process known as *autocrine stimulation*. The other options describe other activities of cancer cells, but not autocrine stimulation.

PTS: 1 DIF: Cognitive Level: Remembering

9. What is apoptosis?
- Normal mechanism for cells to self-destruct when growth is excessive
 - Antigrowth signal activated by the tumor-suppressor gene *Rb*
 - Mutation of cell growth stimulated by the *TP53 gene*
 - Transformation of cells from dysplasia to anaplasia

ANS: A

Normal cells have a mechanism that causes them to self-destruct when growth is excessive and cell cycle checkpoints have been ignored. Unchecked proliferation could lead to malignancy.

PTS: 1 DIF: Cognitive Level: Remembering

10. A student studying biology asks the professor to describe how the *ras* gene is involved in cancer proliferation. What explanation by the professor is *best*?
- It suppresses the action of the tumor-suppressor genes.
 - It changes the way the growth promotion genes work.
 - A mutation in this gene allows continuous cell growth.
 - It activates a cell surface receptor that allows signaling to the nucleus.

ANS: C

Up to one-third of all cancers have an activating mutation in the gene for an intracellular signaling protein called *ras*. This mutant *ras* stimulates cell growth even when growth factors are missing. The remaining options do not describe how *ras contributes to cancer formation and growth*.

PTS: 1 DIF: Cognitive Level: Understanding

11. The professor explains to students that oncogenes are genes that are capable of what?
- Undergoing mutation that directs the synthesis of proteins to accelerate the rate of

- tissue proliferation
- b. Directing synthesis of proteins to regulate growth and to provide necessary replacement of tissue
 - c. Encoding proteins that negatively regulate the synthesis of proteins to slow or halt the replacement of tissue
 - d. Undergoing mutation that directs malignant tissue toward blood vessels and lymph nodes for metastasis

ANS: A

Oncogenes are independent of normal regulatory mechanisms; thus the cell is driven into a state of unregulated constitutive expression of proliferation signals and uncontrolled cell growth.

PTS: 1 DIF: Cognitive Level: Remembering

12. Burkitt lymphomas designate a chromosome that has a piece of chromosome 8 fused to a piece of chromosome 14. This is an example of which mutation of normal genes to oncogenes?
- a. Point mutation
 - b. Chromosome translocation
 - c. Gene amplification
 - d. Chromosome fusion

ANS: B

Chromosome translocations, in which a piece of one chromosome is translocated to another chromosome, can activate oncogenes. One of the best examples is the t(8;14) translocation found in many Burkitt lymphomas; t(8;14) designates a chromosome that has a piece of chromosome 8 fused to a piece of chromosome 14. A point mutation is the alteration of one or a few nucleotide base pairs. Gene amplification is the result of repeated duplication of a region of a chromosome, so that instead of the normal two copies of a gene, tens or even hundreds of copies are present. Chromosome fusion occurs during translocation.

PTS: 1 DIF: Cognitive Level: Remembering

13. In childhood neuroblastoma, the *N-myc* oncogene undergoes which type of mutation of normal gene to oncogene?
- a. Point mutation
 - b. Chromosome fusion
 - c. Gene amplification
 - d. Chromosome translocation

ANS: C

Amplifications are the result of the duplication of a small piece of a chromosome over and over again; consequently, instead of the normal two copies of a gene, tens or even hundreds of copies are present. The *N-myc* oncogene is amplified in 25% of childhood neuroblastoma.

PTS: 1 DIF: Cognitive Level: Remembering

14. What aberrant change causes the abnormal growth in retinoblastoma?
- a. Proto-oncogenes are changed to oncogenes.
 - b. The tumor-suppressor gene is turned off.

- c. Genetic amplification causes the growth.
- d. Chromosomes 9 and 21 are fused.

ANS: B

One of the first discovered tumor-suppressor genes, the retinoblastoma (*Rb*) gene, normally strongly inhibits the cell division cycle. When it is inactivated, the cell division cycle can proceed unchecked. The *Rb* gene is mutated in childhood retinoblastoma. The remaining options do not describe the abnormal growth in retinoblastoma.

PTS: 1 DIF: Cognitive Level: Remembering

15. Why are two “hits” required to inactivate tumor-suppressor genes?
- a. Each allele must be altered, and each person has two copies, or alleles, of each gene, one from each parent.
 - b. The first hit stops tissue growth, and the second hit is needed to cause abnormal tissue growth.
 - c. Tumor-suppressor genes are larger than proto-oncogenes, requiring two hits to affect carcinogenesis.
 - d. The first hit is insufficient to cause enough damage to cause a mutation.

ANS: A

A single genetic event can activate an oncogene, acting in a dominant manner in the cell. However, each person has two copies, or alleles, of each gene, one from each parent. Therefore two hits are required to inactivate the two alleles of a tumor-suppressor gene, allowing the process to become active. The remaining options do not describe the reason two hits are required.

PTS: 1 DIF: Cognitive Level: Remembering

16. How does the *ras* gene convert from a proto-oncogene to an oncogene?
- a. Designating a chromosome that has a piece of one chromosome fused to a piece of another chromosome
 - b. Duplicating a small piece of a chromosome, repeatedly making numerous copies
 - c. Altering one or more nucleotide base pairs
 - d. Promoting proliferation of growth signals by impairing tumor-suppressor genes

ANS: C

A point mutation is the alteration of one or a few nucleotide base pairs. This type of mutation can have profound effects on the activity of proteins. A point mutation in the *ras* gene converts it from a regulated proto-oncogene to an unregulated oncogene, an accelerator of cellular proliferation. Fusion, duplications, and proliferation of growth signals are not the cause of a *ras* gene converting to an oncogene.

PTS: 1 DIF: Cognitive Level: Remembering

17. How do cancer cells use the enzyme *telomerase*?
- a. To repair the telomeres to restore somatic cell growth
 - b. As an intracellular signaling chemical to stimulate cell division
 - c. To switch off the telomerase to enable cells to divide indefinitely

- d. To switch on the telomerase to enable cells to divide indefinitely

ANS: D

Cancer cells, when they reach a critical age, somehow activate telomerase to restore and maintain their telomeres and thereby make it possible for cells to divide over and over again.

PTS: 1 DIF: Cognitive Level: Remembering

18. What are characteristics of benign tumors?
- Benign tumors invade local tissues.
 - Benign tumors spread through the lymph nodes.
 - Benign tumors cause systemic symptoms.
 - Benign tumors include the suffix *-oma*.

ANS: D

Benign tumors are usually encapsulated and well-differentiated. They retain some normal tissue structure and do not invade the capsules surrounding them or spread to regional lymph nodes or distant locations. Benign tumors are generally named according to the tissues from which they arise and include the suffix *-oma*. Benign tumors do not cause systemic symptoms.

PTS: 1 DIF: Cognitive Level: Remembering

19. What is the major virus involved in the development of cervical cancer?
- Herpes simplex virus type 6
 - Herpes simplex virus type 2
 - Human papillomavirus
 - Human immunodeficiency virus

ANS: C

Infection with specific subtypes of human papillomavirus (HPV) causes virtually all cervical cancers. The remaining options are not known to be associated with cervical cancer.

PTS: 1 DIF: Cognitive Level: Remembering

20. The Papanicolaou (Pap) test is used to screen for which cancer?
- Ovarian
 - Uterine
 - Cervical
 - Vaginal

ANS: C

The Pap test, an examination of cervical epithelial scrapings, readily detects early oncogenic human papillomavirus (HPV) infection. The Pap test is not used for screening the other cancer sites listed.

PTS: 1 DIF: Cognitive Level: Remembering

21. A healthcare professional is caring for a patient undergoing chemotherapy. What is the skin-related health risk the professional should assess the patient for and be prepared to treat?

- a. Infection
- b. Ultraviolet damage
- c. Pain
- d. Erythema

ANS: A

Decreased renewal rates of the epidermal layers in the skin may lead to skin breakdown and dryness, altering the normal barrier protection against infection. The healthcare professional should assess the patient for infection regularly and be prepared to treat any infection noted. Radiation therapy may cause skin erythema (redness). Pain and ultraviolet damage is not related to chemotherapies.

PTS: 1 DIF: Cognitive Level: Applying

22. Inherited mutations that predispose to cancer are almost invariably what kind of gene?
- a. Proto-oncogenes
 - b. Oncogenes
 - c. Tumor-suppressor genes
 - d. Growth-promoting genes

ANS: C

Inherited mutations that predispose to cancer are almost invariably in tumor-suppressor genes. At present, no research supports the other options as factors related to how inherited mutations cause cancer.

PTS: 1 DIF: Cognitive Level: Remembering

23. What is the consequence for cells when the functioning *TP53* gene is lost as a result of mutation?
- a. Cells undergo apoptosis.
 - b. Cells escape apoptosis.
 - c. Cells receive less oxygen.
 - d. Cells adhere more readily.

ANS: B

The most common mutations conferring resistance to apoptosis occur in the *TP53* gene. The remaining options do not accurately describe the effect when the functioning *TP53* gene is lost as a result of mutation.

PTS: 1 DIF: Cognitive Level: Remembering

24. Which gastrointestinal tract condition can be an outcome of both chemotherapy and radiation therapy?
- a. Increased cell turnover
 - b. Constipation
 - c. Stomatitis
 - d. Bloody stool

ANS: C

Chemotherapy and radiation therapy may cause a decreased cell turnover, thereby leading to oral ulcers (stomatitis), malabsorption, and diarrhea.

PTS: 1 DIF: Cognitive Level: Remembering

25. What is the role of vascular endothelial growth factor (VEGF) and basic fibroblast growth factor (bFGF) in cell metastasis?
- To stimulate growth of nearby tumor cells
 - To develop new blood vessels to feed cancer cells
 - To prevent cancer cells from escaping apoptosis
 - To act as a chemical gradient to guide cells to blood vessels

ANS: B

By recruiting new vascular endothelial cells and initiating the proliferation of existing blood vessel cells, the angiogenic factors, such as *VEGF* and growth factor *bFGF*, allow small cancers to become large cancers.

PTS: 1 DIF: Cognitive Level: Remembering

26. It has been determined that a patient's tumor is in stage 2. How does the healthcare professional describe this finding to the patient?
- Cancer is confined to the organ of origin.
 - Cancer has spread to regional structures.
 - Cancer is locally invasive.
 - Cancer has spread to distant sites.

ANS: C

Cancer confined to the organ of origin is stage 1; cancer that is locally invasive is stage 2; cancer that has spread to regional structures, such as the lymph nodes, is stage 3; and cancer that has spread to distant sites, such as a liver cancer spreading to the lung or a prostate cancer spreading to bone, is stage 4.

PTS: 1 DIF: Cognitive Level: Understanding

27. A cancer patient has pain at the tumor site and is worried the tumor has metastasized. What does the healthcare provider understand about this patient's complaint?
- Pain is primarily a result of pressure caused by the tumor.
 - Pain indicates the metastasis of a cancer.
 - Pain is usually the initial symptom of cancer.
 - Pain is generally associated with late-stage cancer.

ANS: D

Pain is generally associated with the late stages of cancer. Pressure, obstruction, invasion of a structure sensitive to pain, stretching, tissue destruction, and inflammation can cause pain. Pain is not the initial symptom of cancer nor does it indicate that the cancer has metastasized.

PTS: 1 DIF: Cognitive Level: Remembering

28. A healthcare professional is caring for four patients with cancer. Which patient does the professional educate about brachytherapy?
- Lung
 - Colon
 - Cervical
 - Brain

ANS: C

Radiation sources, such as small ^{125}I -labeled capsules (also called *seeds*), can also be temporarily placed into body cavities, a delivery method termed *brachytherapy*. Brachytherapy is useful in the treatment of cervical, prostate, and head and neck cancers. Brachytherapy is not used in the treatment of the other cancers.

PTS: 1 DIF: Cognitive Level: Applying

29. A child has been diagnosed with acute lymphoblastic leukemia (ALL). What does the healthcare professional tell the parents about the survival rate at 5 years for this disease?
- 90%
 - 70%
 - 40%
 - 20%

ANS: B

The 5-year survival rate for ALL is about 90%.

PTS: 1 DIF: Cognitive Level: Understanding

30. By what process do cancer cells multiply in the absence of external growth signals?
- Proto-oncogene
 - Autocrine stimulation
 - Reliance on caretaker genes
 - Pleomorphology

ANS: B

Cancer cells must have mutations that enable them to proliferate in the absence of external growth signals. To achieve this, some cancers acquire the ability to secrete growth factors that stimulate their own growth, a process known as *autocrine stimulation*. A proto-oncogene is a gene that could become an oncogene. Caretaker genes are responsible for genomic integrity. Pleomorphology is the ability of cells to alter their shape or size depending on environmental conditions.

PTS: 1 DIF: Cognitive Level: Remembering

31. What is the role of caretaker genes?
- Maintenance of genomic integrity
 - Proliferation of cancer cells
 - Secretion of growth factors
 - Restoration of normal tissue structure

ANS: A

Caretaker genes are responsible for the maintenance of genomic integrity. The other options are not roles assumed by caretaker genes.

PTS: 1

DIF: Cognitive Level: Remembering

32. In a normal, nonmutant state, what is an oncogene referred to as?
- Basal cell
 - Target cell
 - Caretaker gene
 - Proto-oncogene

ANS: D

In its normal nonmutant state, an oncogene is referred to as a *proto-oncogene*. A basal cell is in the innermost surface of epithelial tissue. Target cells are the recipients of mutations or substances. A caretaker gene is responsible for the maintenance of genomic integrity.

PTS: 1

DIF: Cognitive Level: Remembering

33. What does the student learn about pleomorphic cells?
- Pleomorphic cells are similar in size.
 - They have different sizes and shapes.
 - They are a result of anaplasia.
 - Pleomorphic cells differentiate uniformly.

ANS: B

In contrast to normal cells, which are uniform in size and shape, cancer cells are of variable size and shape, known as “pleomorphic.”

PTS: 1

DIF: Cognitive Level: Remembering

34. What is the most commonly reported symptom of cancer treatment?
- Nausea
 - Fatigue
 - Hair loss
 - Weight loss

ANS: B

Fatigue is the most frequently reported symptom of cancer and cancer treatment. Although patients report the other options, they are not as frequently experienced as fatigue.

PTS: 1

DIF: Cognitive Level: Remembering

35. What does the health professions student learn about benign tumors?
- The resulting pain is severe.
 - Benign tumors are not encapsulated.
 - Benign tumors are fast growing.
 - The cells are well-differentiated.

ANS: D

A benign tumor is well-differentiated with its tissue appearing similar to the tissue from which it arose. The other options are characteristic of a malignant tumor.

PTS: 1 DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. Normally, which cells are considered immortal? (*Select all that apply.*)
 - a. Germ
 - b. Stem
 - c. Blood
 - d. Epithelial
 - e. Muscle

ANS: A, B

Usually, germ cells (those that generate sperm and eggs) and stem cells are the only cells in the body that are immortal. Other cells in the body, such as those found in blood, epithelial tissue, and muscle tissue, are not immortal and can divide only a limited number of times.

PTS: 1 DIF: Cognitive Level: Remembering

2. What is the most common route for distant metastasis? (*Select all that apply.*)
 - a. Seeding
 - b. Blood
 - c. Lymphatic vessels
 - d. Invasion
 - e. Proliferation

ANS: B, C

To transition from local to distant metastasis, the cancer cells must also be able to invade local blood and lymphatic vessels. The remaining options are not directly related to distant metastasis.

PTS: 1 DIF: Cognitive Level: Remembering

3. What cellular characteristics are affected by anaplasia? (*Select all that apply.*)
 - a. Size
 - b. Ability to differentiate
 - c. Life expectancy
 - d. Tissue structure
 - e. Shape

ANS: A, B, D, E

Anaplasia is defined as the loss of cellular differentiation, irregularities of the size and shape of the nucleus, and loss of normal tissue structure. Life expectancy is not generally included in this term.

PTS: 1 DIF: Cognitive Level: Remembering

4. What are the most common causes of nosocomial infections among patients with cancer? (*Select all that apply.*)
- a. Indwelling medical devices
 - b. Suppressed immune system
 - c. Visitor-introduced microorganisms
 - d. Poor appetite
 - e. Inadequate wound care

ANS: A, C, E

Hospital-acquired (nosocomial) infections increase because of indwelling medical devices, inadequate wound care, and the introduction of microorganisms from visitors and other individuals. A suppressed immune system and a poor appetite are possible causes of infections but they are not nosocomial in nature.

PTS: 1 DIF: Cognitive Level: Remembering

5. Which statements concerning aging and the occurrence of cancer are *true*? (*Select all that apply.*)
- a. Decline in immunologic functions
 - b. Predisposition to nutritional inadequacies
 - c. Unwillingness to access healthcare services
 - d. Reluctance to engage in cancer screenings
 - e. Effects of immobility on the immune system

ANS: A, B, E

Many common malignancies occur mostly in older age as a result of immunologic functions declining with age. Older persons are predisposed to nutritional inadequacies, and malnutrition impairs immunocompetence. Far-advanced cancer often results in immobility and general debility that worsens with age. No research supports a correlation between aging and a reluctance to seek healthcare, in general, or cancer screenings, in particular.

PTS: 1 DIF: Cognitive Level: Remembering

6. Which cancers are associated with chronic inflammation? (*Select all that apply.*)
- a. Brain
 - b. Colon
 - c. Bone
 - d. Thyroid gland
 - e. Urinary bladder

ANS: B, D, E

Some organs appear to be more susceptible to the oncogenic effects of chronic inflammation; for example, the GI tract, prostate, thyroid gland, pancreas, urinary bladder, pleura, and skin. At present, no research supports a link between the remaining options and chronic inflammation.

PTS: 1 DIF: Cognitive Level: Remembering

7. A healthcare professional is assessing a patient who has cancer and a hemoglobin of 8.8 mg/dL. What factors should the professional assess the patient for?
- a. Chronic bleeding

- b. Malabsorption of iron
- c. Malnutrition
- d. Recent blood transfusion
- e. Current infection

ANS: A, B, C

A hemoglobin of 8.8 mg/dL is low, indicating that the patient has anemia. Common causes for cancer patients to become anemic include chronic bleeding, malabsorption of iron, and malnutrition. Recent blood transfusions may have been given to treat anemia, but are not a causative factor. Current infection would not affect the hemoglobin.

PTS: 1

DIF: Cognitive Level: Remembering

Chapter 13: Cancer Epidemiology

MULTIPLE CHOICE

1. In teaching a women's community group, which risk factor does the healthcare professional teach is related to high morbidity of cancer of the colon, uterus, and kidney?
 - a. Women older than 45 years of age
 - b. Women who have never had children
 - c. Women who have a high body mass index
 - d. Woman who have smoked for more than 10 years

ANS: C

A recent hypothesis states that the observed increased incidence of such cancers as breast, endometrium, colon, liver, kidney, and adenomas of the esophagus may be associated with obesity. No current research supports the remaining options.

PTS: 1 DIF: Cognitive Level: Understanding

2. Which substance has been shown to increase the risk of cancer when used in combination with tobacco smoking?
 - a. Alcohol
 - b. Steroids
 - c. Antihistamines
 - d. Antidepressants

ANS: A

Alcohol interacts with smoke, increasing the risk of malignant tumors, possibly by acting as a solvent for the carcinogenic chemicals in smoke products. No current research supports steroids, antihistamines, or antidepressants as having an increased effect on the incidence of cancer when used in combination with tobacco smoking.

PTS: 1 DIF: Cognitive Level: Remembering

3. Which cancers pose the highest risk for radiologists?
 - a. Thyroid
 - b. Breast
 - c. Leukemia
 - d. Brain

ANS: C

Ionizing radiation exposure places radiologists at risk for the development of leukemia, lymphoma, and skin cancers.

PTS: 1 DIF: Cognitive Level: Remembering

4. Research has shown a link between cancer and which sexually transmitted disease?

- a. Syphilis
- b. Gonorrhea
- c. Human papillomavirus
- d. Pelvic inflammatory disease

ANS: C

Human papillomavirus (HPV) is the most common sexually transmitted virus in the United States. High-risk, or oncogenic, HPVs can cause cancer. A persistence of infection with high-risk HPV is a prerequisite for the development of cervical intraepithelial neoplasia (CIN) lesions and invasive cervical cancers. No research supports such a link between syphilis, gonorrhea, or pelvic inflammatory disease and cancer.

PTS: 1 DIF: Cognitive Level: Remembering

5. Research has supported that alcohol consumption has a convincing impact on increasing the risk of which cancer?
- a. Lung
 - b. Breast
 - c. Pharynx
 - d. Pancreas

ANS: C

Research had shown that alcohol consumption has a convincing positive impact on the risk of developing pharynx cancer. No research supports such a connection with the remaining options.

PTS: 1 DIF: Cognitive Level: Remembering

6. A healthcare professional advises patients to exercise because it has a probable impact on reducing which cancer?
- a. Liver
 - b. Endometrial
 - c. Stomach
 - d. Colon

ANS: D

The expert panel report on exercise of the World Cancer Research Fund/American Institute for Cancer Research found a convincing impact of exercise on risk of colon cancer.

PTS: 1 DIF: Cognitive Level: Remembering

7. The World Health Organization (WHO) defines grade 1 (overweight) as which BMI range?
- a. 18.5 to 24.9
 - b. 25 to 29.9
 - c. 30 to 39.9
 - d. 40 to 50.9

ANS: B

A BMI of 25 to 29.9 kg/m² is considered a grade 1 (overweight) classification. A BMI of 18.5 to 24.9 kg/m² is considered normal range, whereas 30 to 39.9 kg/m² is a grade 2 overweight (obese) classification, and a BMI higher than 40 kg/m² is considered grade 3 overweight (morbidly overweight).

PTS: 1

DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. Tobacco smoking is associated with which cancers? (*Select all that apply.*)

- a. Lung
- b. Skin
- c. Bladder
- d. Kidney
- e. Pancreas

ANS: A, C, D, E

Besides lung cancer, tobacco increases the risk for cancers of the mouth, lips, nasal cavity and sinuses, larynx, pharynx, esophagus, stomach, pancreas, kidney, bladder, uterus, cervix, colon and rectum, ovary, and acute leukemia. No current research links tobacco smoking to skin cancer.

PTS: 1

DIF: Cognitive Level: Remembering

2. What are the significant risk factors associated with the development of skin cancers? (*Select all that apply.*)

- a. Light-colored hair
- b. Pale eyes
- c. Fair skin
- d. Freckles
- e. History of acne

ANS: A, B, C, D

Risk factors associated with a high risk of melanoma include light-colored hair, eyes, and skin; an inability to tan; and a tendency to freckle, sunburn, and develop nevi. No current research supports acne as a risk factor.

PTS: 1

DIF: Cognitive Level: Remembering

3. Which environmental factors have been shown to have greatest significant effect on the frequency of genetic mutations in humans? (*Select all that apply.*)

- a. Tobacco use
- b. Radiation exposure
- c. Obesity
- d. Severe allergies
- e. Stressful occupation

ANS: A, B, C

The number of environmental factors can alter the frequency and consequences of genetic mutations. The most significant factors include smoking, radiation, obesity, and a few oncogenic viruses. Allergies and stress have not been strongly linked as risk factors for genetic mutations.

PTS: 1 DIF: Cognitive Level: Remembering

4. Research data support the relationship between the exposure of ultraviolet light (UVL) and the development of what? (*Select all that apply.*)
- a. Basal cell carcinoma
 - b. Squamous cell carcinoma
 - c. Hodgkin lymphoma
 - d. Non-Hodgkin lymphoma
 - e. Soft tissue sarcoma

ANS: A, B

Exposure to UVL can cause basal cell carcinoma and squamous cell carcinoma. No current research supports a causative relationship between the remaining options and UVL exposure.

PTS: 1 DIF: Cognitive Level: Remembering

5. The healthcare professional teaches a community group that alcohol consumption has been proven to be a consistent risk factor in the development of which major cancers? (*Select all that apply.*)
- a. Colorectal
 - b. Kidney
 - c. Breast
 - d. Esophageal
 - e. Pancreatic

ANS: A, C, D

Research supports a consistent link between alcohol consumption and an increased risk for breast, colorectal, and esophageal cancers; no such data have yet been determined for the remaining options.

PTS: 1 DIF: Cognitive Level: Remembering

6. Nutritional counseling regarding cancer stem cell repopulation must stress the importance of including sufficient quantities of what in a daily diet? (*Select all that apply.*)
- a. Vitamin A
 - b. Vitamin D
 - c. Protein
 - d. Vitamin C
 - e. Water

ANS: A, B

Cancer stem cells use several developmental mechanisms for the self-renewal, and these mechanisms appear to be fundamental to the initiation and recurrence of tumors. Adequate consumption of specific food compounds, including vitamin A and D, genistein, green tea epigallocatechin gallate (EGCG), sulforaphane, theanine, curcumin, and choline may suppress cancer stem renewal. No current research supports such a connection with the other options.

PTS: 1 DIF: Cognitive Level: Remembering

7. The healthcare professional advises clients to make which personal lifestyle choices in order to likely reduce the risk for developing cancer? (*Select all that apply.*)
- a. Avoiding crowds
 - b. Wearing a hat while golfing
 - c. Eating a strict vegetarian diet
 - d. Having regular health screenings
 - e. Staying indoors during smog alerts

ANS: B, E

Avoiding exposure to ultraviolet radiation and air pollutants will help decrease the risk of developing skin and lung cancer. Although avoiding crowds may reduce the risk of contracting infections, no research suggests such a decision will reduce the risk of cancer. Eating a diet high in red or processed meats increases the risk of colorectal cancers, but eating a vegetarian diet is not required to reduce risks. Health screening, although important, can detect the possible presence of a specific disease, but it does not prevent diseases.

PTS: 1 DIF: Cognitive Level: Understanding

8. Which individuals are at risk for developing lung and respiratory tract cancers because of exposure to known cancer-inducing environmental factors? (*Select all that apply.*)
- a. A patient whose partner smokes 1 1/2 packs of cigarettes a day
 - b. A 10-year employee of an asbestos fiber manufacturer
 - c. A farmer whose equipment is primarily driven by diesel engines
 - d. An older adult with a family history of lung cancer and chronic obstructive pulmonary disease (COPD)
 - e. A 10-year delivery employee for a paper manufacturing company

ANS: A, B, C, E

Numerous environmental factors can cause inflammation and include, for example, inhaling tobacco smoke, asbestos fibers, or fine particles in the air from diesel engine exhaust and industrial sources. Sulfur dioxide is produced by power plants burning oil and coal, copper smelting, and paper mills. These sources are major factors in lung and other respiratory tract cancers. A family history is not considered a risk factor since these cancers are generally affected by environmental rather than genetic factors.

PTS: 1 DIF: Cognitive Level: Remembering

9. A healthcare professional wants to work on community projects that would include strategies to reduce the risk of developing cancer. Which projects should the professional volunteer for? (*Select all that apply.*)

- a. Offering free smoking cessation classes to college students
- b. Establishing a support group for patients receiving chemotherapy
- c. Providing a breast cancer screening at a senior center twice a year
- d. Supplying low sugar, low-fat snacks at an after-school tutoring program
- e. Funding a support service that offers transportation to cancer treatment centers

ANS: A, C, D

Targeted interventions can substantially reduce the incidences of cancers worldwide and should include prevention strategies to decrease or eliminate certain lifestyle factors including tobacco avoidance and the cessation of smoking, a reduction in obesity and alcohol consumption, an increase in physical activity, and the implementation of vaccination programs for liver and cervical cancer, as well as effective early detection programs for colorectal, breast, and cervical cancer. Support groups and transportation to cancer centers are good strategies but do not decrease the risk of developing cancer.

PTS: 1 DIF: Cognitive Level: Applying

10. When considering topics for a series of community discussions related to cancer prevention strategies, what should the healthcare professional include? (*Select all that apply.*)
- a. Healthy eating
 - b. Tobacco avoidance
 - c. Importance of early diagnosis
 - d. Impact of obesity on one's health
 - e. Age-appropriate exercise routines

ANS: A, B, D, E

Eliminating smoking, decreasing obesity, participating in appropriate exercises, eliminating infections, and avoiding an unhealthy diet are all essential for preventing cancer. Screening is not a prevention strategy.

PTS: 1 DIF: Cognitive Level: Understanding

Chapter 14: Cancer in Children

MULTIPLE CHOICE

1. What congenital malformation is commonly linked to acute leukemia in children?
 - a. Down syndrome
 - b. Wilms tumor
 - c. Retinoblastoma
 - d. Neuroblastoma

ANS: A

Trisomy 21 (Down syndrome) is the most common genetic defect linked to the development of acute leukemia. Children with Down syndrome have a 10- to 20-fold increased risk of developing acute lymphoblastic and myelogenous leukemia and a higher risk for developing acute megakaryocytic leukemia. No current research supports a link between Wilms tumor, retinoblastoma, or neuroblastoma and acute leukemia.

PTS: 1 DIF: Cognitive Level: Remembering

2. When are childhood cancers most often diagnosed?
 - a. During infancy
 - b. At peak times of physical growth
 - c. After diagnosis of a chronic illness
 - d. After an acute illness

ANS: B

Childhood cancers are most often diagnosed during peak times of physical growth. No current research supports the association between frequency of diagnosis and infancy, chronic illness, or acute illness.

PTS: 1 DIF: Cognitive Level: Remembering

3. Prenatal exposure to diethylstilbestrol (DES) can result in which type of cancer?
 - a. Breast cancer
 - b. Leukemia
 - c. Vaginal cancer
 - d. Lymphoma

ANS: C

DES has been identified as a transplacental chemical carcinogen; a small percentage of the daughters of women who took DES during pregnancy developed adenocarcinomas of the vagina. No current research supports a link between the drug and other cancers.

PTS: 1 DIF: Cognitive Level: Remembering

4. Currently, what percentage of children with cancer can be cured?

- a. 40%
- b. 50%
- c. 60%
- d. 85%

ANS: D

Currently, more than 85% of children diagnosed with cancer are cured.

PTS: 1

DIF: Cognitive Level: Remembering

5. What do most childhood cancers arise from?

- a. Epithelium
- b. Mesodermal germ layer
- c. Embryologic ectodermal layer
- d. Viscera

ANS: B

Most childhood cancers originate from the mesodermal germ layer that gives rise to connective tissue, bone, cartilage, muscle, blood, blood vessels, gonads, kidney, and the lymphatic system. The epithelium, embryologic ectodermal layer, and the viscera are not common sites from which cancers originate.

PTS: 1

DIF: Cognitive Level: Remembering

6. Which form of cancer is linked to congenital malformation syndromes?

- a. Wilms tumor
- b. Retinoblastoma
- c. Osteosarcoma
- d. Rhabdomyosarcoma

ANS: A

Wilms tumors are linked with other genetically linked childhood cancers. It is the only form among the available options that is associated with congenital malformation syndromes.

PTS: 1

DIF: Cognitive Level: Remembering

7. Research data support a carcinogenic relationship in children resulting from exposure to which virus?

- a. Herpes simplex virus
- b. Influenza
- c. Varicella-zoster virus
- d. Epstein-Barr virus

ANS: D

The strongest association between viruses and the development of cancer in children has been the Epstein-Barr virus (EBV), Burkitt lymphoma, nasopharyngeal carcinoma, and Hodgkin disease. No current research supports a link between the other viruses and childhood cancer.

PTS: 1

DIF: Cognitive Level: Remembering

8. What does a child diagnosed with acquired immunodeficiency syndrome (AIDS) have an increased risk of developing?
- Non-Hodgkin lymphoma
 - Retinoblastoma
 - Epstein-Barr
 - Leukemia

ANS: A

Children with AIDS have an increased risk of developing non-Hodgkin lymphoma and Kaposi sarcoma. Leukemia is linked to retinoblastoma. Epstein-Barr has been linked to the development of some cancers, whereas no known link has been found between AIDS and the development of leukemia.

PTS: 1

DIF: Cognitive Level: Remembering

9. Which intervention has the greatest effect on a child's mortality rate when diagnosed with cancer?
- Age at the time of diagnosis
 - Participation in clinical trials
 - Proximity to a major cancer treatment center
 - Parental involvement in the treatment planning

ANS: B

Mortality rates have significantly declined in the past 40 years largely as a result of advances in treatment and participation in clinical trials. Although important, age, proximity to treatment centers, and parental involvement are not believed to have an effect on the decline of the mortality rate of childhood cancer.

PTS: 1

DIF: Cognitive Level: Remembering

10. Which statement is likely *true* regarding children being treated for cancer with radiation therapy?
- They will most likely have a successful remission of tumor growth.
 - They seldom require follow-up maintenance treatments.
 - They are prone to experience severe developmental delays.
 - They are at increased risk for developing childhood cancers.

ANS: D

Although the need exists for long-term studies, research has shown a correlation between radiation-induced malignancies from radiotherapy (as in cancer treatment) or radiation exposure from diagnostic imaging; both have shown to increase the risk of developing cancer during childhood. The other options are not necessarily true regarding the outcomes of radiation therapy for childhood cancers.

PTS: 1

DIF: Cognitive Level: Remembering

11. How should the healthcare professional reply when parents question why a computed tomographic (CT) scan of the head was not ordered for their 5-year-old child after a minor fall?
- Physicians are cautious about ordering CT scan on children younger than 10 years

- of age.
- b. CT scans are seldom conclusive when used to diagnosis head injuries in young children.
 - c. The child's symptoms will determine whether a CT scan is necessary and worth the expense.
 - d. Research suggests that repeated CT scans can increase the risk of developing brain cancer.

ANS: D

Findings from a recent study of 176,587 children suggest that those who have two or three CT scans of the head before the age of 22 years are three times more likely to develop brain cancer as those in the general population, and the risk of developing leukemia is three times as great in those who received 5 to 10 CT scans. The other options do not represent the logic behind not ordering a CT scan in relationship to minor head trauma.

PTS: 1

DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. Childhood exposure to which risk factors is known to increase the susceptibility for developing cancers? (*Select all that apply.*)
- a. Low birth weight
 - b. Chemotherapy
 - c. Ionizing radiation
 - d. Cigarette smoke
 - e. Epstein-Barr virus

ANS: B, C, E

Childhood exposure to ionizing radiation, drugs, or existing cancer-causing viruses has been associated with the risk of developing cancer. Low birth weight has no correlation to cancer.

PTS: 1

DIF: Cognitive Level: Remembering

2. Which statement is true concerning the difference between adult and childhood cancers? (*Select all that apply.*)
- a. Numerous differences exist between these two categories of cancer.
 - b. Genetic risk factors and congenital conditions are more related in childhood cancers.
 - c. Environmental risks are strongly associated with childhood cancers.
 - d. Exposure to pesticides is a minor risk for the development of adult cancers.
 - e. Maternal exposure to carcinogenic substances presents little risk to the fetus.

ANS: A, B

Overall, cancers in children are very different than adult cancers and are associated with far fewer genetic mutations. Research does not support the other options.

PTS: 1

DIF: Cognitive Level: Remembering

3. Most childhood cancers originate from the mesodermal germ layer that ultimately produces which of these? (*Select all that apply.*)
- a. Connective tissue
 - b. Digestive system
 - c. Muscles
 - d. Kidneys
 - e. Blood

ANS: A, C, D, E

Most childhood cancers originate from the mesodermal germ layer, which gives rise to connective tissue, bone cartilage, muscle, blood, blood vessels, gonads, kidney, and the lymphatic system. Cancers of the digestive tract do not originate in the mesodermal germ layer.

PTS: 1

DIF: Cognitive Level: Remembering

4. Which statements are *true* regarding cancers that develop in children? (*Select all that apply.*)
- a. Childhood cancers tend to be fast growing.
 - b. Childhood cancers are diagnosed during growth spurts.
 - c. Childhood cancer generally metastasizes by the time of diagnosis.
 - d. Childhood cancer is typically at low risk for aggressive metastasis.
 - e. Childhood cancers respond well to standardized treatment modalities.

ANS: A, B, C

Childhood cancers are most often diagnosed during peak times of physical growth. In general, they are extremely fast growing, with 80% having distant spread (metastases) at diagnosis. Childhood cancers are not as responsive to standardized treatment modalities, which is why participation in clinical trials helps reduce mortality.

PTS: 1

DIF: Cognitive Level: Remembering

5. The healthcare professional is preparing a discussion on cancer and its occurrence among high school students. Which cancers will the professional include in the discussion? (*Select all that apply.*)
- a. Colorectal
 - b. Brain
 - c. Thyroid
 - d. Breast
 - e. Lung

ANS: B, C

The most common cancers among the adolescent population are lymphomas, leukemia, germ-cell tumors (particularly testicular), and central nervous system tumors. Lung cancer generally develops after chronic exposure to tobacco, either from smoking or secondhand smoke.

PTS: 1

DIF: Cognitive Level: Remembering

Chapter 15: Structure and Function of the Neurologic System

MULTIPLE CHOICE

1. Which pathway carries sensory information toward the central nervous system (CNS)?
 - a. Ascending
 - b. Descending
 - c. Somatic
 - d. Efferent

ANS: A

Peripheral nerve pathways can be afferent (ascending) pathways that carry sensory impulses toward the CNS. Efferent, or descending, pathways innervate effector organs. "Somatic" is a branch of the peripheral nervous system and consists of both motor and sensory pathways.

PTS: 1 DIF: Cognitive Level: Remembering

2. Which type of axon transmits a nerve impulse at the highest rate?
 - a. Large nonmyelinated
 - b. Large myelinated
 - c. Small nonmyelinated
 - d. Small myelinated

ANS: B

A myelinated axon has a myelin sheath wrapped around it which functions as an insulating substance that speeds impulse propagation. The diameter of the myelinated axon also affects the speed of nerve impulse transmission with larger diameter axons transmitting at a faster speed than smaller ones.

PTS: 1 DIF: Cognitive Level: Remembering

3. Which nerves are capable of regeneration?
 - a. Nerves within the brain and spinal cord
 - b. Peripheral nerves that are cut or severed
 - c. Myelinated nerves in the peripheral nervous system
 - d. Unmyelinated nerves of the peripheral nervous system

ANS: C

Nerve regeneration is limited to only myelinated fibers and generally occurs only in the peripheral nervous system.

PTS: 1 DIF: Cognitive Level: Remembering

4. Where is the neurotransmitter, norepinephrine, secreted?
 - a. Somatic nervous system
 - b. Parasympathetic preganglion

- c. Sympathetic postganglion
- d. Parasympathetic postganglion

ANS: C

Most postganglionic sympathetic fibers release norepinephrine (adrenaline). Norepinephrine is not secreted in the somatic nervous system, sympathetic preganglion, or parasympathetic postganglion.

PTS: 1 DIF: Cognitive Level: Remembering

5. Both oligodendroglia and Schwann cells share the ability to do what?
- a. Form a myelin sheath
 - b. Remove cellular debris
 - c. Transport nutrients
 - d. Line the ventricles

ANS: A

The function of oligodendroglia (oligodendrocytes) is to deposit myelin within the central nervous system (CNS). Oligodendroglia are the CNS counterpart of Schwann cells. Microglia remove cellular debris. Astrocytes transport nutrients. Ependymal cells line the ventricles.

PTS: 1 DIF: Cognitive Level: Remembering

6. During a synapse, what change occurs after the neurotransmitter binds to the receptor?
- a. The permeability of the presynaptic neuron changes; consequently, its membrane potential is changed as well.
 - b. The permeability of the postsynaptic neuron changes; consequently, its membrane potential is changed as well.
 - c. The postsynaptic cell prevents any change in permeability and destroys the action potential.
 - d. The presynaptic cell synthesizes and secretes additional neurotransmitters.

ANS: B

The binding of the neurotransmitter at the receptor site changes the permeability of the postsynaptic neuron and, consequently, its membrane potential. The remaining options do not accurately describe the occurrence.

PTS: 1 DIF: Cognitive Level: Remembering

7. What name is given to a large network of neurons within the brainstem that is essential for maintaining wakefulness?
- a. Midbrain
 - b. Reticular activating system
 - c. Medulla oblongata
 - d. Pons

ANS: B

The reticular activating system is essential for maintaining wakefulness. The midbrain connects the forebrain with the hindbrain. The pons is in the Metencephalon and transmits information from the cerebellum to the brainstem between the two cerebellar hemispheres.

PTS: 1 DIF: Cognitive Level: Remembering

8. Thought and goal-oriented behaviors are functions of which area of the brain?
- Cerebellum
 - Limbic system
 - Prefrontal lobe
 - Occipital lobe

ANS: C

The prefrontal area is responsible for goal-oriented behavior (i.e., ability to concentrate), short-term or recall memory, and the elaboration of thought and inhibition on the limbic (emotional) areas of the CNS. The cerebellum is responsible for reflexive, involuntary fine-tuning of motor control and for maintaining balance and posture through extensive neural connections with the medulla and with the midbrain. The limbic system mediates emotion and long-term memory through connections in the prefrontal cortex (limbic cortex). Its principal effects are involved in primitive behavioral responses, visceral reaction to emotion, motivation, mood, feeding behaviors, biologic rhythms, and the sense of smell. The occipital lobe lies caudal to the parietooccipital sulci and superior to the cerebellum. The primary visual cortex is located in this region and receives input from the retinas. Much of the remainder of this lobe is involved in visual association.

PTS: 1 DIF: Cognitive Level: Remembering

9. Where is the region responsible for the motor aspects of speech located?
- Wernicke area in the temporal lobe
 - Broca speech area in the frontal lobe
 - Wronka area in the parietal lobe
 - Barlow area in the occipital lobe

ANS: B

Broca speech area is the only region responsible for the motor aspects of speech. Wernicke area is responsible for reception and interpretation of speech. Wronka and Barlow areas were not discussed in the text.

PTS: 1 DIF: Cognitive Level: Remembering

10. Parkinson disease is associated with defects in which area of the brain?
- Thalamus
 - Medulla oblongata
 - Cerebellum
 - Substantia nigra

ANS: D

Parkinson disease is a condition associated with defects of the substantia nigra and destruction of dopamine-secreting neurons. No current research supports the role of the thalamus, medulla oblongata, or the cerebellum in Parkinson disease.

PTS: 1 DIF: Cognitive Level: Remembering

11. Maintenance of a constant internal environment and the implementation of behavioral patterns are main functions of which area of the brain?
- Thalamus
 - Epithalamus
 - Subthalamus
 - Hypothalamus

ANS: D

Hypothalamic function falls into two major areas: (1) maintenance of a constant internal environment and (2) implementation of behavioral patterns. The epithalamus forms the roof of the third ventricle and composes the most superior portion of the diencephalon, which controls vital functions and visceral activities. The subthalamus flanks the hypothalamus laterally and serves as an important basal ganglia center for motor activities.

PTS: 1 DIF: Cognitive Level: Remembering

12. The ability of the eyes to track moving objects through a visual field is primarily a function of which colliculi?
- Inferior
 - Superior
 - Mid
 - Posterior

ANS: B

The superior colliculi are involved with voluntary and involuntary visual motor movements (e.g., the ability of the eyes to *track* moving objects in the visual field). The inferior colliculi accomplish similar motor activities but involve movements affecting the auditory system (e.g., positioning the head to improve hearing). The inferior colliculus also is a major relay center along the auditory pathway. There are no mid or posterior colliculi.

PTS: 1 DIF: Cognitive Level: Remembering

13. What part of the brain mediates the physical expression of emotions?
- Hypothalamus
 - Basal ganglia
 - Medulla oblongata
 - Subthalamus

ANS: A

The hypothalamus is generally responsible for the physical manifestations of emotions. The nuclei of the basal ganglia are important for coordination of voluntary movement and cognitive and emotional functions. Reflex activities, such as heart rate, respiration, blood pressure, coughing, sneezing, swallowing, and vomiting, are controlled in the medulla oblongata. The subthalamus flanks the hypothalamus laterally and serves as an important basal ganglia center for motor activities.

PTS: 1 DIF: Cognitive Level: Remembering

14. Reflex activities concerned with heart rate, blood pressure, respirations, sneezing, swallowing, and coughing are controlled by which area of the brain?
- Pons
 - Midbrain
 - Cerebellum
 - Medulla oblongata

ANS: D

The medulla oblongata makes up the myelencephalon and is the lowest portion of the brainstem. Reflex activities, such as heart rate, respiration, blood pressure, coughing, sneezing, swallowing, and vomiting, are controlled in this area. The pons transmits information from the cerebellum to the brainstem between the two cerebellar hemispheres. The cerebellum is responsible for reflexive, involuntary fine-tuning of motor control and for maintaining balance and posture through extensive neural connections with the medulla (through the inferior cerebellar peduncle) and with the midbrain. The midbrain connects the forebrain to the hindbrain.

PTS: 1 DIF: Cognitive Level: Remembering

15. A healthcare professional is assessing a patient who suffered a head trauma. The patient is not able to sense touch of a sharp pin and cannot distinguish a hot object from a cold one. What part of the patient's brain does the professional suspect is damaged?
- Midbrain
 - Pons
 - Medulla oblongata
 - Lateral colliculi

ANS: B

The nuclei of cranial nerves V through VIII are located in the pons. An inability to recognize pain from a sharp pin and inability to differentiate hot and cold signify dysfunction of cranial nerve V (trigeminal nerve). The healthcare professional would suspect an injury to the pons.

PTS: 1 DIF: Cognitive Level: Applying

16. A healthcare professional is assessing a patient for dysfunction of cranial nerve VII. What assessment finding would confirm the professional's suspicion?
- Patient is unable to open mouth against resistance.
 - Patient does not display intact gag reflex.
 - Patient is able to smile only on one side of the face.
 - Patient's tongue deviates to the right when sticking out.

ANS: C

The inability to smile symmetrically is a sign of cranial nerve VII dysfunction (facial nerve). The inability to open the mouth against resistance is related to a dysfunction of cranial nerve V (trigeminal nerve). Loss of a gag reflex correlates with dysfunction of cranial nerve IX (glossopharyngeal nerve). Deviation in tongue position when the patient extends it is a sign of cranial nerve XII (hypoglossal nerve) dysfunction.

PTS: 1

DIF: Cognitive Level: Applying

17. Which area of the brain assumes the responsibility for involuntary muscle control and for maintaining balance and posture?
- Cerebrum
 - Cerebellum
 - Diencephalon
 - Brainstem

ANS: B

The cerebellum is responsible for reflexive, involuntary fine-tuning of motor control and for maintaining balance and posture through extensive neural connections with the medulla and with the midbrain. The cerebrum is the site of higher brain function. The diencephalon controls vital functions and visceral activities and is closely associated with those of the limbic system. The brainstem contains the reticular formation which is a large network of diffuse nuclei that connect the brainstem to the cortex and control vital reflexes, such as cardiovascular function and respiration. It is essential for maintaining wakefulness and attention.

PTS: 1

DIF: Cognitive Level: Remembering

18. A patient has a spinal cord injury that included damage to the upper motor neurons. What assessment finding would the healthcare provider associate with this injury?
- Permanent paralysis below the level of the injury
 - Initial paralysis, but gradual partial recovery later
 - Hemiplegia on the contralateral side of the body
 - Notable increase in the amount of cerebral spinal fluid (CSF)

ANS: B

Upper motor neurons (i.e., corticospinal tract) are the classification of motor pathways completely contained within the CNS. Their primary roles include directing, influencing, and modifying reflex arcs, lower-level control centers, and motor and some sensory neurons. Damage or destruction to upper motor neurons generally results in partial paralysis that is followed by a gradual and partial recovery. Permanent paralysis is usually the result of lower motor neuron destruction. Hemiplegia is often due to an injury or obstruction of the anterior cerebral artery. Changes in CSF production are a known age-related change and are due to atrophy of epithelial cells and thickening of the basement membrane in the choroid plexus.

PTS: 1

DIF: Cognitive Level: Understanding

19. What is the membrane that separates the brain's cerebellum from its cerebrum?
- Tentorium cerebelli

- b. Falx cerebri
- c. Arachnoid membrane
- d. Falx cerebelli

ANS: A

The tentorium cerebelli is a membrane that separates the cerebellum below from the cerebral structures above. The falx cerebri dips between the two cerebral hemispheres along the longitudinal fissure. The arachnoid membrane (or arachnoid mater) is a spongy, weblike structure just underneath the dura mater that loosely follows the contours of the cerebral structures. The tentorium cerebelli (not falx cerebelli), a common landmark, is a membrane that separates the cerebellum from the cerebral structures above.

PTS: 1 DIF: Cognitive Level: Remembering

20. A patient has a defect in the arachnoid villi. What finding would the healthcare professional expect to note?
- a. Production of excess cerebrospinal fluid (CSF)
 - b. Ischemia in the choroid plexuses
 - c. Cloudy cerebral spinal fluid on analysis
 - d. Absorption of too little cerebrospinal fluid

ANS: D

CSF is reabsorbed by means of a pressure gradient between the arachnoid villi and the cerebral venous sinuses. CSF is produced in the choroid plexuses in the lateral, third, and fourth ventricles. The arachnoid villi do not provide perfusion to the choroid plexuses. Cloudy CSF can indicate infection (meningitis).

PTS: 1 DIF: Cognitive Level: Understanding

21. Where is the cerebrospinal fluid (CSF) produced?
- a. Arachnoid villi
 - b. Choroid plexuses
 - c. Ependymal cells
 - d. Pia mater

ANS: B

The choroid plexuses are the structures that produce CSF; they arise from the pia mater. The arachnoid villi reabsorb the CSF. The ependymal cells form sheets that line fluid filled cavities in the brain. The pia mater closely adheres to the surface of the brain and spinal cord. It provides support for blood vessels serving brain tissue.

PTS: 1 DIF: Cognitive Level: Remembering

22. Which of the meninges closely adheres to the surface of the brain and spinal cord and follows the sulci and fissures?
- a. Dura mater
 - b. Arachnoid
 - c. Pia mater
 - d. Inner dura

ANS: C

The delicate pia mater closely adheres to the surface of the brain and spinal cord and even follows the sulci and fissures. The dura mater (meaning literally “hard mother”) is composed of two layers, with the venous sinuses formed between them. The outermost layer forms the periosteum (endosteal layer) of the skull. The inner dura (meningeal layer) provides rigid membranes that support and separate various brain structures. The arachnoid mater is a spongy, weblike structure just underneath the dura mater that loosely follows the contours of the cerebral structures. The inner dura (meningeal layer) provides rigid membranes that support and separate various brain structures.

PTS: 1

DIF: Cognitive Level: Remembering

23. Norepinephrine produces what *primary* response?

- a. Increased contractility of the heart
- b. Release of renin from the kidney
- c. Vasoconstriction
- d. Sleep cycle disturbance

ANS: C

The primary response from norepinephrine is the stimulation of the α_1 -adrenergic receptors that cause vasoconstriction. Increased contractility and renin release are the result of β -adrenergic receptors. Dopamine is involved in regulating the sleep cycle.

PTS: 1

DIF: Cognitive Level: Remembering

24. A patient is brought to the Emergency Department after being in an explosion. The patient was not seriously injured. Laboratory testing shows an elevated blood glucose (sugar) level, but the patient does not have diabetes. What does the healthcare professional tell the patient about this condition?

- a. “You should have a physical by your primary care provider.”
- b. “Your blood sugar may be high because of the stress of the situation.”
- c. “You actually may have undiagnosed diabetes mellitus.”
- d. “You should be tested for underlying neurological problems.”

ANS: B

In general, sympathetic stimulation promotes responses that are concerned with the protection of the individual (“fight or flight” response), which include increased blood sugar levels, temperature, and blood pressure. The patient may need a physical and might have undiagnosed diabetes, but these are not the most specific answer to the question and do not give the patient any information. It is not likely that an underlying neurological disorder is the cause of the elevated blood glucose.

PTS: 1

DIF: Cognitive Level: Understanding

25. The brain receives approximately what percentage of the cardiac output?

- a. 80%
- b. 40%
- c. 20%

d. 10%

ANS: C

The brain receives approximately 20% of the cardiac output, or 800 to 1000 mL of blood flow per minute.

PTS: 1

DIF: Cognitive Level: Remembering

26. What is the collateral blood flow to the brain provided by?

- a. Carotid arteries
- b. Basilar artery
- c. Circle of Willis
- d. Vertebral arteries

ANS: C

The arterial circle (circle of Willis) is a structure credited with the ability to compensate for reduced blood flow from any one of the major contributors (collateral blood flow). The remaining options are not considered sources of collateral blood flow. The brain derives its arterial supply from two systems: the internal carotid arteries (anterior circulation) and the vertebral arteries (posterior circulation) with the carotid arteries supplying the majority of the blood flow. The basilar artery gives rise to three major paired arteries that perfuse the cerebellum and brainstem. The basilar artery also gives rise to small pontine arteries.

PTS: 1

DIF: Cognitive Level: Remembering

27. The nurse recognizes that a patient's diagnosis of a bacterial infection of the brain's meningeal layer is supported by which diagnostic laboratory result?

- a. Chloride 125 mEq/L
- b. Leukocytes $110/\text{mm}^3$
- c. Protein 32 mg/dL
- d. Glucose 63 mg/dL

ANS: B

Viral infections causing meningitis will produce a white blood cell (leukocyte) count greater than $10/\text{mm}^3$. The chloride level and protein levels are normal and the glucose level is observed in patients with acute viral meningitis.

PTS: 1

DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. Which cranial nerves contain parasympathetic nerves? (*Select all that apply.*)

- a. I (olfactory)
- b. III (oculomotor)
- c. VII (facial)
- d. IX (glossopharyngeal)
- e. X (vagus)

ANS: B, C, D, E

All but cranial nerve I (olfactory) contain parasympathetic nerves.

PTS: 1 DIF: Cognitive Level: Remembering

2. The sympathetic nervous system primarily serves to protect an individual by doing which of these? (*Select all that apply.*)
- a. Decreasing mucous production
 - b. Increasing blood sugar levels
 - c. Increasing body temperature
 - d. Decreasing sweat excretion
 - e. Increasing blood pressure

ANS: B, C, E

In general, sympathetic stimulation promotes responses that are concerned with the protection of the individual, which include increasing blood sugar levels, temperature, and blood pressure. Decreased mucus production and decreased sweating are not protective measures resulting from initiatives made by the sympathetic nervous system.

PTS: 1 DIF: Cognitive Level: Remembering

3. The aging process brings about what changes to human cells? (*Select all that apply.*)
- a. Increased neurofibrillary tangles
 - b. Imbalance of neurotransmitters
 - c. Increased neuron production
 - d. Decreased myelin presence
 - e. Altered dendrite structure

ANS: A, B, D, E

Principal cellular changes associated with aging include a decrease in the number of neurons, decreased myelin, decreased number of dendritic processes and synaptic connections, intracellular neurofibrillary tangles, and an imbalance in the amount and distribution of neurotransmitters. The aging process does not bring about an increase in neuron production.

PTS: 1 DIF: Cognitive Level: Remembering

4. Which statements are *true* regarding the blood-brain barrier (BBB)? (*Select all that apply.*)
- a. The BBB is dependent on astrocytes.
 - b. It uses the meningeal layers of the brain.
 - c. It restricts the flow of large molecules, such as plasma proteins.
 - d. Naturally occurring inflammatory mediators affect the BBB.
 - e. Becomes increasingly permeable with aging

ANS: A, C, D, E

The BBB is a term used to describe cellular structures that selectively inhibit certain substances in the blood from entering the interstitial spaces of the brain or CSF. This term emphasizes the impermeability of the nervous system to large and potentially harmful molecules. Astrocytes wrap their foot processes around the epithelial cells of brain capillaries, thereby contributing to the formation of the BBB. Tight junctions between capillary endothelial cells form a barrier that regulates the passage of ions (e.g., sodium, potassium) that could interfere with nerve transmission, prevent toxins from entering the brain, and promote transport of nutrients and the removal of metabolites. Hormones, neurotransmitters, and inflammatory mediators can affect BBB permeability. The BBB becomes increasingly permeable with age. The statement regarding the meningeal layers of the brain is incorrect.

PTS: 1 DIF: Cognitive Level: Remembering

5. What evidence does the nurse expect to see when a patient experiences trauma to the hypothalamus? (*Select all that apply.*)
- a. Uneven expression of mood
 - b. Unstable blood glucose levels
 - c. Poor regulation of body temperature
 - d. Visual disturbances such as blurred vision
 - e. Nausea, vomiting, and symptoms of gastroesophageal reflux disease

ANS: A, B, C

The hypothalamus forms the base of the diencephalon. Hypothalamic function controls autonomic nervous system (ANS) function, regulation of body temperature, endocrine function (e.g., unstable glucose levels), and regulation of emotional expression. Visual and gastrointestinal symptoms would not likely be related to hypothalamus function.

PTS: 1 DIF: Cognitive Level: Remembering

6. What is a Schwann cell? (*Select all that apply.*)
- a. Can form the myelin sheath
 - b. Is also referred to as a *neurolemma*
 - c. Affects the function of the nodes of Ranvier
 - d. Is located in the peripheral nervous system
 - e. Is responsible of decreasing conduction velocity

ANS: A, B, C, D

The Schwann cell, or neurolemma, is a glial cell that wraps around and covers axons in the peripheral nervous system. Schwann cells form and maintain the myelin sheath, and the nodes of Ranvier form the spaces on either side of the Schwann cell. If the myelin layer is tightly wrapped many times around the axon, forming nodes of Ranvier, then it increases conduction velocity and the neuron is referred to as *myelinated*.

PTS: 1 DIF: Cognitive Level: Remembering

Chapter 16: Pain, Temperature Regulation, Sleep, and Sensory Function

MULTIPLE CHOICE

1. Pricking one's finger with a needle would cause minimal pain, whereas experiencing abdominal surgery would produce more pain. This distinction is an example of which pain theory?
 - a. Gate control theory
 - b. Intensity theory
 - c. Specificity theory
 - d. Pattern theory

ANS: C

According to the specificity theory, a direct relationship exists between the intensity of pain and the extent of tissue injury. Pattern theory proposes that any somatic sense organs respond to a dynamic range of stimulus intensities. Different sense organs have different levels of responsiveness to stimuli. Gate control theory (GCT) integrates and builds upon features of the other theories to explain the complex multidimensional aspects of pain perception and pain modulation. Pain transmission is modulated by a balance of impulses conducted to the spinal cord where cells in the substantia gelatinosa function as a "gate." The spinal gate regulates pain transmission to higher centers in the CNS. There is no intensity theory of pain.

PTS: 1 DIF: Cognitive Level: Remembering

2. Which pain theory proposes that a balance of impulses conducted from the spinal cord to the higher centers in the central nervous system (CNS) modulates the transmission of pain?
 - a. Gate control theory (GCT)
 - b. Pattern theory
 - c. Specificity theory
 - d. Neuromatrix theory

ANS: A

The gate control theory (GCT) explains that a balance of impulses conducted to the spinal cord, where cells in the substantia gelatinosa function as a *spinal gate*, regulates pain transmission to higher centers in the CNS. Pattern theory proposes that any somatic sense organs respond to a dynamic range of stimulus intensities. Different sense organs have different levels of responsiveness to stimuli. According to the specificity theory, a direct relationship exists between the intensity of pain and the extent of tissue injury. Neuromatrix theory is an advancement of the gate control theory and proposes that the brain produces patterns of nerve impulses drawn from various inputs, including genetic, sensory-discriminative, affective-motivational, and evaluative-cognitive experiences.

PTS: 1 DIF: Cognitive Level: Remembering

3. Which type of nerve fibers transmits pain impulses?
 - a. A-alpha ($A\alpha$) fibers

- b. A-beta ($A\beta$) fibers
- c. A-delta ($A\delta$) fibers
- d. B fibers

ANS: C

Of the available options, only medium-sized $A\delta$ fibers transmit pain impulses. A-beta ($A\beta$) fibers are large myelinated fibers that transmit touch and vibration sensations. They do not normally transmit pain but play a role in pain modulation. A-alpha ($A\alpha$) fibers and B fibers do not play any role in pain.

PTS: 1 DIF: Cognitive Level: Remembering

4. Where are the primary-order pain-transmitting neurons located within the spinal cord?
- a. Lateral root ganglia
 - b. Dorsal root ganglia
 - c. Anterior root ganglia
 - d. Medial root ganglia

ANS: B

The cell bodies of the *primary-order neurons*, or pain-transmitting neurons, reside in the dorsal root ganglia just lateral to the spine along the sensory pathways that penetrate the posterior part of the cord. They are not in contact with lateral root, anterior root, or medial root ganglia.

PTS: 1 DIF: Cognitive Level: Remembering

5. Where is the gate in the gate control theory (GCT) of pain located?
- a. Substantia gelatinosa
 - b. Marginal layer
 - c. Nucleus proprius
 - d. Dorsolateral tract of Lissauer

ANS: A

The synaptic connections between the cells of the primary- and secondary-order neurons located in the substantia gelatinosa and other Rexed laminae function as a *pain gate*. The remaining options do not act in this function.

PTS: 1 DIF: Cognitive Level: Remembering

6. Which spinal tract carries the most nociceptive information?
- a. Archeospinothalamic
 - b. Paleospinothalamic
 - c. Dorsal spinothalamic
 - d. Lateral spinothalamic

ANS: D

Most nociceptive information travels by means of ascending columns in the lateral spinothalamic tract (also called the *anterolateral funiculus*). The paleospinothalamic tract is part of the lateral spinothalamic tracts and carries slow impulses for chronic pain. The other tract is the neospinothalamic tract which carries fast impulses for acute pain. The archeospinothalamic and dorsal spinothalamic tracts are not part of this system.

PTS: 1 DIF: Cognitive Level: Remembering

7. Where is the major relay station of sensory information located?
- Basal ganglia
 - Midbrain
 - Thalamus
 - Hypothalamus

ANS: C

Although the organization of all of the ascending tracts is complex, the principal target for nociceptive afferents is the thalamus, which, in general, is the major relay station of sensory information. The A δ and C fibers synapse in the laminae of the dorsal horn, cross over to the contralateral spinothalamic tract, and then ascend to synapse in the midbrain through the neospinothalamic and paleospinothalamic tracts. Impulses are then conducted to the sensory cortex. Descending pain inhibition is initiated in the cerebral cortex or from the midbrain and medulla. The hypothalamus has a major role in temperature regulation. A complex interaction of neural networks and neurotransmitters promote wakefulness and sleep. The hypothalamus, brainstem, and basal forebrain are involved in promoting wakefulness.

PTS: 1 DIF: Cognitive Level: Remembering

8. Where in the CNS does a person's learned pain response occur?
- Cerebral cortex
 - Frontal lobe
 - Thalamus
 - Limbic system

ANS: A

The cognitive-evaluative system overlies the individual's learned behavior concerning the experience of pain and can modulate the perception of pain and is mediated only through the cerebral cortex.

PTS: 1 DIF: Cognitive Level: Remembering

9. Massage therapy relieves pain by closing the pain gate with the stimulation which fibers?
- A β
 - A δ
 - B
 - C

ANS: A

Massaging stimulates different A β fibers to close the pain gate. A δ , B, and C fibers do not have a role in pain modulation.

PTS: 1 DIF: Cognitive Level: Remembering

10. What part of the brain provides the emotional response to pain?
- Limbic system
 - Parietal lobe
 - Thalamus
 - Hypothalamus

ANS: A

The limbic and reticular tracts are involved in alerting the body to danger, initiating arousal of the organism, and emotionally processing the perceived afferent signals, not just as stimuli, but also as pain. This system is in the anterior temporal lobe, not the parietal lobe. The thalamus is the major relay station of sensory information. The hypothalamus, brainstem, and basal forebrain are involved in promoting wakefulness.

PTS: 1 DIF: Cognitive Level: Remembering

11. Which endogenous opioid is located in the hypothalamus and pituitary and is a strong μ -receptor agonist?
- Enkephalins
 - Endorphins
 - Dynorphins
 - Endomorphins

ANS: B

The synthesis and activity of β -endorphin is concentrated in the hypothalamus and the pituitary gland and act as strong μ -receptor agonist. Enkephalins are the most prevalent of the natural opioids and bind to δ opioid receptors. Enkephalins are concentrated in the hypothalamus, the PAG matter, the nucleus raphe magnus of the medulla, the dorsal horns of the spinal cord, but not the pituitary. Dynorphins are the most potent of the endogenous opioids binding strongly with κ receptors to impede pain signals in the brain. They play a role in mood disorders and drug addiction and paradoxically in stimulating chronic pain. Endomorphins are dynorphins.

PTS: 1 DIF: Cognitive Level: Remembering

12. The healthcare professor states that a patient has reached pain tolerance. What further information from the professor is most accurate?
- "The patient cannot endure a higher level of pain intensity at this point."
 - "The patient's pain tolerance is much lower because of consuming too much alcohol."
 - "The patient's pain in one place is higher because pain in multiple other sites."
 - "The patient now recognizes what is being felt is actually pain."

ANS: A

Pain tolerance is the duration of time or the intensity of pain that an individual will endure before initiating overt pain responses. Consuming alcohol usually increases pain tolerance temporarily. Perceptual dominance causes pain at one site to mask pain at another site and is part of pain threshold. Pain threshold is the point at which a stimulus is perceived as pain.

PTS: 1 DIF: Cognitive Level: Understanding

13. Pain that warns of actual or impending tissue injury is referred to as what?
- Chronic
 - Psychogenic
 - Acute
 - Phantom

ANS: C

Acute pain is a protective mechanism that alerts the individual to a condition or experience that is immediately harmful to the body. Chronic pain lasts long beyond the time of an actual injury and serves no purpose. Pain is what each person says it is so there is no psychogenic pain.

Phantom pain is a type of chronic pain where sensations are felt without the typical stimuli, and is seen in people who have had amputations.

PTS: 1 DIF: Cognitive Level: Remembering

14. A patient's chart describes visceral pain. What does the healthcare professional understand about this term?
- Is sharp and well-defined when transmitted by A-delta ($A\delta$) fibers
 - Is perceived as poorly localized and is transmitted by the sympathetic nervous system
 - Arises from connective tissue, muscle, bone, or skin
 - Is perceived as dull, aching, and poorly localized when transmitted by C fibers

ANS: B

Visceral pain refers to pain in internal organs and the abdomen and is transmitted by sympathetic afferents. Visceral pain is poorly localized because of fewer nociceptors in the visceral structures. Sharp and well-defined pain describes acute pain. Somatic pain arises from muscle, bone, joints, and skin.

PTS: 1 DIF: Cognitive Level: Remembering

15. A healthcare professional is caring for a person who has experienced pain for 3 days. What signs would the professional note if the patient has anxiety in addition to the pain?
- Fever and muscle weakness or reports of fatigue
 - Irritability and depression or reports of constipation
 - Decreased blood pressure or reports of fatigue
 - Increased heart rate and respiratory rate with diaphoresis

ANS: D

Anxiety is common in acute pain states and is usually apparent in the alterations of vital signs and can include elevation of blood sugar levels, decreases in gastric acid secretion and intestinal motility, and a general decrease in blood flow to the viscera and skin. Nausea occasionally occurs. Anxiety would not typically produce fever, weakness, fatigue, depression, constipation, or decreased blood pressure.

PTS: 1 DIF: Cognitive Level: Remembering

16. Enkephalins and endorphins act to relieve pain by which process?
- Inhibiting cells in the substantia gelatinosa
 - Stimulating the descending efferent nerve fibers
 - Attaching to opiate receptor sites
 - Blocking transduction of nociceptors

ANS: C

Enkephalins and endorphins are neurohormones that act as neurotransmitters by binding to one or more G protein-coupled opioid receptors and thus relieving pain. They do not inhibit cells in the substantia gelatinosa, stimulate descending efferent nerve fibers, or block transduction of nociceptors.

PTS: 1 DIF: Cognitive Level: Remembering

17. A healthcare professional is caring for a patient who was rewarmed after suffering from hypothermia. What possible long-term complication will the professional continue to assess the patient for?
- Acidosis
 - Dysrhythmias
 - Shock
 - Renal failure

ANS: D

Rewarming can result in long-term complications that include congestive heart failure, hepatic and renal failure, abnormal erythropoiesis, myocardial infarction, pancreatitis, and neurologic dysfunctions. Short-term complications of rewarming include acidosis, rewarming shock, and dysrhythmias.

PTS: 1 DIF: Cognitive Level: Applying

18. How does the release (increase) of epinephrine raise body temperature?
- The release of epinephrine causes shivering.
 - It affects muscle tone.
 - It raises the metabolic rate.
 - It increases and strengthens the heart rate.

ANS: C

Epinephrine and norepinephrine produce a rapid transient increase in heat production by raising the body's basal metabolic rate. The other options are not correct descriptions of the effects of epinephrine on body heat.

PTS: 1

DIF: Cognitive Level: Remembering

19. A healthcare professional is trying to lower a patient's body temperature by convection. What action by the professional will accomplish this?
- Lower the temperature in the patient's room.
 - Place the patient in a cooling blanket.
 - Obtain a fan and set it to blow over the patient.
 - Place cold moist towels over the patient.

ANS: C

Convection occurs through transfer of heat through currents of gas or liquid, so a fan blowing over the patient would accomplish this. Lowering the temperature in the room will aid heat loss through radiation. A cooling blanket and cold moist towels would provide heat loss through conduction.

PTS: 1

DIF: Cognitive Level: Applying

20. A healthcare professional is working in a health tent at a marathon. A person enters the tent and reports profuse sweating for the last hour. How much fluid does the healthcare professional advise the person to drink to replace this fluid loss?
- 2 L
 - 4 cups
 - 6 L
 - 8 cups

ANS: A

Sweating may cause as much as 2.2 L of fluid per hour to be lost. The best option is to have the person drink 2 L.

PTS: 1

DIF: Cognitive Level: Applying

21. The healthcare professional working in a summer camp provides cooling to campers by radiation. What is the most appropriate action by the professional to accomplish this?
- Have the campers sit inside the air-conditioned camp cafeteria.
 - Have the campers sit in front of a large fan.
 - Tell the campers to take cool showers.
 - Instruct the campers to lie still for an hour.

ANS: A

Radiation refers to heat loss through electromagnetic waves. Placing the campers in an air-conditioned building where the air temperature is cooler than their skin provides heat loss through radiation. Loss of heat through air currents such as from a fan would induce heat loss via convection. Taking a cool shower would provide heat loss from conduction where heat is transferred in molecule-to-molecule contact. Reduced muscle tone and activity might produce a minor amount of heat loss because of lowered heat production.

PTS: 1

DIF: Cognitive Level: Applying

22. A patient has been exposed to prolonged high environmental temperatures and now shows signs of dehydration, decreased plasma volumes, hypotension, decreased cardiac output, and tachycardia. What treatment does the healthcare professional prepare to administer to this patient?
- Administer salty beverages to the patient.
 - Aggressive cooling methods to rapidly lower temperature
 - Encourage the patient to have genetic testing after recovery.
 - Give the patient plenty of cool fluids to drink.

ANS: D

Of the options presented, only heat exhaustion, or collapse, is a result of prolonged high core or environmental temperatures resulting in dehydration, decreased plasma volumes, hypotension, decreased cardiac output, and tachycardia. Replacing salt (sodium) losses is the main treatment for heat cramps. Aggressive cooling methods would be undertaken in heat stroke, although temperature should not be lowered too rapidly. Genetic testing would be appropriate for a patient with malignant hyperthermia.

PTS: 1

DIF: Cognitive Level: Applying

23. In acute hypothermia, what physiologic change shunts blood away from the colder skin to the body core in an effort to decrease heat loss?
- Hypotension
 - Peripheral vasoconstriction
 - Voluntary muscle movements
 - Shivering

ANS: B

Tissue hypothermia slows the rate of chemical reactions (tissue metabolism), increases the viscosity of the blood, slows blood flow through microcirculation, facilitates blood coagulation, and stimulates profound vasoconstriction. Hypotension does not lead to vasoconstriction. Voluntary muscle movements and shivering increase heat production.

PTS: 1

DIF: Cognitive Level: Remembering

24. A patient is in the Emergency Department with heat stroke. What finding does the healthcare provider associate with this condition?
- Core temperatures usually reaching approximately 39.5°C (103.1°F)
 - Absence of sweating despite a high core temperature
 - A rapidly decreasing core temperature as heat loss from the evaporation of sweat ceases
 - Symptoms caused by the loss of sodium and prolonged sweating

ANS: B

The absence of sweating despite a high core temperature is characteristic of heat stroke. The temperature is typically above 40°C (104°F) in heat stroke. Since the patient is not sweating, rapid heat loss via sweat cannot occur. The loss of sodium is characteristic of heat cramps. Prolonged sweating can occur in heat cramps or heat exhaustion.

PTS: 1 DIF: Cognitive Level: Remembering

25. The major sleep center is located in which section of the brain?
- Thalamus
 - Cerebellum
 - Frontal lobe
 - Hypothalamus

ANS: D

A complex interaction of neural networks and neurotransmitters promote wakefulness and sleep. The hypothalamus, brainstem, and basal forebrain are involved in promoting wakefulness. These cells are not located in the thalamus, cerebellum, or frontal lobe.

PTS: 1 DIF: Cognitive Level: Remembering

26. Which neuropeptide dysfunction is linked to narcolepsy?
- Prostaglandin D₂
 - L-tryptophan
 - Hypocretins
 - Growth factors

ANS: C

Narcolepsy is related to hypothalamic hypocretin (orexin) deficiency and immune-mediated T-cell destruction of hypocretin-secreting cells. Prostaglandin D₂ is a sleep promoter. L-Tryptophan is used commercially for a variety of complaints. Growth factor is released in sleep stage N3.

PTS: 1 DIF: Cognitive Level: Remembering

27. Which term is also used to refer to *paradoxical sleep*?
- Non-REM
 - Light
 - REM
 - Delta wave

ANS: C

REM sleep is also known as paradoxical sleep because the electroencephalographic (EEG) pattern is similar to the normal awake pattern. None of the other terms are used to identify paradoxical sleep.

PTS: 1 DIF: Cognitive Level: Remembering

28. Parents of a child report that the child wakes up from sleep expressing intense anxiety. What disorder does the healthcare professional educate the parents about?
- Night terrors
 - Insomnia
 - Somnambulism
 - Enuresis

ANS: A

Three types of parasomnias include arousal disorders such as confusional arousals, sleepwalking (somnambulism), and night terrors (dream anxiety attacks). Insomnia is a lack of sleep. Somnambulism is sleep walking. Enuresis is bed-wetting.

PTS: 1 DIF: Cognitive Level: Remembering

29. Rapid eye movement (REM) sleep occurs in cycles approximately how often?
- 45 minutes
 - 90 minutes
 - 120 minutes
 - 150 minutes

ANS: B

REM sleep accounts for 20% to 25% of sleep time and is characterized by desynchronized, low-voltage, fast activity that occurs for 5 to 60 minutes approximately every 90 minutes, beginning after 1 to 2 hours of non-REM sleep.

PTS: 1 DIF: Cognitive Level: Remembering

30. A patient reports loud snoring, fragmented sleep, chronic daytime sleepiness, and fatigue. What treatment does the healthcare professional anticipate teaching this patient about?
- Continuous positive airway pressure while sleeping
 - Eventual adenotonsillectomy
 - Occupational assessment for safety
 - Administration of nightly gabapentin

ANS: A

Obstructive sleep apnea syndrome is characterized by repetitive increases in resistance to airflow within the upper airway with loud snoring, gasping, intervals of apnea lasting from 10 to 30 seconds, fragmented sleep, and chronic daytime sleepiness and fatigue, as well as a decrease in oxygen saturation. The treatment of choice is the use of a continuous positive airway pressure machine (CPAP). Adenotonsillectomy is the treatment of choice for children who have sleep apnea related to adenotonsillar hypertrophy. Occupational safety assessment might be important for patients with narcolepsy or who experience microsleeps in which the person does not realize they are falling asleep. Gabapentin is a treatment for restless leg syndrome.

PTS: 1 DIF: Cognitive Level: Applying

31. What are the expected changes in sleep patterns of older adults?
- Older adults experience difficulty falling asleep with less time spent in REM sleep.
 - They experience sound sleep during the night with approximately 50% of the time spent in REM sleep and dreaming.
 - Older men commonly experience interrupted sleep patterns later in life than do older women.
 - Older adults awaken often but with a rapid return to sleep; they awaken refreshed but often later in the morning.

ANS: A

The sleep pattern of the older adult differs from the younger adult in that total sleep time is decreased, and the older individual takes longer to initiate and maintain sleep. Older adults tend to go to sleep earlier in the evening and awaken more frequently during the night and earlier in the morning. Rapid eye movement (REM) and slow-wave sleep decreases. The alteration in sleep pattern typically appears approximately 10 years later in women than it does in men.

PTS: 1 DIF: Cognitive Level: Remembering

32. A parent reports that her child has reddened eyes with purulent drainage. What instruction by the healthcare professional is most appropriate?
- Give the child soothing saline eyedrops.
 - Tell the child not to go outside during recess.
 - Have the child wear well-fitting sunglasses.
 - Use a separate towel for this child only.

ANS: D

Acute bacterial conjunctivitis (pinkeye) is an inflammation of the conjunctiva (mucous membrane covering the front part of the eyeball) and is characterized by pink eyes and mucopurulent drainage. Meticulous handwashing and the use of separate personal care items, like towels, are important to prevent spread. Soothing saline eyedrops may or may not help. This disease is highly contagious, so the child should not be in school until the infection is resolved.

PTS: 1 DIF: Cognitive Level: Applying

33. Why does open-angle glaucoma occur?
- Decreased production of aqueous humor
 - Increased production of vitreous humor
 - Obstructed outflow of aqueous humor
 - Excessive destruction of vitreous humor

ANS: C

Open-angle glaucoma occurs because of an obstruction of the outflow of aqueous humor at trabecular meshwork or Schlemm canal. Decreased production of aqueous humor does not lead to glaucoma. Vitreous humor is a gel-like substance that prevents the eyeball from collapsing inward and is not related to glaucoma.

PTS: 1 DIF: Cognitive Level: Remembering

34. How can glaucoma cause blindness?
- Infection of the cornea
 - Pressure on the optic nerve
 - Opacity of the lens
 - Obstruction of the venous return from the retina

ANS: B

Glaucoma causes blindness due to increased pressure on the optic nerve due to the death of retinal ganglion cells and optic nerve axons.

PTS: 1 DIF: Cognitive Level: Remembering

35. When comparing the effects of acute and chronic pain on an individual, chronic pain is more often what?
- a. The external event that results in a sense of fear
 - b. Viewed as being meaningful but undesirable
 - c. A factor that contributes to depression
 - d. A sense of internal unease

ANS: C

Chronic pain is often associated with a sense of hopelessness and helplessness as relief becomes more elusive and the timeframe more protracted. The pain is perceived as meaningless, and depression is often a concomitant finding, as either a result of the chronic pain state or as a contributor to its development. Individuals often psychologically respond to acute pain with fear (e.g., fear of diagnosis, fear of continued pain), anxiety, and a general sense of unpleasantness or unease.

PTS: 1

DIF: Cognitive Level: Remembering

36. When considering the risk factors for the development of phantom limb pain, the nurse recognizes which as a primary contributing factor?
- a. Age, with adolescent patients being at a higher risk than adults
 - b. Presence of pain in the limb before amputation
 - c. Patient's previous experience with managing pain
 - d. Cultural views regarding the acceptance of pain

ANS: B

Phantom limb pain is pain that an individual feels in an amputated limb after the stump has completely healed. It is more likely to appear in individuals who experienced pain in the limb before amputation. The other options would not be considered a primary contributing factor.

PTS: 1

DIF: Cognitive Level: Remembering

37. A healthcare professional is caring for four postsurgical patients. Based on an understanding of the physiologic process of nociceptors, the nurse expects to give more pain medication to which patient?
- a. Repair of several crushed fingers
 - b. Dislocated shoulder replacement
 - c. Cyst removal on the internal surface of an ovary
 - d. Repair of a ruptured spleen

ANS: A

The variable nature and distribution of nociceptors affect the relative sensitivity to pain in different areas of the body; the tips of the fingers have more nociceptors than the skin on the back, and all skin has many more nociceptors than the internal organs including bone.

PTS: 1

DIF: Cognitive Level: Understanding

38. What is the basis of the *specificity theory* of pain?
- a. Injury to specific organs results in specific types of pain.

- b. Chronic pain is generally less intense than acute pain.
- c. The greater the tissue injury, the greater the pain.
- d. Acute pain is specific only to certain injuries.

ANS: C

According to the specificity theory, a direct relationship exists between the intensity of pain and the extent of tissue injury. The remaining options are not accurate statements regarding this pain theory.

PTS: 1 DIF: Cognitive Level: Remembering

39. Which statement is *true* regarding the gate control theory (GCT) of pain?
- a. The pain gate is located in the brain.
 - b. A closed gate increases pain perception.
 - c. The brain primarily controls the pain gate.
 - d. An open gate facilitates the brain in processing the pain.

ANS: D

The *open gate* in the spinal cord regulates the transmission of pain impulses that ascend to the brain for further processing and interpretation, thus leading to the management of pain. The spinal gate regulates pain transmission to higher centers in the CNS.

PTS: 1 DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. Which factors contribute to sensorineural hearing loss? (*Select all that apply.*)
- a. Ménière disease
 - b. Aging
 - c. Diabetes mellitus
 - d. Noise exposure
 - e. Outer ear trauma

ANS: A, B, C, D

Impairment of the organ of Corti or its central connections causes a sensorineural hearing loss. The hearing loss may be gradual or sudden. Conditions that commonly cause sensorineural hearing loss include congenital and hereditary factors, noise exposure, aging, Ménière disease, ototoxicity, and systemic disease (e.g., syphilis, Paget disease, collagen diseases, diabetes mellitus). Outer ear trauma is not a typical cause of sensorineural hearing loss.

PTS: 1 DIF: Cognitive Level: Remembering

2. What does heat exhaustion result in? (*Select all that apply.*)
- a. Profuse sweating
 - b. Profound vasodilation
 - c. A need to ingest cool liquids
 - d. Permanent damage to the hypothalamus
 - e. An increased risk for future heat exhaustion

ANS: A, B, C

Internally high temperatures cause the appropriate hypothalamic response of profound vasodilation and profuse sweating. The individual should be encouraged to drink cool fluids to replace fluid lost through sweating. Heat exhaustion is a result of prolonged high core or environmental temperatures that are unique to each incidence.

PTS: 1

DIF: Cognitive Level: Remembering

3. What is true about a fever? (*Select all that apply.*)
- a. It is a complex cascade involving several different systems.
 - b. It can be a result of a dysfunctional hypothalamus.
 - c. It should be eliminated as quickly as possible.
 - d. It triggers endocrine responses.
 - e. It is in response to a pyrogen.

ANS: A, B, D, E

Fever is a complex, integrated cascade of behavioral, neurologic, and endocrine responses to an immune challenge initiated by endogenous pyrogens or disorders of the hypothalamus. Fever production aids responses to infectious processes through several mechanisms and should be interrupted only when it might present an additional risk to the individual.

PTS: 1

DIF: Cognitive Level: Remembering

4. Which neurotransmitters inhibit pain in the medulla and pons? (*Select all that apply.*)
- a. Norepinephrine
 - b. Serotonin
 - c. Glutamate
 - d. Tumor necrosis factor-alpha
 - e. Nitric oxide

ANS: A, B

Norepinephrine and serotonin (5-hydroxytryptamine) contribute to pain modulation (inhibition) in the medulla and pons. Nitric oxide and glutamate promote REM sleep. Tumor necrosis factor-alpha is part of the immune system.

PTS: 1

DIF: Cognitive Level: Remembering

5. Which cytokines are endogenous pyrogens? (*Select all that apply.*)
- a. IL-1
 - b. IL-6
 - c. IL-4
 - d. IFN- γ
 - e. TNF- α

ANS: A, B, D, E

Endogenous pyrogens include prostaglandin E₂ (PGE₂), interleukin-1 (IL-1), IL-6, tumor necrosis factor-alpha (TNF- α), and interferon-gamma (IFN- γ). The other options are not endogenous pyrogens.

PTS: 1 DIF: Cognitive Level: Remembering

6. Which hormones help diminish the febrile response? (*Select all that apply.*)
- a. Arginine vasopressin (AVP)
 - b. Melanocyte-stimulating hormone-alpha (α -MSH)
 - c. Adrenocorticotrophic hormone (ACTH)
 - d. Thyroxine (T4)
 - e. Corticotropin-releasing factor

ANS: A, B, E

During fever, AVP, α -MSH, and corticotropin-releasing factors are released from the brain, and anti-inflammatory cytokines (e.g., IL-1, IL-10) can act as endogenous cryogens or antipyretics to help diminish the febrile response. The other options are not hormones that diminish the febrile response.

PTS: 1 DIF: Cognitive Level: Remembering

Chapter 17: Alterations in Cognitive Systems, Cerebral Hemodynamics, and Motor Function

MULTIPLE CHOICE

1. Cognitive operations cannot occur without the effective functioning of what part of the brain?
 - a. Pons
 - b. Medulla oblongata
 - c. Reticular activating system
 - d. Cingulate gyrus

ANS: C

Cognitive cerebral functions require a functioning reticular activating system (RAS). Cognitive operations are not managed by the pons, medulla oblongata, or the cingulate gyrus.

PTS: 1

DIF: Cognitive Level: Remembering

2. Which intracerebral disease process is capable of producing diffuse dysfunction?
 - a. Closed-head trauma with bleeding
 - b. Subdural pus collections
 - c. Neoplasm
 - d. Embolic infarct

ANS: D

Disorders within the brain substance (intracerebral)—bleeding, infarcts due to emboli, and tumors—primarily functioning as masses may cause diffuse dysfunction. Such localized destructive processes directly impair functioning of the thalamic or hypothalamic activating systems. Disorders outside the brain but within the cranial vault (extracerebral), including neoplasms, closed-head trauma with subsequent bleeding, and subdural empyema (accumulation of pus), can cause similar dysfunction.

PTS: 1

DIF: Cognitive Level: Remembering

3. What is the most common infratentorial brain disease process that results in the direct destruction of the reticulating activation system (RAS)?
 - a. Cerebrovascular disease
 - b. Demyelinating disease
 - c. Neoplasms
 - d. Abscesses

ANS: A

Infratentorial disorders produce a decline in arousal through a direct destruction of the RAS and its pathways. The most common cause of direct destruction is cerebrovascular disease, but demyelinating diseases, neoplasms, granulomas, abscesses, and head injury also may cause brainstem destruction by tissue compression.

PTS: 1 DIF: Cognitive Level: Remembering

4. What stimulus causes posthyperventilation apnea (PHVA)?
- Changes in PaO_2 levels
 - Changes in PaCO_2 levels
 - Damage to the forebrain
 - Any arrhythmic breathing pattern

ANS: B

With normal breathing, a neural center in the forebrain (cerebrum) produces a rhythmic breathing pattern. When consciousness decreases, lower brainstem centers regulate the breathing pattern by responding only to changes in PaCO_2 levels. This irregular breathing pattern is called PHVA. The breathing pattern is not regulated by changes in PaO_2 , damage to the forebrain, or other arrhythmic breathing patterns.

PTS: 1 DIF: Cognitive Level: Remembering

5. A healthcare professional reads in the patient's chart and notes the patient has Cheyne-Stokes respirations. What clinical finding would the professional correlate with this condition?
- Sustained deep rapid but regular pattern of breathing
 - Crescendo-decrescendo pattern of breathing, followed by a period of apnea
 - Prolonged pause after the inspiratory period with occasional end-expiratory pause
 - Completely random, irregular breathing pattern with pauses

ANS: B

Cheyne-Stokes respiration is an abnormal rhythm of breathing (periodic breathing) that alternates between hyperventilation and apnea. Central reflex hyperpnea is characterized by a sustained deep rapid but regular breathing pattern. A prolonged inspiratory pause is characteristic of apneusis. A common variant of apneusis includes expiratory pauses. A completely random and irregular breathing pattern is termed ataxic breathing.

PTS: 1 DIF: Cognitive Level: Remembering

6. Vomiting is associated with central nervous system (CNS) injuries that compress which of the brain's anatomic locations?
- Vestibular nuclei in the lower brainstem
 - Floor of the third ventricle
 - Any area in the midbrain
 - Diencephalon

ANS: A

Vomiting, yawning, and hiccups are complex reflexlike motor responses that are integrated by neural mechanisms in the lower brainstem. Vomiting often accompanies CNS injuries that involve the vestibular nuclei. The remaining options will not trigger vomiting when compressed.

PTS: 1 DIF: Cognitive Level: Remembering

7. Which midbrain dysfunction causes pupils to be pinpoint size and fixed in position?
- Diencephalon dysfunction

- b. Oculomotor cranial nerve dysfunction
- c. Dysfunction of the tectum
- d. Pontine dysfunction

ANS: D

Pinpoint fixed pupils are a result of pontine dysfunction. The diencephalon is not related to pupillary function. Oculomotor nerve dysfunction would result in abnormalities in eye movement. Dysfunction of the tectum results in large, dilated pupils.

PTS: 1

DIF: Cognitive Level: Remembering

8. A healthcare professional suspects a patient is brain dead. How would the professional assess for brain death?
- a. Determine if the patient can make voluntary movements.
 - b. Perform tests to assess if the patient is in a coma.
 - c. Remove the patient's ventilator to see if spontaneous breathing occurs.
 - d. Monitor the patient for eye movements that seem purposeful.

ANS: C

Apnea is viewed as a criterion of brainstem death which represents irreversible total brain damage. If the healthcare professional removed the patient's ventilator and the patient made spontaneous respirations, the healthcare professional could conclude that the patient demonstrates the criteria of brain death. The inability to make any voluntary movements may demonstrate akinetic mutism. A coma indicates injury or death to the cerebrum. Eye movements that seem purposeful could be a sign of locked-in syndrome.

PTS: 1

DIF: Cognitive Level: Applying

9. A patient has damage to the lower pons and medulla. What finding does the healthcare professional associate with this injury?
- a. Flexion with or without extensor response of the lower extremities
 - b. Extension response of the upper and lower extremities
 - c. Extension response of the upper extremities and flexion response of the lower extremities
 - d. Flaccid response in the upper and lower extremities

ANS: D

A flaccid state with little or no motor response to stimuli is characteristic of damage to the lower pons and medulla. Flexion of the upper extremities with or without extensor response in the lower extremities would signify hemispheric injury above the midbrain. Extension of both upper and lower extremities is seen in extensive midbrain, or upper pons injuries. Extension in the upper extremities and flexion in the lower extremities would be indicative of a pons injury.

PTS: 1

DIF: Cognitive Level: Applying

10. Which hospitalized patient does the healthcare professional assess as a priority for the development of delirium?
- a. An individual with diabetes celebrating a 70th birthday
 - b. A depressed Hispanic woman

- c. An elderly male on the second day after hip replacement
- d. A man diagnosed with schizophrenia

ANS: C

Delirium is associated with autonomic nervous system overactivity and typically develops in 2 to 3 days, most commonly in critical care units, post surgically, or during withdrawal from CNS depressants (e.g., alcohol, narcotic agents). Gender and chronic illnesses are not generally associated with delirium triggers. Delirium most often occurs in older people, however; patient with the hip replacement has two risk factors.

PTS: 1

DIF: Cognitive Level: Understanding

11. A patient suffered a seizure for the first time. The spouse asks the healthcare professional to explain what a seizure is. What response by the professional is *best*?
- a. Actions that occur without conscious thought because of a stimulus
 - b. A sudden, explosive, disorderly discharge of brain cells
 - c. A disease where a person has frequent seizures like this one
 - d. A series of excessive, purposeless movements.

ANS: B

A sudden, explosive, disorderly discharge of cerebral neurons describes a seizure. Actions that occur without conscious thought due to a stimulus are reflexes. Epilepsy is a specific brain disease that leads to seizures. Excessive purposeless movements are characteristic of hyperkinesia.

PTS: 1

DIF: Cognitive Level: Understanding

12. A patient had a seizure that consisted of impaired consciousness and the appearance of a dreamlike state. How does the healthcare professional chart this episode?
- a. Focal seizure
 - b. Complex focal seizure
 - c. Tonic-clonic seizure
 - d. Atonic seizure

ANS: B

A complex focal seizure results in impaired consciousness and a vague or dreamlike state. A focal seizure means a seizure that originates in one part of the brain and includes many types. A tonic-clonic seizure would consist of jerking and shaking movements and loss of consciousness. An atonic seizure or “drop attack” is a sudden brief loss of muscle tone with falling.

PTS: 1

DIF: Cognitive Level: Understanding

13. A patient is in status epilepticus. In addition to giving medication to stop the seizures, what would the healthcare professional place highest priority on?
- a. Facilitating a CT scan of the head
 - b. Providing oxygen
 - c. Assessing for brain death
 - d. Assessing for drug overdose

ANS: B

Status epilepticus is a true medical emergency because a single seizure can last longer than 30 min, resulting in hypoxia of the brain. In addition to treating the condition, a high priority must be placed on oxygenation. The patient may or may not need a CT scan. Assessing for brain death is not appropriate at this time, the patient needs to be treated. Assessing for a drug overdose is important, but not as important as giving oxygen.

PTS: 1

DIF: Cognitive Level: Applying

14. What is the most critical aspect in correctly diagnosing a seizure disorder and establishing its cause?
- Computed tomographic (CT) scan
 - Cerebrospinal fluid analysis
 - Skull x-ray studies
 - Health history

ANS: D

Although the history may be supplemented with the remaining options, it remains the pivotal tool for establishing the cause of a seizure disorder.

PTS: 1

DIF: Cognitive Level: Remembering

15. What area of the brain mediates the executive attention functions?
- Limbic
 - Prefrontal
 - Parietal
 - Occipital

ANS: B

The prefrontal areas mediate several cognitive functions, called *executive attention functions* (e.g., *planning, problem solving, setting goals*). The remaining options are not areas involved with the mediation of executive attention functions.

PTS: 1

DIF: Cognitive Level: Remembering

16. A healthcare professional is caring for a patient diagnosed with aphasia. What action by the professional would be best in working with this patient?
- Provide physical therapy.
 - Provide speech therapy.
 - Provide special thickened foods.
 - Provide balance activities.

ANS: B

Aphasia is the loss of the comprehension or production of language. This patient could benefit from speech therapy. Physical therapy could help a patient with weakness, balance, or motor movements. Thickened foods would be most useful for a patient with dysphagia, or difficulty swallowing.

PTS: 1

DIF: Cognitive Level: Applying

17. A patient's chart notes receptive aphasia. What does the healthcare professional understand about this patient's abilities related to speech?
- Speak in made up words.
 - Produce verbal speech, but not comprehend language.
 - Comprehend speech, but not verbally respond.
 - Neither respond verbally nor comprehend speech.

ANS: B

The individual experiencing receptive aphasia may be able to produce verbal language, but language is meaningless because of a disturbance in understanding all language. Speaking in made up words is neologism, a type of aphasia. A patient who can comprehend speech but not respond verbally has expressive aphasia. A patient who cannot verbally respond or comprehend speech has global aphasia.

PTS: 1

DIF: Cognitive Level: Remembering

18. The healthcare professional notes that the patient's intracranial pressure is 12 mmHg. What action should the professional take?
- Do nothing; this is a normal finding.
 - Give medications to immediately lower the pressure.
 - Give medication to immediately raise the pressure.
 - Repeat the reading because the first one was inaccurate.

ANS: A

Intracranial pressure is normally 5 to 15 mmHg or 60 to 180 cm water (H₂O). The healthcare professional does not need to do anything else based on the reading.

PTS: 1

DIF: Cognitive Level: Remembering

19. Cerebral edema is an increase in the fluid content of what part of the brain?
- Ventricles
 - Tissue
 - Neurons
 - Meninges

ANS: B

Cerebral edema is an increase in the fluid content of brain tissue; that is, a net accumulation of water within the brain. Cerebral edema is not noted in the brain's ventricles, neurons, or meninges.

PTS: 1

DIF: Cognitive Level: Remembering

20. What type of cerebral edema occurs when permeability of the capillary endothelium increases after injury to the vascular structure?
- Cytotoxic
 - Interstitial
 - Vasogenic
 - Ischemic

ANS: C

Increased permeability of the capillary endothelium of the brain after injury to the vascular structure causes vasogenic edema. Cytotoxic cerebral edema is caused by a failure of active transport systems. Interstitial cerebral edema is most often seen in patients with noncommunicating hydrocephalus. Ischemia is a common cause of cytotoxic cerebral edema.

PTS: 1 DIF: Cognitive Level: Remembering

21. What is a communicating hydrocephalus caused by an impairment of?
- Cerebrospinal fluid flow between the ventricles
 - Cerebrospinal fluid flow into the subarachnoid space
 - Blood flow to the arachnoid villi
 - Absorption of cerebrospinal fluid

ANS: D

Hydrocephalus from impaired absorption outside the ventricles is called *communicating (extraventricular) hydrocephalus*. It is not caused by having cerebrospinal fluid flowing between the ventricles or into the subarachnoid space or from blood flow into the arachnoid villi.

PTS: 1 DIF: Cognitive Level: Remembering

22. Which dyskinesia involves involuntary movements of the face, trunk, and extremities?
- Paroxysmal
 - Tardive
 - Hyperkinesia
 - Cardive

ANS: B

Tardive dyskinesia is the involuntary movement of the face, trunk, and extremities. Paroxysmal dyskinesias are abnormal, involuntary spasms of movement. Hyperkinesia is an umbrella term that includes tardive and paroxysmal dyskinesias. Cardive is not a type of dyskinesia.

PTS: 1 DIF: Cognitive Level: Remembering

23. Antipsychotic drugs cause tardive dyskinesia by mimicking the effects of an increase of what?
- Dopamine
 - Gamma-aminobutyric acid
 - Norepinephrine
 - Acetylcholine

ANS: A

The antipsychotic drugs cause denervation hypersensitivity, which mimics the effect of too much dopamine.

PTS: 1 DIF: Cognitive Level: Remembering

24. The existence of regular, deep, and rapid respirations after a severe closed head injury is indicative of neurologic injury to what?
- Lower midbrain

- b. Pontine area
- c. Supratentorial
- d. Cerebral area

ANS: A

Central reflex hyperpnea, which is a sustained deep and rapid but regular respiratory pattern that is the result of central nervous system (CNS) damage or disease, involves the lower midbrain and upper pons. This neurologic injury is observed after increased intracranial pressure and blunt head trauma. Damage to any of the other areas listed would not produce this breathing pattern.

PTS: 1

DIF: Cognitive Level: Remembering

25. What type of posturing exists when a person with a severe closed head injury has all four extremities in rigid extension with the forearms in hyperpronation and the legs in plantar extension?
- a. Decorticate
 - b. Decerebrate
 - c. Spastic
 - d. Cerebellar

ANS: B

Decerebrate posturing includes maintaining the position of all four extremities in rigid extension. Decorticate posturing includes bilateral flexion of elbows and wrists with shoulder adduction in upper extremities. Upper motor neuron paresis/paralysis is also known as spastic paresis/paralysis. Cerebellar damage can lead to hypotonia.

PTS: 1

DIF: Cognitive Level: Remembering

26. After a cerebrovascular accident, a patient has been diagnosed with anosognosia. What action by the healthcare professional would be most helpful?
- a. Provide a white board for the patient to write on.
 - b. Ensure the patient has a safe environment.
 - c. Provide physical therapy for strengthening exercises.
 - d. Practice naming colors using flash cards.

ANS: B

Anosognosia is ignorance or denial of the existence of disease. This unawareness can lead to safety issues. The healthcare professional should ensure the patient is in a safe environment. Dysphasia is the term used to describe problems in comprehending or producing speech. Strengthening exercises will not help with anosognosia. Inability to name colors is color agnosia.

PTS: 1

DIF: Cognitive Level: Applying

27. After a cerebrovascular accident, a man is unable to either feel or identify a comb with his eyes closed. What is this an example of?
- a. Agraphia
 - b. Tactile agnosia
 - c. Anosognosia
 - d. Prosopagnosia

ANS: B

Tactile agnosia is the inability to recognize objects by touch as a result of damage to the parietal lobe. Agraphia is the loss of the ability to communicate through writing. Anosognosia is ignorance or denial of the existence of disease. Prosopagnosia is the inability to recognize familiar faces.

PTS: 1

DIF: Cognitive Level: Remembering

28. Most aphasias are associated with cerebrovascular accidents involving which artery?
- Anterior communicating
 - Posterior communicating
 - Circle of Willis
 - Middle cerebral

ANS: D

Aphasias are usually associated with a cerebrovascular accident involving the middle cerebral artery or one of its many branches. Damage to or occlusion of any of the other options does not cause aphasias.

PTS: 1

DIF: Cognitive Level: Remembering

29. A healthcare professional reads in a patient's chart that the patient shows behaviors suggestive of neurofibrillary tangles. What information does the healthcare professional plan to provide the spouse?
- The patient will probably develop seizures.
 - The patient will lose all motor function.
 - The patient will have a gradual decline in function.
 - The patient's intracranial pressure will rise.

ANS: C

Amyloid plaques, neurofibrillary tangles, as well as neuronal and synaptic losses in the brain characterize Alzheimer disease. Patients with Alzheimer disease gradually lose nearly all functioning. Alzheimer disease does not lead to seizures, loss of all motor function, or increased intracranial pressure.

PTS: 1

DIF: Cognitive Level: Remembering

30. The body compensates for a rise in intracranial pressure by *first* displacing what?
- Cerebrospinal fluid
 - Arterial blood
 - Venous blood
 - Cerebral cells

ANS: A

A rise in intracranial pressure necessitates an equal reduction in the volume of the other contents. The most readily displaced content of the cranial vault is cerebrospinal fluid (CSF), not blood or cerebral cells.

PTS: 1 DIF: Cognitive Level: Remembering

31. A patient is in the intensive care unit and has intracranial pressure (ICP) monitoring. The patient's ICP is 17 mmHg. The healthcare professional notes that the chart indicates the patient is now in stage 1 intracranial hypertension. What assessment finding does the professional associate with this condition?
- Rapid spike in measured ICP
 - No significant change in ICP readings
 - Restlessness and subtle breathing and pupil changes
 - A widened pulse pressure and bradycardia

ANS: B

In stage 1 intracranial hypertension, vasoconstriction and external compression of the venous system occur in an attempt to decrease the ICP. This compensatory mechanism may work well enough to keep the ICP at the same level. A rapid spike in the ICP would indicate a worsening condition because the ICP is already slightly high. Restlessness and subtle changes in pupils and respiratory pattern occur in Stage 2. A widened pulse pressure and bradycardia signify Stage 3.

PTS: 1 DIF: Cognitive Level: Understanding

32. Dilation of the ipsilateral pupil following uncal herniation is the result of pressure on which cranial nerve (CN)?
- Optic (CN I)
 - Abducens (CN VI)
 - Oculomotor (CN III)
 - Trochlear (CN IV)

ANS: C

The oculomotor CN (III) is involved in this manifestation of pupil dilation. None of the other options would result in pupil dilation when subjected to pressure.

PTS: 1 DIF: Cognitive Level: Remembering

33. To quickly assess a patient's nervous system for dysfunction, what assessment should the healthcare professional perform as the *priority*?
- Size and reactivity of pupils
 - Pattern of breathing
 - Motor response
 - Level of consciousness

ANS: D

Level of consciousness is the most critical clinical index of nervous system function or dysfunction. An alteration in consciousness indicates either improvement or deterioration of a person's condition. Pupils, breathing patterns, and motor responses all give information about the nervous system, but none are as important as level of consciousness.

PTS: 1 DIF: Cognitive Level: Applying

34. What does diagnostic criteria for a persistent vegetative state include?

- a. Absence of eye opening
- b. Lack of subcortical responses to pain stimuli
- c. Roving eye movements with visual tracking
- d. Return of autonomic functions

ANS: D

Diagnostic criteria for vegetative state (VS) include the return of vegetative (autonomic) functions, including sleep-wake cycles and normalization of respiratory and digestive system functions. Absence of eye opening may signify coma. Lack of any response to painful stimuli would also indicate coma. Roving eye movements are seen in several conditions and only require an intact brainstem.

PTS: 1 DIF: Cognitive Level: Remembering

35. When does uncal herniation occur?
- a. The hippocampal gyrus shifts from the middle fossa through the tentorial notch into the posterior fossa.
 - b. The diencephalon shifts from the middle fossa straight downward through the tentorial notch into the posterior fossa.
 - c. The cingulate gyrus shifts under the falx cerebri.
 - d. A cerebellar tonsil shifts through the foramen magnum.

ANS: A

Uncal herniation (i.e., hippocampal herniation, lateral mass herniation) occurs when the uncus or hippocampal gyrus (or both) shifts from the middle fossa through the tentorial notch into the posterior fossa. This shift results in the compression of the ipsilateral third cranial nerve (CN), impairing parasympathetic function. When the diencephalon shifts from the middle fossa straight down through the tentorial notch it is termed a central herniation. Cingulate gyrus shift occurs when the gyrus shifts under the falx cerebri. A cerebellar tonsil shift occurs in an infratentorial herniation.

PTS: 1 DIF: Cognitive Level: Remembering

36. Which assessment finding marks the end of spinal shock?
- a. Return of blood pressure and heart rate to normal
 - b. Gradual return of spinal reflexes
 - c. Return of bowel and bladder function
 - d. Evidence of diminished deep tendon reflexes and flaccid paralysis

ANS: B

A gradual return of spinal reflexes marks the end of spinal shock. Blood pressure and heart rate readings, bowel and bladder function, reflex reactions, and motor function are not an indication of the presence or absence of spinal shock.

PTS: 1 DIF: Cognitive Level: Remembering

37. A patient demonstrates rippling under the skin on the arms. The patient's spouse asks the healthcare professional to explain why this occurs. What response by the professional is *most* accurate?

- a. Loss of temperature regulation in distal, proximal, or midline muscles
- b. Atrophy of primary motor neurons
- c. Loss of sensation leading to flaccid paralysis
- d. Spastic movements due to increased deep tendon reflexes

ANS: B

This phenomenon is known as fasciculation and is particularly associated with primary motor neuron injury. The other explanations do not explain this phenomenon.

PTS: 1

DIF: Cognitive Level: Remembering

38. A patient has finally been diagnosed with amyotrophic lateral sclerosis (ALS) after seeing several physicians. The patient expresses frustration that the diagnosis has taken so long. What information can the healthcare professional give to the patient about this situation?
- a. Many diseases cause weakness and fatigue.
 - b. Only upper motor neurons are involved.
 - c. Several nerves are connected to each muscle.
 - d. Lack of sensation makes it hard to describe.

ANS: C

The weakness resulting from the segmental paresis and paralysis characteristic of anterior horn cell injury is difficult to recognize because two or more nerve roots supply each muscle. Many diseases do cause weakness and fatigue, but this answer is not specific for ALS. ALS involves both upper and lower motor neurons. The disease involves a disturbance in motor, not sensory function.

PTS: 1

DIF: Cognitive Level: Understanding

39. Parkinson disease is a degenerative disorder of which part of the brain?
- a. Hypothalamus
 - b. Anterior pituitary
 - c. Frontal lobe
 - d. Basal ganglia

ANS: D

Parkinson disease is a commonly occurring degenerative disorder of the basal ganglia and not of any of the other brain structures.

PTS: 1

DIF: Cognitive Level: Remembering

40. Clinical manifestations of Parkinson disease are caused by a deficit in which of the brain's neurotransmitters?
- a. Gamma-aminobutyric acid
 - b. Dopamine
 - c. Norepinephrine
 - d. Acetylcholine

ANS: B

Parkinson disease is a commonly occurring degenerative disorder involving deficits of dopamine, not gamma-aminobutyric acid, norepinephrine, or acetylcholine.

PTS: 1 DIF: Cognitive Level: Remembering

41. Tremors at rest, rigidity, akinesia, and postural abnormalities are a result of the atrophy of neurons in which part of the brain?
- Caudate that produces serotonin
 - Putamen that produces gamma-aminobutyric acid
 - Substantia nigra that produces dopamine
 - Hypothalamus that produces acetylcholine

ANS: C

The hallmark characteristics of Parkinson disease (PD) are a result of a loss of dopaminergic-pigmented neurons in the substantia nigra pars compacta with dopaminergic deficiency in the putamen portion of the striatum (the striatum includes the putamen and caudate nucleus). Alterations in gamma-aminobutyric acid, serotonin, and acetylcholine are not involved.

PTS: 1 DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. Dementia is commonly characterized by the deterioration in which abilities? (*Select all that apply.*)
- Sociability
 - Balance
 - Memory
 - Speech
 - Decision making

ANS: C, D, E

Dementia is the progressive failure (an acquired deterioration) of many cerebral functions that include impairment of intellectual function with a decrease in orienting, memory, language, executive attentional functions, and alterations in behavior. Loss of the need for social contact and impaired balance are not associated with dementia, although a person with such a diagnosis may exhibit these deficiencies.

PTS: 1 DIF: Cognitive Level: Remembering

2. What do the clinical manifestations of Parkinson disease include? (*Select all that apply.*)
- Fragmented sleep
 - Drooping eyelids
 - Depression
 - Muscle stiffness
 - Bradykinesia

ANS: A, C, D, E

The classic motor manifestations of Parkinson disease (PD) are bradykinesia, tremor at rest (resting tremor), rigidity (muscle stiffness), and postural abnormalities. Nonmotor symptoms associated with PD include hyposmia, fatigue, pain, autonomic dysfunction, sleep fragmentation, depression, and dementia with or without psychosis. Drooping eyelids are not characteristics of PD.

PTS: 1 DIF: Cognitive Level: Remembering

3. In Parkinson disease the basal ganglia influence the hypothalamic function to produce which clinical manifestations? (*Select all that apply.*)
- a. Inappropriate diaphoresis
 - b. Gastric retention
 - c. Vomiting
 - d. Diarrhea
 - e. Urinary retention

ANS: A, B, E

The basal ganglia influence hypothalamic function (autonomic and neuroendocrine) through pathways connecting the hypothalamus with the basal ganglia and cerebral cortex. Common autonomic symptoms in Parkinson disease include inappropriate diaphoresis, gastric retention, constipation, and urinary retention. Neither vomiting nor diarrhea would be clinical manifestation observed under these circumstances.

PTS: 1 DIF: Cognitive Level: Remembering

Chapter 18: Disorders of the Central and Peripheral Nervous Systems and the Neuromuscular Junction

MULTIPLE CHOICE

1. What do diffuse axonal injuries (DAIs) of the brain often result in?
 - a. Reduced levels of consciousness
 - b. Mild but permanent dysfunction
 - c. Fine motor tremors
 - d. Visual disturbances

ANS: A

Diffuse axonal injuries occur from mechanical forces of acceleration, deceleration, and rotation that cause stretching and shearing of axons. The injury can be mild, moderate, or severe. Persons with head injury can experience headaches, nausea and vomiting, confusion, disorientation, attention-deficit, dizziness, and impaired ability to concentrate for days after the injury, contributed to DAI among other processes. DAI can cause permanent or temporary dysfunction. DAI do not cause fine motor tremors or visual disturbances.

PTS: 1

DIF: Cognitive Level: Remembering

2. What event is most likely to occur when a person experiences a closed head injury?
 - a. Brief period of vital sign instability
 - b. Cerebral edema throughout the cerebral cortex
 - c. Cerebral edema throughout the diencephalon
 - d. Disruption of axons extending from the diencephalon and brainstem

ANS: A

Transient cessation of respiration can occur with brief periods of bradycardia, and a decrease in blood pressure occurs, lasting 30 sec or less. Vital signs stabilize within a few seconds to within normal limits. Edema does not occur immediately. Disruption of axons in the diencephalon and brainstem may or may not occur.

PTS: 1

DIF: Cognitive Level: Remembering

3. A healthcare professional wants to volunteer for a community education project to help prevent spinal cord injury. What activity would the professional most likely volunteer for?
 - a. Teaching school aged children bicycle safety
 - b. Teaching stretching to high school athletes
 - c. Teaching adults good body mechanics for lifting
 - d. Teaching older adults how to prevent trip-and-fall events

ANS: D

Because of preexisting degenerative vertebral disorders, older adults are particularly at risk for minor trauma, resulting in serious spinal cord injury, especially from falls. Although any of the events listed could help prevent spinal cord injury, the activity targeting older adults would have the biggest impact because the risk to the other groups is less than that of the older adult.

PTS: 1 DIF: Cognitive Level: Applying

4. A patient has a spinal cord injury at C4. What should the healthcare professional assess as the priority in this patient?
- Blood pressure
 - Respirations
 - Pulse
 - Temperature

ANS: B

In the cervical region, the swelling that accompanies an injury to C3 to C5 can be life-threatening because of the possibility of resulting impairment of the diaphragm function (phrenic nerves exit C3 to C5). All vital signs are important, but because of this possibility the priority is to monitor signs of respiratory impairment.

PTS: 1 DIF: Cognitive Level: Applying

5. What indicates that spinal shock is terminating?
- Voluntary movement below the level of injury
 - Reflex emptying of the bladder
 - Paresthesia below the level of injury
 - Decreased deep tendon reflexes and flaccid paralysis

ANS: B

Indications that spinal shock is terminating include the reappearance of reflex activity, hyperreflexia, spasticity, and reflex emptying of the bladder. Termination of spinal shock is not evidenced by voluntary movement, paresthesia, decreased deep tendon reflexes, or paralysis.

PTS: 1 DIF: Cognitive Level: Remembering

6. A healthcare professional is caring for a patient who has a spinal cord injury at T5. The patient exhibits severe hypertension, a heart rate of 32 beats/min, and sweating above the spinal cord lesion. How does the professional chart this event?
- Craniosacral dysreflexia
 - Parasympathetic dysreflexia
 - Autonomic hyperreflexia
 - Retrograde hyperreflexia

ANS: C

Individuals most likely to be affected have lesions at the T6 level or above. Paroxysmal hypertension (up to 300 mmHg systolic), a pounding headache, blurred vision, sweating above the level of the lesion with flushing of the skin, nasal congestion, nausea, piloerection caused by pilomotor spasm, and bradycardia (30 to 40 beats/min) characterize autonomic hyperreflexia. This does not describe craniosacral dysreflexia, parasympathetic dysreflexia, or retrograde hyperreflexia.

PTS: 1 DIF: Cognitive Level: Remembering

7. Why does a person who has a spinal cord injury experience faulty control of sweating?
- The hypothalamus is unable to regulate body heat as a result of damage to the sympathetic nervous system.
 - The thalamus is unable to regulate body heat as a result of damage to the sympathetic nervous system.
 - The hypothalamus is unable to regulate body heat as a result of damage to the parasympathetic nervous system.
 - The thalamus is unable to regulate body heat as a result of damage to spinal nerve roots.

ANS: A

A spinal cord injury results in disturbed thermal control because the hypothalamus is unable to regulate a damaged sympathetic nervous system. This damage causes faulty control of sweating and radiation through capillary dilation. The thalamus is not involved in temperature regulation.

PTS: 1 DIF: Cognitive Level: Remembering

8. Autonomic hyperreflexia-induced bradycardia is a result of stimulation of what?
- Sympathetic nervous system to β -adrenergic receptors to the sinoatrial node
 - Carotid sinus to the vagus nerve to the sinoatrial node
 - Parasympathetic nervous system to the glossopharyngeal nerve to the atrioventricular node
 - Bundle branches to the α -adrenergic receptors to the sinoatrial node

ANS: B

The intact autonomic nervous system reflexively responds with an arteriolar spasm that increases blood pressure. Baroreceptors in the cerebral vessels, the carotid sinus, and the aorta sense the hypertension and stimulate the parasympathetic system. The heart rate decreases, but the visceral and peripheral vessels do not dilate because efferent impulses cannot pass through the cord. The sympathetic system is damaged and not able to stimulate receptors. Without sympathetic balance, the parasympathetic nervous system dominates. The glossopharyngeal nerve is not involved in heart rate regulation. α -Adrenergic receptors would be stimulated by the sympathetic system.

PTS: 1 DIF: Cognitive Level: Remembering

9. A herniation of which disk will likely result in motor and sensory changes of the lateral lower legs and soles of the feet?
- L2 to L3

- b. L3 to L5
- c. L5 to S1
- d. S2 to S3

ANS: C

Clinical manifestations of posterolateral protrusions include radicular pain exacerbated by movement and straining (medial calf suggests L5; lateral calf suggests S1 root compression). L2 to L3 herniation would result in radicular pain in the anterior middle thigh and knee. L3 to L5 would manifest as pain in the knee and the bilateral calf. An S2 to S3 herniation would be characterized with pain on the upper posterior thigh going down to the distal portion of the calf, just proximal to the ankle.

PTS: 1 DIF: Cognitive Level: Remembering

10. A healthcare professional is planning a community event to reduce risk of cerebrovascular accident (CVA) in high risk groups. Which group would the professional target as the priority?
- a. Insulin-resistant diabetes mellitus
 - b. Hypertension
 - c. Polycythemia
 - d. Smoking

ANS: B

Hypertension is the single greatest risk factor for stroke. The other options are recognized risk factors but do not carry the intensity of hypertension.

PTS: 1 DIF: Cognitive Level: Applying

11. A right hemisphere embolic CVA has resulted in left-sided paralysis and reduced sensation of the left foot and leg. Which cerebral artery is most likely affected by the emboli?
- a. Middle cerebral
 - b. Vertebral
 - c. Posterior cerebral
 - d. Anterior cerebral

ANS: D

Symptoms of an embolic stroke in only the right anterior cerebral artery would include left-sided contralateral paralysis or paresis (greater in the foot and thigh). A middle cerebral CVA would result in greater effects in the face and upper extremities. A posterior cerebral artery CVA would manifest with contralateral hemiplegia with possible dysmetria, dyskinesia, hemiballism or choreoathetosis, dystaxia, cerebellar ataxia, and tremor; and contralateral upper motor neuron palsy.

PTS: 1 DIF: Cognitive Level: Remembering

12. Atrial fibrillation, rheumatic heart disease, and valvular prosthetics are risk factors for which type of stroke?
- a. Hemorrhagic
 - b. Thrombotic
 - c. Embolic

d. Lacunar

ANS: C

High-risk sources for the onset of embolic stroke are atrial fibrillation (15% to 25% of strokes), left ventricular aneurysm or thrombus, left atrial thrombus, recent myocardial infarction, rheumatic valvular disease, mechanical prosthetic valve, nonbacterial thrombotic endocarditis, bacterial endocarditis, patent foramen ovale, and primary intracardiac tumors. Hemorrhagic stroke is often the result of hypertension. Thrombotic CVAs develop most often from atherosclerosis and inflammatory disease processes that damage vessel walls. Lacunar strokes are usually caused by perivascular edema.

PTS: 1

DIF: Cognitive Level: Remembering

13. Microinfarcts resulting in pure motor or pure sensory deficits are the result of which type of stroke?
- Embolic
 - Hemorrhagic
 - Lacunar
 - Thrombotic

ANS: C

A lacunar stroke (lacunar infarct) is a microinfarct smaller than 1 cm in diameter. Because of the subcortical location and small area of infarction, these strokes may have pure motor and sensory deficits. The other options would not result in the complications described.

PTS: 1

DIF: Cognitive Level: Remembering

14. Which vascular malformation is characterized by arteries that feed directly into veins through vascular tangles of abnormal vessels?
- Cavernous angioma
 - Capillary telangiectasia
 - Arteriovenous angioma
 - Arteriovenous malformation

ANS: D

In an arteriovenous malformation (AVM), arteries feed directly into veins through a vascular tangle of malformed vessels. A cavernous angioma is a blood vessel abnormality associated with subdural hematomas. Telangiectasia are simple “spider veins” usually found on the skin. An arteriovenous angioma usually is found deep within the brain and often leads to seizures and hemiparesis.

PTS: 1

DIF: Cognitive Level: Remembering

15. Which clinical finding is considered a diagnostic indicator for an arteriovenous malformation (AVM)?
- Systolic bruit over the carotid artery
 - Decreased level of consciousness
 - Hypertension with bradycardia
 - Diastolic bruit over the temporal artery

ANS: A

A systolic bruit over the carotid in the neck, the mastoid process, or (in a young person) the eyeball is almost always diagnostic of an AVM. The other options are not as indicative as the systolic bruit.

PTS: 1

DIF: Cognitive Level: Remembering

16. Which cerebral vascular hemorrhage causes meningeal irritation, photophobia, and positive Kernig and Brudzinski signs?
- Intracranial
 - Subarachnoid
 - Epidural
 - Subdural

ANS: B

Assessment findings related to only a subarachnoid hemorrhage include meningeal irritation and inflammation, causing neck stiffness (nuchal rigidity), photophobia, blurred vision, irritability, restlessness, and low-grade fever. A positive Kernig sign, in which straightening the knee with the hip and knee in a flexed position produces pain in the back and neck regions, and a positive Brudzinski sign, in which passive flexion of the neck produces neck pain and increased rigidity, may appear.

PTS: 1

DIF: Cognitive Level: Remembering

17. In adults, how are most intracranial tumors located?
- Infratentorially
 - Supratentorially
 - Laterally
 - Posterolaterally

ANS: B

Approximately 70% to 75% of all intracranial tumors diagnosed in adults are located supratentorially (above the tentorium cerebella). The other options are not primary locations for intracranial tumors in adults.

PTS: 1

DIF: Cognitive Level: Remembering

18. In children, how are most intracranial tumors located?
- Infratentorially
 - Supratentorially
 - Laterally
 - Posterolaterally

ANS: A

Approximately 70% of all intracranial tumors in children are located infratentorially (below the tentorium cerebelli) and not in the locations provided by the other options.

PTS: 1

DIF: Cognitive Level: Remembering

19. What is the most common primary central nervous system (CNS) tumor?

- a. Microglioma
- b. Neuroblastoma
- c. Astrocytoma
- d. Neuroma

ANS: C

Astrocytomas are the most common primary CNS tumors (50% of all brain and spinal cord tumors). The other options do not occur as frequently.

PTS: 1

DIF: Cognitive Level: Remembering

20. A person has been diagnosed with multiple sclerosis and asks the healthcare professional to explain the disease. What description by the professional is most accurate?

- a. Myelination of nerve fibers in the peripheral nervous system (PNS)
- b. Demyelination of nerve fibers in the CNS
- c. Development of neurofibrillary tangles in the CNS
- d. Inherited autosomal dominant trait with high penetrance

ANS: B

Multiple sclerosis (MS) is an autoimmune disorder diffusely involving the degeneration of CNS myelin and loss of axons. Myelination in the PNS is not involved. Neurofibrillary tangles in the CNS are characteristic of Alzheimer disease. Neurofibromatosis is an autosomal dominant genetic disorder.

PTS: 1

DIF: Cognitive Level: Remembering

21. A blunt-force injury to the forehead would result in a coup injury to which region of the brain?

- a. Frontal
- b. Temporal
- c. Parietal
- d. Occipital

ANS: A

Coup injuries occur directly below the point of impact. A blunt-force injury would not produce a coup injury to other areas of the brain such as the temporal, parietal, or occipital regions.

PTS: 1

DIF: Cognitive Level: Remembering

22. A blunt-force injury to the forehead would result in a *contrecoup* injury to which region of the brain?

- a. Frontal
- b. Temporal
- c. Parietal
- d. Occipital

ANS: D

The focal injury produces a *contrecoup* (on the pole opposite the site of impact) injury. The occipital portion of the brain is opposite of the site of impact (the forehead). A blunt-force injury to the forehead would not produce a contrecoup injury to the frontal, temporal, or parietal lobes.

PTS: 1 DIF: Cognitive Level: Remembering

23. Spinal cord injuries occur most frequently in which region?
- Cervical and thoracic
 - Thoracic and lumbar
 - Lumbar and sacral
 - Cervical and thoracic lumbar

ANS: D

Vertebral injuries most often occur at vertebrae C1 to C2 (cervical), C4 to C7, and T10 to L2 (thoracic lumbar) because these are the most mobile portions of the spine.

PTS: 1 DIF: Cognitive Level: Remembering

24. A patient who sustained a cervical spinal cord injury 2 days ago suddenly develops severe headache and blurred vision. What should the healthcare professional do?
- Give the patient a glass of cool water.
 - Give the patient some pain medication.
 - Take the patient's blood pressure and pulse.
 - Facilitate the patient having a head CT scan.

ANS: C

This patient is most likely experiencing autonomic hyperreflexia, which is characterized by paroxysmal hypertension, a pounding headache, blurred vision, sweating above the level of the lesion with flushing, nasal congestion, nausea, piloerection, and bradycardia. The healthcare professional would recognize the symptoms and take the patient's blood pressure and pulse. Autonomic hyperreflexia is an emergency, so giving the patient cool water, pain medication, or facilitating a CT scan are not appropriate.

PTS: 1 DIF: Cognitive Level: Applying

25. What is the type of vascular malformation that most often results in hemorrhage?
- Cavernous angioma
 - Venous angioma
 - Capillary telangiectasia
 - Arteriovenous malformation

ANS: D

In an arteriovenous malformation (AVM), arteries feed directly into veins through a vascular tangle of malformed vessels, causing venous hemorrhaging. The other options are not as likely to result in a hemorrhage.

PTS: 1 DIF: Cognitive Level: Remembering

26. Where are atheromatous plaques *most* commonly found?

- a. In larger veins
- b. Near capillary sphincters
- c. At branches of arteries
- d. On the venous sinuses

ANS: C

Over 20 to 30 years, atheromatous plaques (stenotic lesions) tend to form at branches and curves in the cerebral circulation, not at any of the other options provided.

PTS: 1

DIF: Cognitive Level: Remembering

27. A patient has AIDS and reports fever, clumsiness, difficulty with balance and walking, and trouble speaking. What treatment does the healthcare professional educate the patient about?
- a. Radiation therapy
 - b. Chemotherapy
 - c. Oral pyrimethamine
 - d. Surgery

ANS: C

These symptoms are characteristic of toxoplasmosis which is the most common opportunistic infection seen in approximately one third of individuals with AIDS. It is treated with pyrimethamine, anti-parasitic medication. It is not treated with radiation, chemotherapy, or surgery.

PTS: 1

DIF: Cognitive Level: Understanding

28. A patient has been hospitalized with Guillain-Barré syndrome (GBS). The patient asks how this could have occurred. What response by the healthcare professional is *best*?
- a. It is often preceded by a viral illness.
 - b. It is due to a genetic defect in acetylcholine.
 - c. It could be caused by a brain tumor.
 - d. It is often transmitted by family pets.

ANS: A

GBS is considered to be an autoimmune disease triggered by a preceding bacterial or viral infection. It is not a genetic defect, due to a brain tumor, or transmitted by family pets.

PTS: 1

DIF: Cognitive Level: Understanding

29. What does a healthcare professional explain to a student about myasthenia gravis?
- a. It is an acute autoimmune disease.
 - b. It affects the nerve roots.
 - c. It may result in adrenergic crisis.
 - d. It causes muscle weakness.

ANS: D

Exertional fatigue and weakness that worsens with activity, improves with rest, and recurs with resumption of activity characterizes myasthenia gravis. Myasthenia gravis is not an acute autoimmune disease, does not affect nerve roots, and does not lead to adrenergic crisis.

PTS: 1 DIF: Cognitive Level: Understanding

30. In which disorder are acetylcholine receptor antibodies (IgG antibodies) produced against acetylcholine receptors?
- Guillain-Barré syndrome
 - Multiple sclerosis
 - Myasthenia gravis
 - Parkinson disease

ANS: C

The main defect of myasthenia gravis is the formation of autoantibodies (an immunoglobulin G [IgG] antibody) against receptors at the Ach-binding site on the postsynaptic membrane. Guillain-Barré syndrome is a rare demyelinating disorder caused by a humoral (antibody) and cell-mediated immunologic reaction directed at the peripheral nerves. Multiple sclerosis is a chronic inflammatory disease involving degeneration of CNS myelin, scarring (sclerosis or plaque formation), and loss of axons. Parkinson disease is a slowly progressive brain disorder caused by diminishing dopamine production.

PTS: 1 DIF: Cognitive Level: Remembering

31. Multiple sclerosis and Guillain-Barré syndrome are similar in that they both do what?
- Result from demyelination by an immune reaction.
 - Cause permanent destruction of peripheral nerves.
 - Result from inadequate production of neurotransmitters.
 - Block acetylcholine receptor sites at the myoneuronal junction.

ANS: A

Acute inflammatory demyelinating polyneuropathy (AIDP) accounts for most occurrences of Guillain-Barré syndrome (GBS). Multiple sclerosis (MS) is an autoimmune disorder diffusely involving degeneration of CNS myelin and loss of axons. These diseases do not have in common permanent destruction of peripheral nerves, inadequate production of neurotransmitters, or blockage of acetylcholine receptor sites.

PTS: 1 DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. Which clinical manifestations are characteristic of cluster headaches? (*Select all that apply.*)
- Preheadache aura
 - Severe unilateral tearing
 - Gradual onset of a tight band around the head
 - Can be associated with vomiting
 - Pain lasting from 20 to 120 min

ANS: B, E

The cluster headache attack usually begins without warning and is characterized by severe unilateral tearing, burning, periorbital, and retrobulbar or temporal pain lasting 30 min to 2 hr. A preheadache aura often precedes a migraine. Migraines can include dizziness, nausea, and vomiting. The feeling of a tight band characterizes tension-type headaches.

PTS: 1 DIF: Cognitive Level: Remembering

2. What are the initial clinical manifestations immediately noted after a spinal cord injury? (*Select all that apply.*)
- a. Headache
 - b. Bladder incontinence
 - c. Loss of deep tendon reflexes
 - d. Hypertension
 - e. Flaccid paralysis

ANS: B, C, E

A complete loss of reflex function in all segments below the level of the lesion characterizes a spinal cord injury. Severe impairment below the level of the lesion is obvious; it includes paralysis and flaccidity in muscles, absence of sensation, loss of bladder and rectal control, transient drop in blood pressure, and poor venous circulation. Neither headache nor hypertension is an initial clinical manifestation related to a spinal cord injury.

PTS: 1 DIF: Cognitive Level: Remembering

Chapter 19: Neurobiology of Schizophrenia, Mood Disorders, and Anxiety Disorders

MULTIPLE CHOICE

1. Which would be considered a positive symptom of schizophrenia?
 - a. Blunted affect
 - b. Auditory hallucinations
 - c. Poverty of speech
 - d. Lack of social interaction

ANS: B

Positive symptoms frequently occur during a *psychotic episode*, when an individual loses touch with reality and experiences something that should be absent (e.g., hallucinations). The remaining options are classified as negative symptoms.

PTS: 1 DIF: Cognitive Level: Remembering

2. A healthcare professional is seeing a patient with suspected schizophrenia. For which prenatal occurrence should the professional assess?
 - a. Viral infection
 - b. Maternal depression
 - c. Maternal smoking
 - d. Exposure to toxic waste

ANS: A

A leading hypothesis for the cause of schizophrenia suggests that the illness results from neurodevelopmental defects that occur in fetal life. Several early environmental factors have been suggested to increase the risk of developing schizophrenia, including viral infection during pregnancy, prenatal nutritional deficiencies, and perinatal complications, such as birth defects and neonatal hypoxia. No current research supports the theory that any of the other options are prenatal triggers of schizophrenia.

PTS: 1 DIF: Cognitive Level: Applying

3. Which neurotransmitter is reduced in people with schizophrenia?
 - a. Dopamine
 - b. Gamma-aminobutyric acid
 - c. Acetylcholine
 - d. Serotonin

ANS: B

In the dorsal prefrontal cortex of schizophrenic brains, glutamic acid decarboxylase, the major enzyme in gamma-aminobutyric acid GABA biosynthesis, is diminished, which likely impairs synaptic performance and cognitive and behavioral functions associated with this brain region. Dopamine levels may be elevated in schizophrenia; however a current view questions whether dopamine is altered in this way. Acetylcholine is a neurotransmitter working at neuromuscular connections. Serotonin levels are diminished in depression.

PTS: 1 DIF: Cognitive Level: Remembering

4. A patient has positive signs of schizophrenia and is scheduled for a brain scan. What part of the brain does the healthcare professional expect the scan will focus on?
- Parietal lobe
 - Limbic system
 - Temporal lobe
 - Hypothalamus

ANS: C

Only temporal lobe alterations may be responsible for the production of positive schizophrenic symptoms, such as hallucinations, delusions, thought disorders, and bizarre behavior.

PTS: 1 DIF: Cognitive Level: Remembering

5. A patient has started on clozapine. The healthcare professional educates the patient that this drug blocks which neurotransmitter receptor?
- Norepinephrine
 - Gamma-aminobutyric acid
 - Serotonin
 - Dopamine

ANS: D

The *dopamine hypothesis* initially suggested that abnormal elevation in dopaminergic transmission contributes to the onset of schizophrenia. This hypothesis was based on pharmacologic studies showing that antipsychotic drugs are potent blockers of brain dopamine receptors. Clozapine is a second-generation atypical antipsychotic drug that works by blocking dopamine receptors.

PTS: 1 DIF: Cognitive Level: Understanding

6. Hypothalamic-pituitary-adrenal (HPA) system abnormalities exist in a large percentage of individuals with what?
- Schizophrenia
 - Major depression
 - Mania
 - Panic disorder

ANS: B

Excessive activation of the HPA system resulting in elevated glucocorticoid secretion is found in a large percentage (30% to 70%) of people with major depression, suggesting that mechanisms responsible for HPA hormone alterations contribute to the pathophysiologic condition of depression. HPA system abnormalities do not necessarily exist in individuals with schizophrenia, mania, or panic disorder.

PTS: 1 DIF: Cognitive Level: Remembering

7. The common property among the three types of medications used to treat depression is that they do what?
- Increase neurotransmitter levels within the synapse
 - Increase neurotransmitter levels in the presynapse
 - Decrease neurotransmitter levels in the postsynapse
 - Decrease neurotransmitter levels within the synapse

ANS: A

All available antidepressants share the common property, albeit through different mechanisms, that increasing monoamine neurotransmitter levels within the synapse is the basis for their antidepressant effects.

PTS: 1 DIF: Cognitive Level: Remembering

8. What is the link between major depression and cortisol secretion?
- Individuals with depression show suppression of plasma cortisol when given dexamethasone.
 - Individuals with depression have a decreased plasma cortisol level, despite the administration of exogenous corticosteroids.
 - Individuals with depression show that persistently elevated plasma cortisol levels can result in inflammation that is believed to trigger depression.
 - Individuals with depression have normal plasma cortisol levels throughout the day when they take antidepressant medication as prescribed.

ANS: C

Persistent elevations in cortisol may also induce immunosuppression that compromises the body's immune systems to contain inflammation and infectious diseases. Increasing evidence suggests that inflammation is another risk factor that triggers the onset of depression. The options related to dexamethasone and exogenous corticosteroids are not true as they apply to depression and cortisol secretion.

PTS: 1 DIF: Cognitive Level: Remembering

9. A decrease in receptor binding for which neurotransmitter is found in individuals with depression?
- Norepinephrine
 - Serotonin
 - Dopamine
 - Acetylcholine

ANS: B

Postmortem and/or brain imaging studies of individuals with depression reveal a widespread decrease in serotonin 5-HT_{1A}-receptor subtype binding in frontal, temporal, and limbic cortex, as well as serotonin-transporter binding in cerebral cortex and hippocampus. A decrease in receptor binding is not observed in the other neurotransmitters.

PTS: 1 DIF: Cognitive Level: Remembering

10. A severely depressed patient has been taking venlafaxine but is now pregnant and asks the healthcare professional what treatment options are available for her. What therapy does the professional discuss as a first choice?
- Electroconvulsive therapy (ECT)
 - Switch to haloperidol
 - Intensive psychotherapy until the baby is weaned
 - Limit zinc and magnesium in the diet

ANS: A

Electroconvulsive therapy (ECT) may be used when individuals fail to respond to antidepressants or when they are severely depressed, pregnant, suicidal, or psychotic. Haloperidol is used for schizophrenia, not depression. Psychotherapy alone may help some people, but this woman is severely depressed and not likely to benefit from it without medication. Zinc supplementation has been found to improve depression in some patients.

PTS: 1 DIF: Cognitive Level: Understanding

11. A patient has been diagnosed with lithium toxicity. Which electrolyte imbalance does the healthcare professional correlate with this condition?
- Hypernatremia
 - Hyponatremia
 - Hyperkalemia
 - Hypokalemia

ANS: B

Lithium toxicity can be a result of hyponatremia. Lithium is normally removed from the kidneys; however, when the body is sodium depleted, the kidneys reabsorb sodium along with lithium. Lithium toxicity does not result from hypernatremia or potassium imbalances.

PTS: 1 DIF: Cognitive Level: Understanding

12. A criterion for a diagnosis of generalized anxiety disorder (GAD) is a period of excessive worrying that lasts for at least how many months?
- 3
 - 6
 - 9
 - 12

ANS: B

GAD is diagnosed when an individual spends at least 6 months worrying excessively and exhibits at least three of the six symptoms. Although 3 months is not a sufficient time, the remaining options would have the patient wait an excessive amount of time before being treated.

PTS: 1 DIF: Cognitive Level: Remembering

13. A patient is taking phenelzine and presents to the clinic complaining of “feeling awful.” The patient reports eating aged cheese and avocados last night. What assessment by the healthcare professional is the priority?
- Kidney function studies
 - Blood pressure
 - Chest x-ray
 - Weight

ANS: B

MAOIs such as phenelzine may induce acute and heightened elevations in blood pressure (e.g., hypertensive crisis) after the intake of tyramine-rich foods, such as aged cheeses, sour cream, pods of broad beans, pickled herring, liver, canned figs, raisins, and avocados. The healthcare professional should assess this patient’s blood pressure. Kidney function studies, a chest x-ray, and a weight are not needed at this time.

PTS: 1 DIF: Cognitive Level: Applying

14. What is a notable complication of panic disorder?
- Avolition
 - Anhedonia
 - Alogia
 - Agoraphobia

ANS: D

The development of agoraphobia or phobic avoidance of places or situations where escape or help is not readily available is a complication of panic disorder. Avolition is a deficit in spontaneous or goal-directed behavior, such as completing simple daily tasks seen in schizophrenia. In anhedonia, individuals with schizophrenia are unable to experience emotions such as pleasure or pain and report a sense of detachment from the environment. Alogia is the absence of spontaneous speech production for the purpose of answering questions or expressing oneself, also seen in schizophrenia.

PTS: 1 DIF: Cognitive Level: Remembering

15. A patient reports frequent nightmares. For which of these should the healthcare professional assess the patient?
- A recent major loss
 - Family history of nightmares
 - History of traumatic event
 - Poor nutrition and weight loss

ANS: C

In PTSD, the individual re-experiences the traumatic event as intrusive collections or flashbacks during the day and during persistent nightmares. Nightmares replicate the traumatic experiences and often prevent sleep. The professional should assess the patient for recent or distant trauma. Losses, weight loss, and poor nutrition might be correlated with depression. PTSD does not run in families.

PTS: 1 DIF: Cognitive Level: Applying

MULTIPLE RESPONSE

1. Significant numbers of individuals with depression have problems related to what? (*Select all that apply.*)
- a. Sleep cycles
 - b. Weight stabilization
 - c. Eating patterns
 - d. Thyroid function
 - e. Cognitive skills

ANS: A, B, C, D

Insomnia, loss of appetite and body weight, and reduced interest in pleasurable activities and interpersonal relationships frequently accompany depression. Approximately 20% to 30% of persons with unipolar depression have an altered hypothalamic-pituitary-thyroid (HPT) system. Impaired cognitive skills are not necessarily associated with depression.

PTS: 1 DIF: Cognitive Level: Remembering

2. Which neurotransmitters are inhibited in generalized anxiety disorder (GAD)? (*Select all that apply.*)
- a. Acetylcholine
 - b. Serotonin
 - c. Dopamine
 - d. Norepinephrine
 - e. Epinephrine

ANS: B, D

Abnormalities in the norepinephrine and serotonin systems were reported in GAD. The other options are more related to depression.

PTS: 1 DIF: Cognitive Level: Remembering

3. A patient is starting on a new prescription for sertraline. What side effects does the healthcare professional educate the patient about? (*Select all that apply.*)
- a. Orthostatic hypotension
 - b. Dry mouth
 - c. Sleep disturbances
 - d. Agitation
 - e. Nausea

ANS: B, C, E

Side effects of SSRIs include sleep disturbances (e.g., insomnia), dry mouth, and nausea. Orthostatic hypotension and agitation are not usual side effects.

PTS: 1

DIF: Cognitive Level: Remembering

4. A patient has a history of panic disorder. What substances does the healthcare professional teach the patient to avoid? (*Select all that apply.*)
- a. Carbon dioxide
 - b. Coffee
 - c. Diesel fumes
 - d. Soda pop
 - e. Asbestos

ANS: A, B, D

Panic-prone individuals respond to panicogens (chemicals that produce panic symptoms) that include carbon dioxide, caffeine, cholecystokinin, sodium lactate, and adrenergic receptor agonists, such as yohimbine. The professional advised the patient to avoid carbon dioxide and coffee and pop (which include caffeine). Diesel fumes and asbestos are not panicogens.

PTS: 1

DIF: Cognitive Level: Understanding

Chapter 20: Alterations of Neurologic Function in Children

MULTIPLE CHOICE

1. The neural groove closes dorsally during which week of gestational life?
 - a. Second
 - b. Fourth
 - c. Eighth
 - d. Twelfth

ANS: B

During the fourth week of gestation, the neural groove deepens, its folds develop laterally, and it closes dorsally to form *the neural tube*, epithelial tissue that ultimately becomes the central nervous system (CNS). The second week is too early, and the other options represent times periods after the groove closes.

PTS: 1 DIF: Cognitive Level: Remembering

2. A healthcare professional advises a pregnant woman to add supplements of which nutrient to her diet to prevent birth defects?
 - a. Iron
 - b. Vitamin C
 - c. Zinc
 - d. Folate

ANS: D

Maternal folate deficiency is associated with neural tube defects such as meningocele. All the listed substances are part of a healthy diet, but only folate is associated with a specific birth defect.

PTS: 1 DIF: Cognitive Level: Remembering

3. Which defect of neural tube closure is *most* common?
 - a. Anterior
 - b. Posterior
 - c. Lateral
 - d. Midline

ANS: B

Posterior defects are most common.

PTS: 1 DIF: Cognitive Level: Remembering

4. What is the anomaly in which the soft bony component of the skull and much of the brain is missing?
 - a. Anencephaly

- b. Myelodysplasia
- c. Cranial meningocele
- d. Hydrocephaly

ANS: A

Anencephaly is an anomaly in which the soft, bony component of the skull and much of the brain are missing. Myelodysplasia is a defect in the formation of the spinal cord. Meningocele is a saclike cyst of meninges filled with spinal fluid and is a mild form of spina bifida. Hydrocephalus is a common cause of accelerating head growth and macrocephaly. Increased intracranial pressure results in enlargement of the cerebrospinal fluid (CSF) compartment (ventricles).

PTS: 1 DIF: Cognitive Level: Remembering

5. What is the most common cause of obstructive hydrocephalus in infants?
- a. Obstructed arachnoid villi
 - b. Stenosis of the aqueduct of Sylvius
 - c. Excessive production of cerebrospinal fluid
 - d. Impaired cerebrospinal fluid circulation in the subarachnoid space

ANS: B

Congenital aqueduct stenosis most commonly causes obstructive hydrocephalus. The other options do not represent the most common cause of this condition.

PTS: 1 DIF: Cognitive Level: Remembering

6. A student reads in a chart that a baby was born with an encephalocele. The student asks the healthcare professional to explain this condition. What explanation by the healthcare professional is *best*?
- a. A herniation or protrusion of brain and meninges through a defect in the skull
 - b. A protruding saclike cyst of meninges filled with spinal fluid and is a mild form of spina bifida
 - c. Protrusion of a saclike cyst containing meninges, spinal fluid, and a portion of the spinal cord through a defect in the posterior arch of a vertebra
 - d. Premature closure of one or more of the cranial sutures during the first 18 to 20 months of an infant's life

ANS: A

Encephalocele refers to a herniation or protrusion of brain and meninges through a defect in the skull, resulting in a saclike structure. A meningocele is a saclike cyst of meninges filled with spinal fluid. A myelomeningocele contains meninges, spinal fluid, and a portion of the spinal cord with nerves. Craniosynostosis causes malformations due to premature closure of sutures.

PTS: 1 DIF: Cognitive Level: Understanding

7. What is the result of a Chiari type II malformation associated with a myelomeningocele?
- a. Upward displacement of the cerebellum into the diencephalon
 - b. Motor and sensory lesions below the level of the myelomeningocele
 - c. Downward displacement of the cerebellum, brainstem, and fourth ventricle

d. Generalized cerebral edema and hydrocephalus

ANS: C

One serious, potentially life-threatening problem associated with myelomeningocele is the Chiari type II malformation. This deformity involves the downward displacement of the cerebellum, cerebellar tonsils, brainstem, and fourth ventricle. The other options do not appropriately describe the pathologic characteristics resulting from a Chiari type II malformation.

PTS: 1

DIF: Cognitive Level: Remembering

8. A baby is born with a myelomeningocele and needs urgent surgery to repair the defect. The parents want to take the baby home instead. What does the healthcare professional tell the parents about the purpose of this surgery?
- “Surgery is much easier on a tiny infant than on a larger, older baby.”
 - “If your baby has surgery this young, he/she cannot feel pain.”
 - “Additional nervous system damage will occur the longer we wait.”
 - “Prompt surgery is needed to prevent total paralysis later on.”

ANS: C

Until the myelomeningocele is surgically closed, cerebrospinal fluid (CSF) may accumulate, resulting in further dilation and enlargement of the sac, which may risk more damage to the nervous system. The surgery may or may not be easier on a smaller infant, but that is not the rationale for having surgery as soon as possible. Pain can be felt by newborns. A child with a myelomeningocele will have motor, sensory, reflex, and autonomic function below the level of the lesion and will not have total paralysis.

PTS: 1

DIF: Cognitive Level: Understanding

9. A baby demonstrates asymmetric pathological reflexes and microcephaly at a 9-month checkup. The baby appeared normal at birth. What action by the healthcare professional is *best*?
- Determine the baby’s risk for developing an HIV infection since birth.
 - Assess the baby for other signs of child abuse or neglect.
 - Ask the mother if she uses drugs or alcohol in excess.
 - Perform spinal cord imaging and other diagnostic studies.

ANS: A

A particularly vulnerable site of HIV-1 infection in infants and children is the CNS. This baby demonstrates manifestations of HIV infection, which include failure to attain or loss of previously developed milestones or intellectual functioning, impaired brain growth or acquired microcephaly, and acquired symmetric motor deficits manifested by two or more of these: paresis, pathologic reflexes, ataxia, or gait disturbances. The healthcare professional should assess the baby for his or her risks of contracting HIV infection. Part of the assessment would include the mother’s drug history, but many other factors must be considered. Since these manifestations are specific to HIV infection, there is no reason to suspect child abuse or perform imaging specifically on the spinal cord.

PTS: 1

DIF: Cognitive Level: Applying

10. An infant is brought to the emergency department by parents who report that the baby's fontanels seem to be bulging outward. What action by the healthcare provider is *most* appropriate?
- Assess the baby for recent trauma to the head.
 - Measure the head circumference and plot it on a growth chart.
 - Prepare the baby for a lumbar puncture and blood cultures.
 - Determine how much fluid the baby had in the last 24 hours.

ANS: B

A bulging fontanel and macrocephaly are common findings in hydrocephalus. The healthcare professional should measure the baby's head circumference and plot it against a standard growth chart to determine if the baby's head is larger than expected. The baby may or may not need a trauma assessment depending on other findings, but this would not be the first action. A lumbar puncture and blood cultures would be done for suspected infection. Fluid intake probably would not have this dramatic an effect on the fontanels.

PTS: 1

DIF: Cognitive Level: Applying

11. Gait disturbances and instability are characteristic of which form of cerebral palsy?
- Spastic
 - Dystonic
 - Ataxic
 - Biochemical

ANS: C

Ataxic cerebral palsy causes damage to the cerebellum and exhibits gait disturbances and instability. Spastic cerebral palsy is associated with increased muscle tone, persistent primitive reflexes, hyperactive deep tendon reflexes, clonus, rigidity of the extremities, scoliosis, and contractures. Dystonic cerebral palsy is a result of injury to the basal ganglia or extrapyramidal tracts. Movements are stiff, uncontrolled, and abrupt, resulting in extreme difficulty in fine motor coordination and purposeful movements. Biochemical is not a type of CP.

PTS: 1

DIF: Cognitive Level: Remembering

12. A child has phenylketonuria (PKU). The healthcare professional educates the parents on the special diet needed, telling them that children with PKU are unable to synthesize what?
- Essential amino acid, phenylalanine, to tyrosine
 - Renin, erythropoietin, and antidiuretic hormone
 - Aldosterone, cortisol, and androgens
 - Neurotransmitters gamma-aminobutyric acid (GABA) and acetylcholine

ANS: A

PKU is an inborn error of metabolism characterized by the inability of the body to convert the essential amino acid, phenylalanine, to tyrosine. PKU does not affect synthesis of renin, erythropoietin, antidiuretic hormone, aldosterone, cortisol, androgens, GABA, or acetylcholine.

PTS: 1

DIF: Cognitive Level: Understanding

13. A healthcare professional teaches a parenting class that benign febrile seizures are characterized by what?
- A temperature higher than 38.5°C (101.3°F)
 - Concurrent respiratory or ear infections
 - Onset after the fifth year of life
 - Episodes lasting 30 min or longer

ANS: B

An acute respiratory or ear infection is usually present when a child has a febrile seizure. Simple febrile seizures are rare in infants before 9 months of age or in children older than 5 years of age. The seizure occurs with a rise in temperature higher than 39°C (102.2°F). The seizure is short (15 min or less).

PTS: 1

DIF: Cognitive Level: Understanding

14. Parents bring their 1-year-old child to the emergency department, reporting that the child has been irritable and pounding on her head, has projectile vomiting, and seems very sleepy for most of the last 3 days. What diagnostic testing does the healthcare professional prepare the child and parents for as the priority?
- Brain scanning with either CT or MRI
 - Lumbar puncture with CSF cultures
 - Developmental assessment
 - Ophthalmologic assessment

ANS: A

Symptoms of brain tumors may be generalized or localized. The most common general symptom is increased intracranial pressure, which may cause headaches, irritability, vomiting, somnolence, and bulging of fontanel. This young child may not be able to verbalize symptoms so pounding on the head may indicate pain. The most critical test to undertake first is a brain scan. Developmental and ophthalmologic assessments will be part of the workup but do not take priority because of the threat of increased ICP. A lumbar puncture would be done if infection is suspected.

PTS: 1

DIF: Cognitive Level: Understanding

15. A 7 months old in the clinic displays an intact tonic neck reflex. What action by the healthcare professional is most appropriate?
- Chart the finding as normal in the child's chart.
 - Assess the baby for signs of malnutrition.
 - Educate the parents on how to improve mobility.
 - Assess the child's development further.

ANS: D

The tonic neck reflex should be unobtainable by 5 months of age, so the professional needs to do a complete developmental and medical history on the child. Malnutrition and mobility are not issues at this time.

PTS: 1

DIF: Cognitive Level: Remembering

16. A pregnant woman is seen for the first time at 6 months' gestation and has not taken prenatal vitamins. The healthcare professional educates the woman on the need for a blood test specifically to assess what substance?
- Total protein
 - Culture
 - α -Fetoprotein
 - C-reactive protein

ANS: C

Pregnant women are advised to take folic acid supplements to prevent the development of neural tube defects. The presence of a neural tube defect (NTD) may result in an elevated amniotic fluid α -fetoprotein (AFP) level and subsequent maternal serum AFP levels. Total protein would provide information on nutritional status. A culture would be done to isolate microorganisms in a suspected infection. C-reactive protein would be drawn to evaluate inflammation.

PTS: 1

DIF: Cognitive Level: Applying

17. The clinical manifestations of dyskinetic cerebral palsy include what?
- Increased muscle tone and prolonged primitive reflexes
 - Exaggerated deep tendon reflexes, clonus, and rigidity of extremities
 - Scoliosis, contractures, and stiffness of trunk muscles
 - Jerky uncontrolled and abrupt fine musculoskeletal movements

ANS: D

Dyskinetic cerebral palsy is associated with extreme difficulty in fine motor coordination and purposeful movements. Movements are jerky, uncontrolled, and abrupt, resulting from injury to the basal ganglia or extrapyramidal tracts.

PTS: 1

DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. What can microcephaly be caused by? (*Select all that apply.*)
- Autosomal gene alterations
 - Prenatal physical abuse of the mother
 - X-linked gene alterations
 - Toxic-induced chromosomal defects
 - Maternal anorexia

ANS: A, C, D, E

Autosomal recessive genetic defects in any 1 of 16 chromosomes can cause *primary microcephaly* (present at birth). Environmental causes include toxin exposure, radiation, intrauterine infection, or chemical exposure may be the initiating factor in *secondary microcephaly*. Other causes can include infection, trauma, metabolic disorders, maternal anorexia, and the presence of other genetic syndromes.

PTS: 1

DIF: Cognitive Level: Remembering

2. Which statements regarding the term *myelodysplasia* are *true*? (*Select all that apply.*)
- a. Myelodysplasia is used to define a defect in the formation of the spinal cord.
 - b. It can be used to refer to brain anomalies involving missing brain tissue.
 - c. Myelodysplasia correctly includes encephaloceles.
 - d. It is used to describe a herniation of brain and meninges through a defect in the skull.
 - e. Myelodysplasia can be used to refer to a form of spina bifida.

ANS: A, E

Although myelodysplasia is defined as a defect in the formation of the spinal cord, the term is also used to refer to anomalies of both the vertebral column and the spinal cord. Birth defects in which the vertebrae fail to close are known as spina bifida (split spine). *Anencephaly* is an anomaly in which the soft, bony component of the skull and much of the brain are missing. Encephalocele refers to a herniation or protrusion of various amounts of brain and meninges through a defect in the skull, resulting in a saclike structure.

PTS: 1

DIF: Cognitive Level: Remembering

Chapter 21: Mechanisms of Hormonal Regulation

MULTIPLE CHOICE

1. What imbalance lessens the rate of secretion of parathyroid hormone (PTH)?
 - a. Increased serum calcium levels
 - b. Decreased serum magnesium levels
 - c. Decreased levels of thyroid-stimulating hormone
 - d. Increased levels of thyroid-stimulating hormone

ANS: A

PTH is the single most important regulator of serum calcium. When serum calcium levels are low, PTH secretion is stimulated; when calcium levels are high, PTH secretion is inhibited. PTH secretion is not inhibited by magnesium or thyroid-stimulating hormone levels.

PTS: 1 DIF: Cognitive Level: Remembering

2. Regulation of the release of insulin is an example of which type of regulation?
 - a. Negative feedback
 - b. Positive feedback
 - c. Neural
 - d. Physiologic

ANS: C

Hormone release is governed by three factors: chemical factors, endocrine factors, and neural control. An example of neural control is when insulin is secreted in response to increased glucose in the blood. Negative feedback is seen when changes occur in chemical, endocrine, or neural control that lead to decreased synthesis or secretion of a hormone. Positive feedback occurs when changes in one of the factors lead to increased synthesis or secretion of a hormone. "Physiologic" is not a specific type of regulation.

PTS: 1 DIF: Cognitive Level: Remembering

3. A student asks the professor how a faulty negative-feedback mechanism results in a hormonal imbalance. What response by the professor is best?
 - a. Hormones are not synthesized in response to cellular and tissue activities.
 - b. Decreased hormonal secretion is a response to rising hormone levels.
 - c. Too little hormone production is initiated.
 - d. Excessive hormone production results from a failure to *turn off* the system.

ANS: D

Negative-feedback systems are important in maintaining hormones within physiologic ranges. The lack of negative-feedback inhibition on hormonal release often results in pathologic conditions. Excessive hormone production, which is the result of the failure to *turn off* the system in response to changes in chemical, endocrine, or neurologic factors, can cause various hormonal imbalances and related conditions. Hormones are synthesized in response to cellular and tissue activities, but not appropriately.

PTS: 1 DIF: Cognitive Level: Understanding

4. Which substance is a water-soluble protein hormone?
- Thyroxine
 - Aldosterone
 - Follicle-stimulating hormone
 - Insulin

ANS: D

Peptide or protein hormones, such as insulin, pituitary, hypothalamic, and parathyroid, are water soluble and circulate in free (unbound) forms. All the remaining options are fat-soluble hormones.

PTS: 1 DIF: Cognitive Level: Remembering

5. Which of these is a lipid-soluble hormone?
- Cortisol
 - Oxytocin
 - Epinephrine
 - Growth hormone

ANS: A

Cortisol and adrenal androgens are lipid-soluble hormones and are primarily bound to a carrier or transport protein in circulation. The other options are water-soluble hormones.

PTS: 1 DIF: Cognitive Level: Remembering

6. Most protein hormones are transported in the bloodstream and are what?
- Bound to a lipid-soluble carrier
 - Free in an unbound, water-soluble form
 - Bound to a water soluble-binding protein
 - Free because of their lipid-soluble chemistry

ANS: B

Peptide or protein hormones, such as insulin, pituitary, hypothalamic, and parathyroid, are water soluble and circulate in free (unbound) forms. They are not bound to carriers or lipid soluble.

PTS: 1 DIF: Cognitive Level: Remembering

7. When insulin binds its receptors on muscle cells, an increase in glucose uptake by the muscle cells is the result. This is an example of what type of effect by a hormone?
- Pharmacologic

- b. Permissive
- c. Synergistic
- d. Direct

ANS: D

Direct effects are the obvious changes in cell function that specifically result from the stimulation by a particular hormone. The term pharmacologic could be used to describe the effect of a medication on a hormone. Permissive effects encourage maximum response of functioning of a cell. Synergistic means that two separate entities work together to create a bigger result than either one would have alone; this is not a type of hormone effect.

PTS: 1 DIF: Cognitive Level: Remembering

8. Thyroid-stimulating hormone (TSH) is released to stimulate thyroid hormone (TH) and is inhibited when plasma levels of TH are adequate. What is this an example of?
- a. Positive feedback
 - b. Negative feedback
 - c. Neural regulation
 - d. Physiologic regulation

ANS: B

Feedback systems provide precise monitoring and control of the cellular environment. *Negative feedback* occurs because the changing chemical, neural, or endocrine response to a stimulus negates the initiating change that triggered the release of the hormone. *Thyrotropin-releasing hormone* (TRH) from the hypothalamus stimulates TSH secretion from the anterior pituitary. Secretion of TSH stimulates the synthesis and secretion of THs. Increasing levels of T_4 and triiodothyronine (T_3) then generate negative feedback on the pituitary and hypothalamus to inhibit TRH and TSH synthesis. A positive feedback loop would have the opposite effect. Neural regulation is a type of hormonal control that involves the nervous system. Physiologic is not a specific type of hormone regulation.

PTS: 1 DIF: Cognitive Level: Remembering

9. A person wants to know if eating only plant-based foods is advisable as a way to cut cholesterol to near-zero levels. What response by the health care professional is best?
- a. "No, you will become extremely malnourished."
 - b. "Yes, that is an effective way to eliminate cholesterol."
 - c. "No, many hormones are made from cholesterol."
 - d. "Yes, that will increase the action of insulin."

ANS: C

All the lipid-soluble hormones except thyroid hormone are synthesized from cholesterol, so it is a needed substance in the body. Vegetarian and vegan diets can be healthy so malnutrition is not the issue. Insulin is water soluble.

PTS: 1 DIF: Cognitive Level: Understanding

10. Which second messenger is stimulated by epinephrine binding to a β -adrenergic receptor?
- a. Calcium

- b. Inositol triphosphate (IP₃)
- c. Diacylglycerol (DAG)
- d. Cyclic adenosine monophosphate (cAMP)

ANS: D

Second-messenger molecules are the initial link between the first signal (hormone) and the inside of the cell. For example, the binding of epinephrine to a β -adrenergic-receptor subtype activates (through a stimulatory G protein) the enzyme, adenylyl cyclase. Adenylyl cyclase catalyzes the conversion of adenosine triphosphate (ATP) to the second messenger, 3', and 5'-cAMP. The remaining messengers are not stimulated by epinephrine to bind as described.

PTS: 1 DIF: Cognitive Level: Remembering

11. Why is the control of calcium in cells important?
- a. It is controlled by the calcium negative-feedback loop.
 - b. It is continuously synthesized.
 - c. It acts as a second messenger.
 - d. It carries lipid-soluble hormones in the bloodstream.

ANS: C

In addition to being an important ion that participates in a multitude of cellular actions, Ca⁺⁺ is considered an important second messenger. Serum calcium levels are mainly controlled by parathyroid hormone. Timing of synthesis is not related to the control of calcium levels. Calcium does not carry lipid-soluble hormones in the bloodstream.

PTS: 1 DIF: Cognitive Level: Remembering

12. What is the portion of the pituitary that secretes oxytocin?
- a. Posterior
 - b. Inferior
 - c. Anterior
 - d. Superior

ANS: A

Only the posterior pituitary secretes oxytocin and antidiuretic hormone (ADH). The anterior pituitary secretes adrenocorticotrophic hormone (ACTH), follicle-stimulating hormone, growth hormone, luteinizing hormone, prolactin, and thyroid-stimulating hormone (TSH). There is no inferior or superior portion of the pituitary gland.

PTS: 1 DIF: Cognitive Level: Remembering

13. A patient is in severe shock and is receiving vasopressin. A student asks the health care professional to explain the rationale for this treatment. What response by the professional is *most* accurate?
- a. "Antidiuretic hormone conserves fluid when urine output is less than 20 mL/hr."
 - b. "Antidiuretic hormone causes serum osmolality to be increased."
 - c. "Antidiuretic hormone leads to better insulin utilization."
 - d. "Antidiuretic hormone causes vasoconstriction to help increase blood pressure."

ANS: D

ADH in high doses causes vasoconstriction and a resulting increase in arterial blood pressure which would be important to the patient in shock. It does not cause fluid conservation, changes in serum osmolality, or better insulin utilization.

PTS: 1

DIF: Cognitive Level: Understanding

14. What is the target tissue for prolactin-releasing factor?
- Hypothalamus
 - Anterior pituitary
 - Mammary glands
 - Posterior pituitary

ANS: B

Prolactin-releasing factor targets the anterior pituitary gland to stimulate the secretion of prolactin.

PTS: 1

DIF: Cognitive Level: Remembering

15. Where is antidiuretic hormone (ADH) synthesized, and where does it act?
- Hypothalamus; renal tubular cells
 - Renal tubules; renal collecting ducts
 - Anterior pituitary; posterior pituitary
 - Posterior pituitary; loop of Henle

ANS: A

Once synthesized in the hypothalamus, ADH is stored and secreted by the posterior pituitary and acts on the vasopressin 2 (V2) receptors of the renal duct cells to increase their permeability.

PTS: 1

DIF: Cognitive Level: Remembering

16. Where is oxytocin synthesized?
- Hypothalamus
 - Paraventricular nuclei
 - Anterior pituitary
 - Posterior pituitary

ANS: A

Oxytocin is synthesized in hypothalamic neurons and is stored and secreted by the posterior pituitary. The paraventricular nuclei and anterior pituitary are not involved in oxytocin synthesis.

PTS: 1

DIF: Cognitive Level: Remembering

17. How do the releasing hormones that are made in the hypothalamus travel to the anterior pituitary?
- Vessels of the zona fasciculata
 - Infundibular process
 - Pituitary stalk
 - Portal hypophyseal blood vessels

ANS: D

Releasing and inhibitory hormones are synthesized in the hypothalamus and are secreted into the portal blood vessels through which they travel to the anterior pituitary hormones. The initial stages of aldosterone synthesis occur in the adrenal zona fasciculata and zona reticularis. The infundibular process is part of the posterior pituitary. The pituitary stalk contains the axons of neurons that originate in the supraoptic and paraventricular nuclei of the hypothalamus.

PTS: 1

DIF: Cognitive Level: Remembering

18. To ensure optimal thyroid health and function, which mineral does the health care professional advise a nutrition class to include in the daily diet?
- Iron
 - Zinc
 - Iodide
 - Copper

ANS: C

Iodine is needed for thyroid stimulating hormone (TSH) to stimulate the secretion of thyroid hormone (TH). The other minerals are important for good health, but not related to the health and function of the thyroid gland.

PTS: 1

DIF: Cognitive Level: Understanding

19. Which hormone triggers uterine contractions?
- Thyroxine
 - Oxytocin
 - Growth hormone
 - Insulin

ANS: B

Oxytocin is responsible for the contraction of the uterus and milk ejection in lactating women and may affect sperm motility in men. Thyroxine is the major hormone secreted by the thyroid gland helps regulate metabolic activity in the body. Growth hormone is essential to normal growth and maturation. Insulin helps cells utilize glucose.

PTS: 1

DIF: Cognitive Level: Remembering

20. What effect does hyperphosphatemia have on other electrolytes?
- Increases serum calcium
 - Decreases serum calcium
 - Decreases serum magnesium
 - Increases serum magnesium

ANS: B

Hyperphosphatemia leads to hypocalcemia.

PTS: 1

DIF: Cognitive Level: Remembering

21. A diabetic patient has not taken insulin in several days and has an extremely high blood sugar. What electrolyte would the health care professional assess as the *priority*?
- Potassium
 - Calcium
 - Sodium
 - Chloride

ANS: A

Insulin facilitates the intracellular transport of potassium, phosphate, and magnesium. Without insulin, potassium does not get transported to the intracellular environment and the serum potassium will rise. The health care professional would assess the patient's potassium level as the priority.

PTS: 1

DIF: Cognitive Level: Applying

22. A person who has experienced physiologic stresses will have increased levels of which hormone?
- Cortisol
 - Thyroid hormone
 - Somatostatin
 - Alpha endorphin

ANS: A

Stress has been shown to increase adrenocorticotrophic hormone secretion. Thyroid hormone, somatostatin, and alpha endorphin are not increased with stress.

PTS: 1

DIF: Cognitive Level: Remembering

23. What is the action of calcitonin?
- Increases metabolism
 - Decreases metabolism
 - Increases serum calcium
 - Decreases serum calcium

ANS: D

Calcitonin, also called *thyrocalcitonin*, acts to lower serum calcium levels by inhibiting bone-resorbing osteoclasts. Calcitonin does not alter metabolism.

PTS: 1

DIF: Cognitive Level: Remembering

24. Which hormone is involved in the regulation of serum calcium levels?
- Parathyroid hormone (PTH)
 - Thyroxine (T₄)
 - Adrenocorticotrophic hormone (ACTH)
 - Triiodothyronine (T₃)

ANS: A

The parathyroid glands produce PTH, a regulator of serum calcium. Thyroxine (T_4) and triiodothyronine (T_3) are thyroid hormones. ACTH is the main regulator of cortisol secretion and adrenocortical growth.

PTS: 1 DIF: Cognitive Level: Remembering

25. Which hormone inhibits the secretion of growth hormone (GH)?
- Somatostatin
 - Thyroxine
 - Thyroid-stimulating hormone
 - Calcitonin

ANS: A

Two hormones from the hypothalamus control GH secretion: (1) GH-releasing hormone (GHRH), which increases GH secretion; and (2) somatostatin, which inhibits it. Thyroxine and thyroid-stimulating hormone are related to thyroid function. Calcitonin helps regulate serum calcium levels.

PTS: 1 DIF: Cognitive Level: Remembering

26. Where are target cells for parathyroid hormone located?
- Tubules of nephrons
 - Thyroid gland
 - Glomeruli of nephrons
 - Smooth and skeletal muscles

ANS: A

Parathyroid hormone acts on its plasma membrane receptor only in the distal and proximal tubules of the kidney's nephron.

PTS: 1 DIF: Cognitive Level: Remembering

27. Which compound or hormone is secreted by the adrenal medulla?
- Cortisol
 - Epinephrine
 - Androgens
 - Aldosterone

ANS: B

Epinephrine is secreted by the adrenal medulla. Cortisol, androgens, and aldosterone are secreted by adrenal cortex.

PTS: 1 DIF: Cognitive Level: Remembering

28. What are the effects of aging on pancreatic cells?
- Pancreatic cells are replaced by fibrotic cells.
 - Increased insulin production is typical.
 - Beta cell function decreases.
 - No appreciable change occurs on pancreatic cells.

ANS: C

With aging, there is an associated decline in the functioning of pancreatic beta cells. There is no evidence to suggest that pancreatic cells are replaced with fibrotic tissue, or that insulin production increases.

PTS: 1

DIF: Cognitive Level: Remembering

29. What does aldosterone directly increase the reabsorption of?

- a. Magnesium
- b. Calcium
- c. Sodium
- d. Water

ANS: C

In the kidney, aldosterone primarily acts on the epithelial cells of the nephron-collecting duct to increase sodium ion reabsorption. Aldosterone does not directly increase the reabsorption of magnesium, calcium, or water.

PTS: 1

DIF: Cognitive Level: Remembering

30. Which is an expected hormonal change in an older patient?

- a. Thyroid-stimulating hormone secretion below normal
- b. Triiodothyronine level below normal
- c. Cortisol level below normal
- d. Adrenocorticotrophic hormone level above normal

ANS: A

Aging causes overall thyroid-stimulating hormone secretion to diminish but does not bring about the other changes.

PTS: 1

DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. What are actions of glucocorticoids? (*Select all that apply.*)

- a. Decreasing muscle cell reuptake of glucose
- b. Fat storage
- c. Decreased blood glucose
- d. Carbohydrate metabolism
- e. Liver gluconeogenesis

ANS: A, D, E

The term *glucocorticoid* refers to those steroidal hormones that have direct effects on carbohydrate metabolism. These hormones increase blood glucose concentration by promoting gluconeogenesis in the liver and by decreasing uptake of glucose into muscle cells, adipose cells, and lymphatic cells. Glucocorticoids are not capable of fat storage.

PTS: 1

DIF: Cognitive Level: Remembering

Chapter 22: Alterations of Hormonal Regulation

MULTIPLE CHOICE

1. The effects of the syndrome of inappropriate antidiuretic hormone (SIADH) secretion include which solute?
 - a. Sodium and water retention
 - b. Sodium retention and water loss
 - c. Sodium dilution and water retention
 - d. Sodium dilution and water loss

ANS: C

The symptoms of SIADH secretion are a result of dilutional hyponatremia and water retention. SIADH does not lead to sodium retention or water loss.

PTS: 1

DIF: Cognitive Level: Remembering

2. Which patient would the healthcare professional assess for elevated levels of antidiuretic hormone (ADH) secretion?
 - a. Being treated for small cell carcinoma of the stomach
 - b. Taking high dose acetaminophen (Tylenol) for arthritis
 - c. Had a hip replacement operation 14 days ago
 - d. Has long-standing kidney disease from diabetes

ANS: A

A common cause of elevated levels of ADH secretion is ectopically produced ADH by tumors, such as small cell carcinoma of the duodenum, stomach, and pancreas; cancers of the bladder, prostate, and endometrium; lymphomas; and sarcomas. High doses of antiinflammatory medications are a risk factor, but acetaminophen is not an antiinflammatory medication. Surgery within the last 5 to 7 leads to increased ADH secretion. Kidney disease does not lead to excess levels of ADH.

PTS: 1

DIF: Cognitive Level: Applying

3. Which laboratory value would the nurse expect to find if a person is experiencing syndrome of inappropriate antidiuretic hormone (SIADH)?
 - a. Hypernatremia and urine hypoosmolality
 - b. Serum potassium (K^+) level of 5 mEq/L and urine hyperosmolality compared to serum
 - c. Serum sodium (Na^+) level of 120 mEq/L and serum osmolality 260 mOsm/kg
 - d. Serum potassium (K^+) of 2.8 mEq/L and serum hyperosmolality

ANS: C

A diagnosis of SIADH requires a serum sodium level of less than 135 mEq/L, serum hypoosmolality less than 280 mOsm/kg, and urine hyperosmolality. Potassium levels are not considered a factor.

PTS: 1 DIF: Cognitive Level: Remembering

4. What is diabetes insipidus a result of?
- Antidiuretic hormone hyposecretion
 - Antidiuretic hormone hypersecretion
 - Insulin hyposecretion
 - Insulin hypersecretion

ANS: A

Diabetes insipidus is a result of insufficient antidiuretic hormone (hyposecretion). It is not related to insulin secretion.

PTS: 1 DIF: Cognitive Level: Remembering

5. A patient who is diagnosed with a closed head injury has a urine output of 6 to 8 L/day. Electrolytes are within normal limits, but the antidiuretic hormone (ADH) level is low. Although the patient has had no intake for 4 hours, no change in the polyuria level has occurred. What treatment or diagnostic testing does the healthcare professional prepare the patient for?
- Administration of desmopressin
 - Serum copeptin testing
 - Insulin administration
 - Renal angiogram

ANS: A

The stated symptoms are reflective of neurogenic diabetes insipidus (DI) which can be treated with desmopressin. Desmopressin will cause an increased ability to concentrate urine. Copeptin is a precursor of ADH and obtaining a serum level is useful in diagnosing dipsogenic DI. The patient does not need insulin or a renal angiogram.

PTS: 1 DIF: Cognitive Level: Applying

6. A patient is having a water deprivation test. The patient's initial weight was 220 pounds (100 kg). The next weight is 209 pounds (95 kg). What action by the healthcare professional is *most* appropriate?
- Stop the water deprivation test.
 - Administer salt tablets.
 - Continue with the test as planned.
 - Take the patient's blood glucose.

ANS: A

In patients with severe diabetes insipidus the water deprivation test can be diagnostic. However, it can also be risky; if the patient loses more than 3% of body weight, cardiovascular collapse and shock can occur. This patient has lost 5% of initial body weight, so the professional should stop the test. Administering salt tablets does not take priority over stopping the test. Glucose measurement is not relevant.

PTS: 1 DIF: Cognitive Level: Analyzing

7. A healthcare professional is caring for four patients. Which patient does the professional assess for neurogenic diabetes insipidus (DI)?
- Anterior pituitary tumor
 - Thalamus hypofunction
 - Posterior pituitary trauma
 - Renal tubule disease

ANS: C

Neurogenic DI is a result of dysfunctional antidiuretic hormone synthesis, caused by a lesion of the posterior pituitary, hypothalamus, or pituitary stalk. Injury or dysfunction of the anterior pituitary, the thalamus, or the renal tubules does not cause neurogenic DI.

PTS: 1 DIF: Cognitive Level: Applying

8. Which form of diabetic insipidus (DI) will result if the target cells for antidiuretic hormone (ADH) in the renal collecting tubules demonstrate insensitivity?
- Neurogenic
 - Nephrogenic
 - Psychogenic
 - Ischemic

ANS: B

Only nephrogenic DI is associated with an insensitivity of the renal collecting tubules to ADH.

PTS: 1 DIF: Cognitive Level: Remembering

9. Which laboratory value is consistent with diabetes insipidus (DI)?
- Low urine-specific gravity
 - Low serum sodium
 - Low urine protein
 - High serum total protein

ANS: A

The basic criteria for diagnosing DI include a low urine-specific gravity while sodium levels are high. Protein levels are not considered.

PTS: 1 DIF: Cognitive Level: Remembering

10. A patient has nephrogenic diabetes insipidus (DI). What treatment does the healthcare professional anticipate for this patient?
- Exogenous ADH replacement
 - Intranasal desmopressin
 - Water and sodium restriction
 - Loop diuretic administration

ANS: A

Nephrogenic DI is usually treated with administration of fluids, or intranasal (or oral) desmopressin. Neurogenic DI is treated with ADH replacement therapy. Water restriction would not be helpful. Thiazide (not loop) diuretics can improve moderate nephrogenic DI.

PTS: 1 DIF: Cognitive Level: Remembering

11. Which condition may result from pressure exerted by a pituitary tumor?
- Hypothyroidism
 - Hypercortisolism
 - Diabetes insipidus
 - Insulin hyposecretion

ANS: A

If the tumor exerts sufficient pressure, then thyroid and adrenal hypofunction may occur because of lack of thyroid-stimulating hormone (TSH) and adrenocorticotrophic hormone (ACTH). These result in the symptoms of hypothyroidism and hypocortisolism. The remaining options are not associated with the pressure exerted by a pituitary tumor.

PTS: 1 DIF: Cognitive Level: Remembering

12. A healthcare professional reads a chart that notes the patient has panhypopituitarism. What does the professional understand that term to mean?
- The patient has a lack of all hormones associated with the anterior pituitary gland.
 - The patient has a lack of all hormones associated with the lateral pituitary gland.
 - The patient has total adrenocorticotrophic hormone deficiency.
 - The patient has a dysfunction of the posterior pituitary gland due to a tumor.

ANS: A

Panhypopituitarism is the term denoting the lack of all anterior pituitary hormones.

PTS: 1 DIF: Cognitive Level: Understanding

13. Visual disturbances are a result of a pituitary adenoma because of what?
- Liberation of anterior pituitary hormones into the optic chiasm
 - Pituitary hormones clouding the lens of the eyes
 - Pressure of the tumor on the optic chiasm
 - Pressure of the tumor on the optic and oculomotor cranial nerves

ANS: C

Pressure on the optic chiasm is the only cause for visual disturbances resulting from a pituitary adenoma.

PTS: 1 DIF: Cognitive Level: Remembering

14. A patient has an enlarged tongue, body odor, rough skin, and coarse hair. Which laboratory result does the healthcare professional associate with this presentation?
- Decreased blood glucose
 - Increased growth hormone
 - Decreased ACTH
 - Increased TSH

ANS: B

This patient has clinical findings suggestive of acromegaly which is caused by high levels of growth hormone (GH), often from a pituitary adenoma. It would result in high blood glucose and no effect on ACTH or TSH.

PTS: 1 DIF: Cognitive Level: Understanding

15. A patient has acromegaly. What assessment by the healthcare professional would be *most* important?
- Skin condition
 - Sleep patterns
 - Bowel function
 - Range of motion

ANS: B

Sleep patterns are important to assess for in patients with acromegaly because sleep-disordered breathing such as obstructive sleep apnea is common. The skin in patients with acromegaly will be coarse. Bowel function may or may not be altered. Range of motion is decreased as an expected consequence of the disease.

PTS: 1 DIF: Cognitive Level: Applying

16. Why does gigantism occur only in children and adolescents?
- Their growth hormones are still diminished.
 - Their epiphyseal plates have not yet closed.
 - Their skeletal muscles are not yet fully developed.
 - Their metabolic rates are higher than in adulthood.

ANS: B

Gigantism is related to the effects of excess growth hormones on the growth of long bones at their epiphyseal plates in acromegaly. It is not related to skeletal muscle development or metabolic rate.

PTS: 1 DIF: Cognitive Level: Remembering

17. A patient chart notes the patient has amenorrhea, galactorrhea, hirsutism, and osteoporosis. What diagnostic test would the healthcare professional prepare the patient for?
- Water deprivation test
 - Hemoglobin A1C
 - CT scan of the head
 - Ovarian biopsy

ANS: C

The patient presents with characteristics of a prolactinoma: a pituitary tumor that secretes prolactin. The professional would prepare the patient for a CT scan of the head. A water deprivation test is used to diagnose diabetes insipidus. The hemoglobin A1C is used to measure blood glucose over time. Polycystic ovary disease can lead to increased level of prolactin, but this is not diagnosed with a biopsy.

PTS: 1 DIF: Cognitive Level: Remembering

18. What does Graves' disease develop from?
- A viral infection of the thyroid gland that causes overproduction of thyroid hormone
 - An autoimmune process during which lymphocytes and fibrous tissue replace thyroid tissue
 - A thyroid-stimulating immunoglobulin that causes overproduction of thyroid hormones
 - An ingestion of goitrogens that inhibits the synthesis of the thyroid hormones, causing a goiter

ANS: C

The pathologic features of Graves' disease indicate that normal regulatory mechanisms are overridden by abnormal immunologic mechanisms resulting in the stimulation of excessive TH. Graves' disease is not caused by a viral infection, lymphocyte and fibrous tissue infiltration, or ingestion of goitrogens.

PTS: 1

DIF: Cognitive Level: Remembering

19. Which patient would the healthcare professional assess for other signs of thyrotoxic crisis?
- Constipation with gastric distention
 - Bradycardia and bradypnea
 - Hyperthermia and tachycardia
 - Constipation and lethargy

ANS: C

The systemic symptoms of thyrotoxic crisis include hyperthermia, tachycardia, diarrhea, and agitation or delirium, heart failure, dysrhythmias, nausea, and vomiting.

PTS: 1

DIF: Cognitive Level: Applying

20. Which pathologic changes are associated with Graves' disease?
- High levels of circulating thyroid-stimulating immunoglobulins
 - Diminished levels of thyrotropin-releasing hormone
 - High levels of thyroid-stimulating hormone
 - Diminished levels of thyroid-binding globulin

ANS: A

High levels of circulating thyroid-stimulating immunoglobulins are found in more than 95% of individuals diagnosed with this disease.

PTS: 1

DIF: Cognitive Level: Remembering

21. A healthcare professional is palpating the neck of a person diagnosed with Graves' disease. What finding would the professional associate with this disorder?
- Parathyroids left of midline
 - Thyroid small with discrete nodules
 - Parathyroids normal in size
 - Thyroid diffusely enlarged

ANS: D

Graves' disease is characterized by a diffusely enlarged thyroid gland. The parathyroid glands are not involved.

PTS: 1

DIF: Cognitive Level: Remembering

22. A person has hypothyroidism. What chemical does the healthcare professional advise the person to include in the diet?
- Iron
 - Iodine
 - Zinc
 - Magnesium

ANS: B

A lack of iodine can lead to hypothyroidism.

PTS: 1

DIF: Cognitive Level: Understanding

23. A patient has a suspected thyroid carcinoma. What diagnostic test does the healthcare professional prepare the patient for?
- Measurement of serum thyroid levels
 - Radioisotope scanning
 - Ultrasonography
 - Fine-needle aspiration biopsy

ANS: D

Fine-needle aspiration of a thyroid nodule is generally performed to diagnose thyroid carcinoma. Serum thyroid levels probably will not be abnormal early in disease. Radioisotope scanning is not used and ultrasound is not specific enough for diagnosis.

PTS: 1

DIF: Cognitive Level: Understanding

24. Renal failure is the most common cause of which type of hyperparathyroidism?
- Primary
 - Secondary
 - Exogenous
 - Inflammatory

ANS: B

Chronic renal failure is the most common cause of secondary hyperparathyroidism because of the resulting hyperphosphatemia that stimulates parathyroid hormone secretion. Although the other options may occur, they are not the most common types of the disorder.

PTS: 1

DIF: Cognitive Level: Remembering

25. A patient had a thyroidectomy and now reports tingling around the mouth and has a positive Chvostek sign. What laboratory finding would be most helpful to the healthcare professional?
- TSH and T₄
 - Serum sodium

- c. Serum calcium
- d. Urine osmolality

ANS: C

The patient is displaying signs of hypocalcemia, which can be caused by hypoparathyroidism. The most common cause of hypoparathyroidism is damage caused during thyroid surgery. The healthcare professional would be more informed by a serum calcium test. Thyroid hormones, serum sodium, and urine osmolality will not provide information related to this condition.

PTS: 1 DIF: Cognitive Level: Analyzing

26. A patient diagnosed with diabetic ketoacidosis (DKA) has the following laboratory values: arterial pH 7.20; serum glucose 500 mg/dL; positive urine glucose and ketones; serum potassium (K^+) 2 mEq/L; serum sodium (Na^+) 130 mEq/L. The patient reports that he has been sick with the “flu” for 1 week. What relationship do these values have to his insulin deficiency?
- a. Increased glucose use causes the shift of fluid from the intravascular to the intracellular space.
 - b. Decreased glucose use causes fatty acid use, ketogenesis, metabolic acidosis, and osmotic diuresis.
 - c. Increased glucose and fatty acids stimulate renal diuresis, electrolyte loss, and metabolic alkalosis.
 - d. Decreased glucose use results in protein catabolism, tissue wasting, respiratory acidosis, and electrolyte loss.

ANS: B

Decreased glucose causes fatty acid use, ketogenesis, metabolic acidosis, and osmotic diuresis, which have resulted in the symptoms listed in the question. Glucose is not being used which accounts for the high serum glucose. The pH indicates acidosis, not alkalosis. DKA is a metabolic, not respiratory, process.

PTS: 1 DIF: Cognitive Level: Understanding

27. Why does polyuria occur with diabetes mellitus?
- a. Formation of ketones
 - b. Chronic insulin resistance
 - c. Elevation in serum glucose
 - d. Increase in antidiuretic hormone

ANS: C

Glucose accumulates in the blood and appears in the urine as the renal threshold for glucose is exceeded, producing an osmotic diuresis and the symptoms of polyuria and thirst. Ketone formation would lead to acidosis. Insulin resistance will promote hyperglycemia. And increase in antidiuretic hormone leads to water retention.

PTS: 1 DIF: Cognitive Level: Remembering

28. A student asks the professor to differentiate Type 2 diabetes mellitus from Type 1. The professors' response would be that Type 2 is best described as what?
- a. Resistance to insulin by insulin-sensitive tissues

- b. Need for lifelong insulin injections
- c. Increase of glucagon secretion from beta cells of the pancreas
- d. Presence of insulin autoantibodies that destroy beta cells in the pancreas

ANS: A

One of the basic pathophysiologic characteristics of type 2 diabetes is the development of insulin-resistant tissue cells. Type 1 diabetes always must be treated with insulin. Type 2 diabetes can be treated with insulin but there are other options. Pancreatic beta cells are destroyed in Type 1 diabetes. Increased glucagon is not secreted from pancreatic beta cells in Type 2 diabetes.

PTS: 1

DIF: Cognitive Level: Understanding

29. A person diagnosed with type 1 diabetes experienced an episode of hunger, lightheadedness, tachycardia, pallor, headache, and confusion. The healthcare professional teaches the person that what is the *most* probable cause of these symptoms?
- a. Hyperglycemia caused by incorrect insulin administration
 - b. Dawn phenomenon from eating a snack before bedtime
 - c. Hypoglycemia caused by increased exercise
 - d. Somogyi effect from insulin sensitivity

ANS: C

The most likely cause of these symptoms is hypoglycemia, which is often caused by a lack of systemic glucose as a result of muscular activity or decreased food intake. Hyperglycemia is not characterized by these symptoms. The Dawn phenomenon is manifested by an early morning elevation in blood glucose. The Somogyi effect is distinguished by early morning (i.e., 4 AM) hypoglycemia followed by hyperglycemia upon arising.

PTS: 1

DIF: Cognitive Level: Remembering

30. Which serum glucose level would indicate hypoglycemia in a newborn?
- a. 28 mg/dL
 - b. 40 mg/dL
 - c. 60 mg/dL
 - d. 80 mg/dL

ANS: A

Serum glucose <30 mg/dL in newborn (first 2 to 3 days) and <55 to 60 mg/dL in adults is associated with hypoglycemia.

PTS: 1

DIF: Cognitive Level: Remembering

31. When comparing the clinical manifestations of both diabetic ketoacidosis (DKA) and hyperglycemic hyperosmolar nonketotic syndrome (HHNKS), which condition is associated with only DKA?
- a. Fluid loss
 - b. Weight loss
 - c. Increased serum glucose
 - d. Kussmaul respirations

ANS: D

Kussmaul respirations are only observed in those with DKA. This is due to compensation by the lungs for the metabolic acidosis. Both DKA and HHNKS show fluid loss, weight loss, and hyperglycemia.

PTS: 1

DIF: Cognitive Level: Remembering

32. Hypoglycemia, followed by rebound hyperglycemia, is observed in those with what?
- The Somogyi effect
 - The dawn phenomenon
 - Diabetic ketoacidosis
 - Hyperosmolar hyperglycemic nonketotic syndrome

ANS: A

Hypoglycemia, followed by rebound hyperglycemia, is observed only in the Somogyi effect.

PTS: 1

DIF: Cognitive Level: Remembering

33. A patient has diabetes mellitus. A recent urinalysis showed increased amounts of protein. What therapy does the healthcare provider educate the patient that is specific to this disorder?
- More frequent blood glucose monitoring
 - Moderate dietary sodium restriction
 - Treatment with an ACE inhibitor
 - Home blood pressure monitoring

ANS: C

Microalbuminuria is the first manifestation of diabetic nephropathy. Treatment with an ACE inhibitor or angiotensin receptor blocker is the treatment of choice. Depending on the patient, more frequent blood glucose and blood pressure monitoring may be in order, but is not specific to this disorder and does not treat it. The patient may benefit from a moderate or even severe sodium restriction for several reasons (nephropathy, hypertension, etc.) but that is not as specific to nephropathy treatment as the medications are.

PTS: 1

DIF: Cognitive Level: Understanding

34. Which classification of oral hypoglycemic drugs decreases hepatic glucose production and increases insulin sensitivity and peripheral glucose uptake?
- Biguanide (metformin)
 - Sulfonylureas (glyburide)
 - Meglitinides (glinides)
 - α -Glycosidase inhibitor (miglitol)

ANS: A

Only biguanides decrease hepatic glucose production and increase insulin sensitivity and peripheral glucose uptake. The sulfonylureas and meglitinides stimulate insulin release from pancreatic beta cells. The α -glycosidase inhibitors delay carbohydrate absorption in the gut.

PTS: 1

DIF: Cognitive Level: Remembering

35. What causes the microvascular complications in patients with diabetes mellitus?
- The capillaries contain plaques of lipids that obstruct blood flow.
 - Pressure in capillaries increases as a result of the elevated glucose attracting water.
 - The capillary basement membranes thicken, and cell hyperplasia develops.
 - Fibrous plaques form from the proliferation of subendothelial smooth muscle of arteries.

ANS: C

Microvascular complications are a result of capillary basement membranes thickening and endothelial cell hyperplasia. They do not occur due to plaque accumulation, increased capillary pressure, or from proliferation of subendothelial smooth muscle.

PTS: 1

DIF: Cognitive Level: Remembering

36. A healthcare professional advises a person with diabetes mellitus to have an annual eye exam. When the person asks why this is necessary, the professional states that retinopathy develops in patients with diabetes mellitus because of what reason?
- Plaques of lipids develop in the retinal vessels.
 - Pressure in the retinal vessels increase as a result of increased osmotic pressure.
 - Ketones cause microaneurysms in the retinal vessels.
 - Retinal ischemia and red blood cell aggregation occur.

ANS: D

Retinopathy appears to be a response to retinal ischemia and red blood cell aggregation. None of the remaining explanations appropriately describe the relationship between retinopathy and diabetes mellitus.

PTS: 1

DIF: Cognitive Level: Understanding

37. A person has acne, easy bruising, thin extremities, and truncal obesity. The healthcare professional assesses the person for which of these?
- Previous thyroid surgery
 - Urine osmolality
 - Serum electrolytes
 - Use of glucocorticoids

ANS: D

These symptoms are characteristic of Cushing disease (or Cushing-like syndrome) which can be caused by long-term use of glucocorticoids to treat other medical conditions. Thyroid surgery, urine osmolality, and serum electrolytes would not give information about the disorder.

PTS: 1

DIF: Cognitive Level: Applying

MULTIPLE RESPONSE

1. A person may experience which complications as a result of a reduction in parathyroid hormone (PTH)? (*Select all that apply.*)

- a. Muscle spasms
- b. Tonic-clonic seizures
- c. Laryngeal spasms
- d. Hyporeflexia
- e. Asphyxiation

ANS: A, B, C, E

Symptoms associated with hypoparathyroidism are related to hypocalcemia. Hypocalcemia causes a lowering of the threshold for nerve and muscle excitation so that a slight stimulus anywhere along the length of a nerve or muscle fiber may initiate a nerve impulse. This creates tetany manifested as muscle spasms, hyporeflexia, tonic-clonic convulsions, laryngeal spasms, and, in severe cases, death from asphyxiation.

PTS: 1 DIF: Cognitive Level: Remembering

2. A chronic complication of diabetes mellitus is likely to result in microvascular complications in which areas? (*Select all that apply.*)
- a. Eyes
 - b. Coronary arteries
 - c. Renal system
 - d. Peripheral vascular system
 - e. Nerves

ANS: A, C, E

Of the options provided, the areas most often affected are the retina, kidneys, and nerves. Coronary artery disease and peripheral vascular disease are macrovascular complications.

PTS: 1 DIF: Cognitive Level: Remembering

3. What are clinical manifestations of hypothyroidism? (*Select all that apply.*)
- a. Intolerance to heat
 - b. Restlessness
 - c. Constipation
 - d. Bradycardia
 - e. Lethargy

ANS: C, D, E

The lower levels of thyroid hormone result in decreased energy metabolism, resulting in constipation, bradycardia, and lethargy. Intolerance to heat and restlessness would be associated with hyperthyroidism.

PTS: 1 DIF: Cognitive Level: Remembering

Chapter 23: Obesity and Disorders of Nutrition

MULTIPLE CHOICE

1. A researcher is moving to an area with a year-round cold climate. The researcher asks the health care professional how people in these areas are able to adjust to the temperature. What response by the professional is *most* accurate?
 - a. They have less adipose tissue.
 - b. They have more beige (bAT) adipose tissue.
 - c. Their bone marrow produces more adipose tissue.
 - d. They gain weight which insulates them.

ANS: B

Chronic exposure to cold climates causes the conversion of white adipose tissue (WAT) to beige adipose tissue, which is thermogenic. Changing the amount of adipose tissue overall does not help with acclimation to cold climates.

PTS: 1

DIF: Cognitive Level: Understanding

2. A health care professional wishes to provide community screening for obesity. Which population should the professional focus on as the *priority*?
 - a. Caucasians
 - b. Non-Hispanic blacks
 - c. Hispanics
 - d. Asians

ANS: B

Non-Hispanic blacks have the highest age-adjusted rate of obesity at 48.1% followed by Hispanics (42.5%), non-Hispanic whites (34.5%), and non-Hispanic Asians (11.7%). The professional's priority should be on the group with the highest prevalence rate, which is non-Hispanic blacks.

PTS: 1

DIF: Cognitive Level: Remembering

3. The student asks the professor for a definition of "orexigenic neurons." What description by the professor is *most* accurate?
 - a. Promote appetite and stimulate eating
 - b. Suppress appetite and inhibit eating
 - c. Increase overall metabolism
 - d. Promote satiety after eating

ANS: A

Orexigenic neurons promote appetite, stimulate eating, and decrease metabolism. The anorexigenic neurons suppress appetite, inhibit eating, increase metabolism, and promote satiety after eating.

PTS: 1

DIF: Cognitive Level: Understanding

4. A student asks the health care professional why obese people are at higher risk for hypertension than non-obese individuals. What response by the professional is *best*?
- They produce more ghrelin in the stomach.
 - Their thyroid gland secretes less hormone.
 - They produce more angiotensinogen.
 - They secrete fewer endocannabinoids.

ANS: C

Angiotensinogen is a precursor of angiotensin I, which, converted to angiotensin II, is a potent vasoconstrictor. Angiotensinogen is produced both by the liver and by adipocytes; therefore obese individuals have more, leading to increased vasoconstriction and increased systemic vascular resistance which leads to high blood pressure. Ghrelin, produced in the stomach, increases food intake. The thyroid gland function is not directly linked to obesity. Endocannabinoids are associated with increase in appetite and nutrient absorption.

PTS: 1

DIF: Cognitive Level: Understanding

5. Which individual does the health care professional determine is obese?
- Body mass index 23 kg/m^2
 - Body mass index 25 kg/m^2
 - Body mass index 29 kg/m^2
 - Body mass index 32 kg/m^2

ANS: D

Overweight is defined as a body mass index (BMI) of $>25 \text{ kg/m}^2$, while a BMI of $>30 \text{ kg/m}^2$ is considered obese. The individual with the BMI of 23 kg/m^2 would be considered of normal weight, those with BMIs of 25 and 29 kg/m^2 would be considered overweight, and the person with the BMI of 32 kg/m^2 is obese.

PTS: 1

DIF: Cognitive Level: Remembering

6. A health care professional is caring for a patient admitted to the hospital with severe anorexia. What action by the health care professional would be *most* important?
- Ensuring the patient is on a cardiac monitor
 - Facilitating laboratory testing of electrolytes
 - Arranging a psychiatry consultation
 - Assessing the patient's favorite foods

ANS: A

Patients with severe anorexia can have cardiac dysrhythmias, so this patient should be placed on a cardiac monitor as the priority. The other actions are appropriate; they just do not take priority.

PTS: 1

DIF: Cognitive Level: Applying

7. A person has abnormally severe tooth decay and erosion of the tooth enamel. What problem should the health care professional assess the person for?
- Anorexia nervosa

- b. Binge eating
- c. Bulimia
- d. Refeeding syndrome

ANS: C

Chronic vomiting and exposure to gastric acids leads to loss of tooth enamel and decay. These are not signs of anorexia, binge eating, or refeeding syndrome.

PTS: 1 DIF: Cognitive Level: Applying

8. A patient weighs 82 pounds and is hospitalized for anorexia. In order to prevent refeeding syndrome, how many calories should the person eat in the first two days?
- a. 400
 - b. 745
 - c. 936
 - d. 1200

ANS: B

In order to prevent refeeding syndrome, feedings should start slowly at about 20 kcal/kg/day. This 82-pound person weighs 37.2727 kg, so that would be 745 calories a day.

PTS: 1 DIF: Cognitive Level: Applying

9. A severely malnourished patient is in the hospital to improve nutrition. On the second day, the patient reports palpitations and difficulty breathing. After placing the patient on a cardiac monitor, what action does the health care professional take next?
- a. Take the patient's temperature.
 - b. Have lab drawn for electrolyte levels.
 - c. Cancel the patient's next meal.
 - d. Facilitate a chest x-ray.

ANS: B

Refeeding syndrome occurs when patients are fed too quickly, causing rapid shifts of fluids and electrolytes, often leading to dysrhythmias. After placing the patient on a cardiac monitor, the professional should next ensure that serum electrolytes are measured. The patient's temperature is not relevant to this situation. The patient should continue to eat although calories should be decreased. There may or may not be a need for a chest x-ray.

PTS: 1 DIF: Cognitive Level: Analyzing

MULTIPLE RESPONSE

1. A student asks the professor about the functions of adipose tissue. What responses by the professor are accurate? (*Select all that apply.*)
- a. Provides insulation
 - b. Helps with mechanical support
 - c. Dysregulates thyroid function
 - d. Secretes adipokines

- e. Helps generate heat

ANS: A, B, D, E

Adipose tissue has multiple functions including providing insulation and mechanical support, secreting adipokines, and heat generation. They do not specifically cause thyroid dysregulation.

PTS: 1 DIF: Cognitive Level: Understanding

2. A health care professional is speaking to a weight-loss support group and encourages the participants to have regular screening for medical conditions that are related to obesity. Which conditions does the professional include in this list? (*Select all that apply.*)
- a. Cancer
 - b. Cardiovascular disease
 - c. Cirrhosis
 - d. Diabetes
 - e. Dementias

ANS: A, B, D

The three leading causes of death in the US related to obesity are cancer, cardiovascular disease, and diabetes. The professional would encourage the participants to be screened for these conditions. Obesity is not linked to cirrhosis of the liver or dementias.

PTS: 1 DIF: Cognitive Level: Understanding

3. What role does leptin resistance have in promoting obesity? (*Select all that apply.*)
- a. Promotes overeating
 - b. Promotes early satiety
 - c. Inhibits orexigenic outcomes
 - d. Increases oxidative stress
 - e. Leads to hyperglycemia

ANS: A, D, E

Leptin resistance has a major role in obesity. Some of the effects of leptin resistance include: promotion of overeating, failure to inhibit orexigenic hypothalamic satiety signaling, increased oxidative stress, and hyperglycemia.

PTS: 1 DIF: Cognitive Level: Remembering

4. What does the student learn about the effects of long-term starvation? (*Select all that apply.*)
- a. Energy is supplied through glycogenolysis.
 - b. Gluconeogenesis begins for energy requirements.
 - c. Increase in inflammatory mediators.
 - d. Use of ketone bodies for energy needs.
 - e. Proteolysis begins in adipose tissue.

ANS: C, D

Glycogenolysis and gluconeogenesis supply energy needs in short-term starvation, or fasting states. During long-term starvation the body produces more inflammatory mediators and begins using ketones for energy. Proteolysis begins once adipose tissue has been depleted.

PTS: 1 DIF: Cognitive Level: Remembering

5. A family is concerned that their most elderly member is not eating. What information about the anorexia of aging does the health care professional provide the family? (*Select all that apply.*)
- a. Usually there is a direct cause that can be treated successfully.
 - b. Is not related to age-related changes and signifies illness
 - c. Decreases in saliva and the sense of taste are contributing factors.
 - d. Age-related loss of appetite is common finding.
 - e. Social stimulation at meals might promote better eating habits.

ANS: C, D, E

Anorexia of aging has multiple causes that include normal age-related changes, physiologic alterations, and social/psychological factors. Decreases in saliva and the senses of smell and taste are contributory. Aging is marked by a decrease in orexigenic signals and an increase in anorexigenic signals, leading to decreased appetite. Social isolation has also been implicated in this phenomenon.

PTS: 1 DIF: Cognitive Level: Understanding

6. A student learning about the effects of obesogens discovers what information about them? (*Select all that apply.*)
- a. Can be found in personal care products
 - b. Cannot cross the placental barrier
 - c. Can be transmitted through breast milk
 - d. Are limited to a single genetic defect
 - e. Have been associated with pesticide exposure

ANS: A, C, E

Obesogens are exogenous chemicals related to the development of obesity. They can be found in a variety of items such as person care products, plastics, pesticides, food products, and other household and consumer products. Some of them can cross the placental barrier and be transmitted through breast milk. They produce epigenetic changes in gene regulation and expression.

PTS: 1 DIF: Cognitive Level: Understanding

Chapter 24: Structure and Function of the Reproductive Systems

MULTIPLE CHOICE

1. The initial reproductive structures of the male and female embryos appear the same until which week of gestation?
 - a. Third
 - b. Seventh
 - c. Twentieth
 - d. Thirtieth

ANS: B

Differentiation of the male and female reproductive system begins at about 6 to 7 weeks of embryonic gestation.

PTS: 1 DIF: Cognitive Level: Remembering

2. The absence of which major hormone is a determinant of sexual differentiation (Wolffian system) in utero?
 - a. Estrogen
 - b. Progesterone
 - c. Growth hormone
 - d. Testosterone

ANS: D

In the presence of estrogen and the absence of testosterone, a loss of the Wolffian system occurs and the two gonads develop into ovaries at 6 to 8 weeks' gestation. Growth hormone and progesterone are not involved in this differentiation.

PTS: 1 DIF: Cognitive Level: Remembering

3. Which gland produces the associated hormones that are found in high levels in a female fetus?
 - a. Posterior pituitary excretes gonadotropin-releasing hormone (GnRH) and luteinizing hormone (LH).
 - b. Hypothalamus excretes luteinizing hormone (LH) and gonadotropin-releasing hormone (GnRH).
 - c. Anterior pituitary produces follicle-stimulating hormone (FSH) and luteinizing hormone (LH).
 - d. Hypothalamus excretes gonadotropin-releasing hormone (GnRH) and follicle-stimulating hormone (FSH).

ANS: C

In the female fetus, the anterior pituitary produces and excretes high levels of two gonadotropins—FSH and LH.

PTS: 1 DIF: Cognitive Level: Remembering

4. A mother reports that her young teens have voracious appetites. The healthcare professional would explain that which hormone is linked to an increase in appetite during puberty?
- Inhibin
 - Leptin
 - Activin
 - Follistatin

ANS: B

The healthcare professional would explain that sensitivity to *leptin*, which regulates appetite and energy metabolism, increases during puberty. Inhibin inhibits FSH production. Activin stimulates the secretion of FSH. Follistatin inhibits activin and stimulates inhibin activity.

PTS: 1 DIF: Cognitive Level: Understanding

5. The Skene glands are located on either side of which structure?
- Introitus
 - Urinary meatus
 - Clitoris
 - Vestibule

ANS: B

The ducts of the Skene glands are located on either side of the urinary meatus.

PTS: 1 DIF: Cognitive Level: Remembering

6. What is the function of the mucus secreted by the Bartholin glands?
- Enhancement of the motility of sperm
 - Lubrication of the urinary meatus and vestibule
 - Maintenance of an acid-base balance to discourage infection
 - Enhancement of the size of the penis during intercourse

ANS: A

In response to sexual stimulation, the Bartholin glands secrete mucus that serves to lubricate the inner labial surfaces, as well as to enhance the viability and motility of sperm. Skene glands lubricate the urinary meatus and vestibule. Maintaining acid–base balance is a function of the vagina to discourage the growth of pathogenic organisms. Stimulation of penile mechanoreceptors assists in enlargement of the penis in erections.

PTS: 1 DIF: Cognitive Level: Remembering

7. Which change is a result of puberty and defends the vagina from infection?
- The pH stabilizes between 7 and 8.
 - A thin squamous epithelial lining develops.
 - Vaginal pH becomes more acidic.
 - Estrogen levels are low.

ANS: C

At puberty, the pH becomes more acidic (4 to 5) and the squamous epithelial lining thickens. These changes are maintained until menopause (cessation of menstruation), at which time the pH rises again to more alkaline levels and the epithelium thins out. Therefore protection from infection is greatest during the years when a woman is most likely to be sexually active. Estrogen does not play a role in infection protection.

PTS: 1 DIF: Cognitive Level: Remembering

8. What happens to the vagina's lining at puberty?
- It becomes thinner.
 - It becomes thicker.
 - It assumes a neutral pH.
 - It undergoes atrophy.

ANS: B

Before puberty, vaginal pH is approximately 7 (neutral) and the vaginal epithelium is thin. At puberty, the pH becomes more acidic (4 to 5) and the squamous epithelial lining thickens. Cell atrophy is not associated with puberty.

PTS: 1 DIF: Cognitive Level: Remembering

9. Which structure is lined with columnar epithelial cells?
- Perimetrium
 - Endocervical canal
 - Myometrium
 - Vagina

ANS: B

Of the available options, only the endocervical canal does not have an endometrial layer; rather, the layer is lined with columnar epithelial cells.

PTS: 1 DIF: Cognitive Level: Remembering

10. Where is the usual site of fertilization of an ovum?
- Trumpet end of the fallopian tubes
 - Fimbriae of the fallopian tubes
 - Ampulla of the fallopian tubes
 - Os of the fallopian tubes

ANS: C

The ampulla, or distal third, of the fallopian tube is the usual site of fertilization.

PTS: 1 DIF: Cognitive Level: Remembering

11. Where is the usual site of cervical dysplasia or cancer in situ?
- Squamous epithelium of the cervix meets the cuboidal epithelium of the vagina.
 - Columnar epithelium of the cervix meets the squamous epithelium of the uterus.
 - Squamous epithelium of the cervix meets the columnar epithelium of the uterus.
 - Columnar epithelium of the cervix meets the squamous epithelium of the vagina.

ANS: D

The point at which the columnar epithelium of the cervix meets the squamous epithelium of the vagina is called the *transformation zone* or the *squamous-columnar junction*. The transformation zone is especially susceptible to the oncogenic human papillomavirus (HPV), which leads to cervical dysplasia and, ultimately, cervical cancer; these are the cells sampled during a Papanicolaou (Pap) test.

PTS: 1 DIF: Cognitive Level: Remembering

12. Having ejected a mature ovum, what does the ovarian follicle develop into?
- Atretic follicle
 - Theca follicle
 - Corpus luteum
 - Functional scar

ANS: C

Having ejected a mature ovum, the ovarian follicle develops into the corpus luteum. The remaining follicles either fail to develop at all or degenerate without maturing completely and are known as atretic follicles. Theca cells produce androgens that migrate to granulosa cells. Scar tissue serves no reproductive purpose.

PTS: 1 DIF: Cognitive Level: Remembering

13. The mucosal secretions of the cervix secrete which immunoglobulin?
- IgA
 - IgE
 - IgG
 - IgM

ANS: A

Mucosal secretions from the cervix contain enzymes and antibodies—predominantly IgA.

PTS: 1 DIF: Cognitive Level: Remembering

14. A surge of which hormone causes the corpus luteum to produce progesterone?
- Follicle stimulating hormone
 - Luteinizing hormone
 - Gonadotropin-releasing hormone
 - Estrogen

ANS: B

Luteinizing hormone from the anterior pituitary stimulates the corpus luteum to secrete progesterone, the second major female sex hormone. Follicle stimulating hormone works with luteinizing hormone to stimulate the production of estrogen and progesterone by the ovary. Gonadotropin-releasing hormone controls the release of LH and FSH in the anterior pituitary.

PTS: 1 DIF: Cognitive Level: Remembering

15. What directly causes ovulation during the menstrual cycle?

- a. Gradual decrease in estrogen levels
- b. Sudden increase of LH
- c. Sharp rise in progesterone levels
- d. Gradual increase in estrogen levels

ANS: B

LH, along with estrogen, controls the menstrual cycle. A sudden surge of LH is the direct cause of ovulation. This surge occurs when estrogen levels are high. It is not related to progesterone.

PTS: 1

DIF: Cognitive Level: Remembering

16. Which anatomic structure secretes follicle stimulating hormone (FSH) and luteinizing hormone (LH)?
- a. Hypothalamus
 - b. Ovaries
 - c. Anterior pituitary
 - d. Adrenal cortex

ANS: C

The anterior pituitary is the gland that secretes FSH and LH.

PTS: 1

DIF: Cognitive Level: Remembering

17. A woman attempting to conceive tells the healthcare professional that she and her partner have intercourse when her basal body temperature (BBT) is around 37°C (98°F) without getting pregnant. What information does the professional give the woman?
- a. Maybe you need a fertility workup.
 - b. That's a normal temperature, but during ovulation BBT decreases.
 - c. Temperature alone is not the most accurate way to predict ovulation.
 - d. BBT rises consistently above 37.8°C (100°F) with ovulation.

ANS: C

BBT is not the best predictor of ovulation alone; changes in mucus also occur. This woman does not need a fertility workup but rather needs to adjust the timing of intercourse. After the LH surge, the BBT rises 0.2°C to 0.5°C (0.4°F to 1°F).

PTS: 1

DIF: Cognitive Level: Understanding

18. What structure in the male lies posterior to the urinary bladder?
- a. Seminal vesicles
 - b. Prostate glands
 - c. Cowper glands
 - d. Parabladder glands

ANS: A

The seminal vesicles are a pair of glands, each measuring approximately 4 to 6 cm long, which lie behind the urinary bladder and in front of the rectum. None of the other structures lie in this location.

PTS: 1 DIF: Cognitive Level: Remembering

19. When do penile erections begin?

- a. Before birth
- b. Shortly after birth
- c. Shortly before puberty
- d. After puberty

ANS: A

Erections begin in utero and continue throughout life, but ejaculation does not occur until sperm production begins at puberty.

PTS: 1 DIF: Cognitive Level: Remembering

20. *What does the student learn* regarding the major difference between male and female sex hormone production?

- a. Luteinizing hormone has no apparent action in a man.
- b. In a man, sex hormone production is relatively constant.
- c. Estradiol is not produced in a man.
- d. In a man, gonadotropin-releasing hormone does not cause the release of follicle stimulating hormone.

ANS: B

In men, sex hormone production is relatively constant with some diurnal variation.

PTS: 1 DIF: Cognitive Level: Remembering

21. Where in the male body does spermatogenesis occur?

- a. Epididymis
- b. Rete testis
- c. Seminiferous tubules
- d. Vas deferens

ANS: C

Spermatogenesis takes place in the seminiferous tubules of the testes. The epididymis has structural and physiologic functions. Its structural function is to conduct sperm from the efferent tubules to the vas deferens, whereas physiologic functions include sperm maturation, mobility, and fertility. The rete testis is the central portion of the testis. The vas deferens propels sperm toward the urethra.

PTS: 1 DIF: Cognitive Level: Remembering

22. A healthcare professional is discussing breast feeding with a pregnant woman. Which beneficial substance does the professional tell the mother is found in breast milk?

- a. IgA
- b. IgE
- c. IgG
- d. IgM

ANS: A

Not only does breast milk composition change over time to meet the changing digestive capabilities and nutritional requirements of the infant, but it also contains immune cells, specific immunoglobulins, especially IgA, and nonspecific antimicrobial factors, such as lysozymes and lactoferrin, that protect the infant against infection, allergies, and asthma.

PTS: 1

DIF: Cognitive Level: Understanding

23. Which hormone promotes the development of the lobular ducts in the breasts?
- Progesterone
 - Prolactin
 - Oxytocin
 - Estrogen

ANS: D

Estrogen promotes the development of the lobular ducts. Progesterone stimulates development of cells lining the acini. Oxytocin controls let-down of milk from the acini cells. Prolactin leads to milk production.

PTS: 1

DIF: Cognitive Level: Remembering

24. What causes the vasomotor flushes (hot flashes) that are associated with declining ovarian function with age?
- Decreased estrogen levels
 - Absence of estrogen
 - Increased estrogen levels
 - Rapid changes in estrogen levels

ANS: D

A rapid change in estrogen levels (withdrawal or increase), rather than low estrogen, absence, or simply decreased levels, induces hot flashes.

PTS: 1

DIF: Cognitive Level: Remembering

25. When does the male body begin to produce sperm?
- Before birth
 - Shortly after birth
 - At puberty
 - When erection is possible

ANS: C

Sperm production begins at puberty.

PTS: 1

DIF: Cognitive Level: Remembering

26. The human zygote has a total of how many chromosomes?
- 23
 - 25
 - 46

d. 50

ANS: C

A 23-chromosome female gamete, the ovum, and a 23-chromosome male gamete, the spermatozoon (sperm cell), unite to form a 46-chromosome zygote that is capable of developing into a new individual.

PTS: 1

DIF: Cognitive Level: Remembering

27. Which hormone promotes the development of testosterone in both males and females?

- a. Progesterone
- b. Prolactin
- c. Oxytocin
- d. Estrogen

ANS: B

Prolactin, a polypeptide synthesized and secreted from the pituitary, helps maintain biosynthesis of testosterone in both males and females.

PTS: 1

DIF: Cognitive Level: Remembering

28. Which hormone relaxes the myometrium and prevents lactation until the fetus is born?

- a. Gonadotropin-releasing hormone (GnRH)
- b. Follicle-stimulating hormone (FSH)
- c. Progesterone
- d. Estrogen

ANS: C

Progesterone is sometimes called the *hormone of pregnancy*. Its effects in pregnancy include (1) maintenance of the thickened endometrium; (2) relaxation of smooth muscle in the myometrium, which prevents premature contractions and helps the uterus expand; (3) thickening of the myometrium, which prepares it for the muscular work of labor; (4) prevention of lactation until the fetus is born; and (5) prevention of additional maturation of ova by way of suppressing FSH and LH, thereby stopping the menstrual cycle.

PTS: 1

DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. Estrogen has many biological effects on the female body including what? (*Select all that apply.*)

- a. Maturation of reproductive organs
- b. Differentiating female physical characteristics
- c. Postpuberty closure of short bones
- d. Regulation of the menstrual cycle
- e. Endometrial regeneration after menstruation

ANS: A, B, D, E

Estrogen has numerous biologic effects, many of which involve interactions with other hormones. Estrogen is needed for the maturation of the reproductive organs, development of secondary sex characteristics (differentiating male and female physical characteristics that are not directly related to reproduction), closure of long bones after the pubertal growth spurt, regulation of the menstrual cycle, and endometrial regeneration after menstruation.

PTS: 1 DIF: Cognitive Level: Remembering

2. Which statements are *true* regarding the female menstrual cycle? (*Select all that apply.*)
- a. Initial cycles may dramatically vary in length.
 - b. By adulthood, the commonly accepted cycle average is 28 (27 to 30) days.
 - c. The length of a cycle varies among women.
 - d. Up to 10 years before menopause, the intervals of the menstrual cycle begin to lengthen.
 - e. Menopause is achieved when a woman is without a period for 2 years.

ANS: A, B, C, D

At first, cycles are anovulatory and may vary in length from 10 to 60 days or longer. As adolescence proceeds into adulthood, regular patterns of menstruation and ovulation are established at intervals ranging from 25 to 35 days. The length of the menstrual cycle varies considerably among women. The commonly accepted cycle average is 28 (27 to 30) days, with rhythmic intervals of 21 to 35 days considered normal. About 5 to 10 years before menopause, approximately 90% of women note mild to extreme variability in frequency and quality of menstrual flow. *Menopause* is defined as the cessation of menstrual flow for 1 year.

PTS: 1 DIF: Cognitive Level: Remembering

3. Testosterone is believed to have a role in what? (*Select all that apply.*)
- a. Decreased hemoglobin and hematocrit
 - b. Libido levels
 - c. Acne development
 - d. Altered cholesterol metabolism
 - e. Thinning of the larynx

ANS: B, C, D

Testosterone is associated with increases in hemoglobin and hematocrit, libido levels, acne development, and altered cholesterol metabolism. It stimulates the growth of the larynx's cartilage, giving men a deeper voice compared to women.

PTS: 1 DIF: Cognitive Level: Remembering

4. What are normal characteristics of aging of the male reproductive system? (*Select all that apply.*)
- a. Reduced sperm count
 - b. Slower, less forceful ejaculations
 - c. Testicular atrophy and softening
 - d. Longer time to achieve full erection
 - e. Decreased levels of testosterone

ANS: B, C, D, E

The described effects on ejaculation, testes, erection, and testosterone are normal characteristics of male aging. Sperm count remains normal with age, although the semen tends to contain more defective and nonmotile sperm.

PTS: 1

DIF: Cognitive Level: Remembering

Chapter 25: Alterations of the Female Reproductive System

MULTIPLE CHOICE

1. In the majority of children experiencing delayed puberty, what is the problem caused by?
 - a. Disruption in the hypothalamus
 - b. Disruption of the pituitary
 - c. Deficit in estrogen or testosterone
 - d. Physiologic delays in maturation

ANS: D

In 95% of children with delayed puberty, the delay is physiologic; that is, hormonal levels are normal and the hypothalamic-pituitary-gonadal (HPG) axis is intact, but maturation is happening slowly.

PTS: 1 DIF: Cognitive Level: Remembering

2. What is the first sign of puberty in girls?
 - a. Breast enlargement
 - b. Growth of pubic hair
 - c. Menstruation
 - d. Vaginal discharge

ANS: A

The first sign of puberty in girls is usually thelarche or breast development. Growth of pubic hair, menstruation, and vaginal discharge are not the usual first sign of puberty in girls.

PTS: 1 DIF: Cognitive Level: Remembering

3. Which type of precocious puberty causes the child to develop some secondary sex characteristics of the opposite sex?
 - a. Mixed
 - b. Partial
 - c. Isosexual
 - d. Central

ANS: A

Mixed precocious puberty, which is virilization of a girl or feminization of a boy, causes the child to develop some secondary sex characteristics of the opposite sex. Partial precocious puberty is the partial early development of appropriate secondary sex characteristics alone or in combination. Central precocious puberty is GnRH dependent and occurs when the HPG axis is working normally but prematurely. Central precocious puberty results from failure of central inhibition of the GnRH pulse generator (the gonadostat), often because of CNS abnormality. "Isosexual" is not a description of a type of precocious puberty.

PTS: 1 DIF: Cognitive Level: Remembering

4. A person has been diagnosed with primary dysmenorrhea and wants to know why ibuprofen is a good choice for pain control. What response by the health care professional is *best*?
- "It inhibits the release of leukotrienes in your system."
 - "It reduces the production of prostaglandins in your body."
 - "It enhances the effects of bradykinin release."
 - "It contributes to a higher C reactive protein in your blood."

ANS: B

Primary dysmenorrhea is painful menstruation associated with the release of prostaglandins in ovulatory cycles. Nonsteroidal antiinflammatory medications like ibuprofen reduce the activity of the COX enzyme, which in turn inhibits prostaglandin production. Leukotrienes are part of the inflammatory process. Bradykinin is a vasodilator and also has a role in pain, but is not related to dysmenorrhea. C reactive protein is part of the innate immune system.

PTS: 1

DIF: Cognitive Level: Understanding

5. A woman has been diagnosed with compartment II primary amenorrhea. The healthcare professional helps prepare the woman for what type of diagnostic testing?
- Genetic testing
 - CT scan of the anterior pituitary
 - Blood work for hypothalamic function
 - Vaginal speculum exam

ANS: A

Compartment II disorders involve the ovary and are often linked to genetic disorders. The professional would help prepare the woman for genetic testing. Compartment III disorders result from dysfunction of the anterior pituitary gland. Hypothalamic disorders often cause compartment IV primary amenorrhea. *Compartment I disorders* are anatomic defects of the outflow tract associated with primary amenorrhea and include congenital absence of the vagina.

PTS: 1

DIF: Cognitive Level: Remembering

6. Which condition is considered a clinical cause of amenorrhea?
- Disorder in the endometrium
 - Obstruction of the fallopian tubes
 - Lack of physical exercise
 - Failure to ovulate

ANS: D

Depressed ovarian hormone levels, which are associated with a variety of clinical disorders, also cause amenorrhea by preventing ovulation. Disorders of the endometrium, obstruction of fallopian tubes, and sedentary lifestyle do not cause amenorrhea.

PTS: 1

DIF: Cognitive Level: Remembering

7. Clinical manifestations that include irregular or heavy bleeding, the passage of large clots, and the depletion of iron stores support which diagnosis?
- Premenstrual syndrome

- b. Abnormal uterine bleeding
- c. Polycystic ovary syndrome
- d. Primary dysmenorrhea

ANS: B

Unpredictable and variable bleeding, in terms of amount and duration, characterize abnormal uterine bleeding. Especially during perimenopause, dysfunctional bleeding also may involve flooding and the passage of large clots, which often indicate excessive blood loss. Excessive bleeding can lead to iron-deficiency anemia. Premenstrual syndrome involves distressing physical, emotional, or behavioral symptoms. Over 300 symptoms have been ascribed to this condition, but heavy bleeding, passing clots, and iron deficiency anemia are not characteristics of PMS. Polycystic ovary syndrome can include dysfunctional bleeding or amenorrhea. Primary dysmenorrhea is lack of the menstrual period, so heavy bleeding would not be a manifestation of this disorder.

PTS: 1

DIF: Cognitive Level: Remembering

8. A woman has been diagnosed with polycystic ovary syndrome but is confused because her pelvic ultrasound (US) was read as “normal” and did not show cysts. What response by the health care professional is most appropriate?
- a. “We will schedule another US in 3 months to check again.”
 - b. “The cysts may be too small to see right now.”
 - c. “Maybe that diagnosis was incorrect; let’s schedule more testing.”
 - d. “You do not need to have cysts on your ovaries to have this condition.”

ANS: D

The three criteria used to diagnose PCOS are androgen excess, chronic anovulation, and sonographic evidence of polycystic ovaries. Two of the three criteria must be present for the diagnosis, so the woman’s ovaries may or may not have cysts and she can still be diagnosed with this condition. If the woman meets the other 2 criteria, there is no need for a follow-up US or testing for other diagnoses.

PTS: 1

DIF: Cognitive Level: Understanding

9. A woman reports bloating, anxiety, irritability, and feeling depressed before each of her monthly menstrual cycles. What medication classification does the healthcare professional educate this woman on?
- a. NSAIDs
 - b. Estrogen
 - c. SSRIs
 - d. Progesterone

ANS: C

This woman is describing premenstrual syndrome (PMS). Selective serotonin reuptake inhibitors (SSRI) (an antidepressant) relieve symptoms in approximately 60% to 90% of women and may be continually administered or only prescribed during the premenstrual period. Oral contraceptive pills that contain a combination of estrogen and progesterone also can be continuously used for up to 3 months to decrease the frequency of menstrual periods, PMS, and premenstrual dysphoric disorder (PMDD). Nonsteroidal antiinflammatory drugs (NSAIDs) and pure estrogen or progesterone preparations would not be administered continually.

PTS: 1 DIF: Cognitive Level: Applying

10. A student is learning about pelvic inflammatory disease (PID). What information does the student clarify with a study partner as being correct?
- An episode of mild PID can decrease the possibility of a successful pregnancy by 80%.
 - Such an inflammation results in permanent changes to the ciliated epithelium of the fallopian tubes.
 - PID has not been associated with an increased risk of an ectopic pregnancy.
 - Contracting this infection increases the risk of cervical cancer.

ANS: B

PID infection results in permanent changes to the ciliated epithelium of the fallopian or uterine tubes. A recent study has found that one episode of mild, subclinical PID resulted in a 40% decrease in later pregnancy rates, and multiple episodes of PID further increase the risk of infertility. Scarring caused by PID greatly increases the risk of a later ectopic pregnancy by up to 10-fold. Scarring and adhesions also can result in chronic pelvic pain and, potentially, an increased risk of later uterine (not cervical) cancer.

PTS: 1 DIF: Cognitive Level: Remembering

11. A healthcare professional reads in a woman's chart that she has a grade 2 uterine prolapse. What assessment finding does the professional correlate with this condition?
- Uterus halfway to the hymen
 - Uterus reaches the hymen
 - Uterus protruding from the vagina
 - Uterus and rectum protruding

ANS: B

A grade 2 prolapse reaches the hymen.

PTS: 1 DIF: Cognitive Level: Remembering

12. Which term is used to identify the descent of the posterior bladder and trigone into the vaginal canal?
- Rectocele
 - Vaginocele
 - Cystocele
 - Enterocele

ANS: C

Cystocele is the only term used to identify the descent of a portion of the posterior bladder wall and trigone into the vaginal canal. A rectocele is the bulging of the rectum and posterior vaginal wall into the vaginal canal. "Vaginocele" is not a term used to describe relaxation of pelvic structure support. An enterocele is the herniation of the peritoneal sac between the vagina and rectum.

PTS: 1 DIF: Cognitive Level: Remembering

13. What type of cyst develops when an ovarian follicle is stimulated but no dominant follicle develops and completes the maturity process?
- Follicular
 - Corpus luteum
 - Corpus albicans
 - Benign ovarian

ANS: D

Benign cysts of the ovary are produced when a follicle or a number of follicles are stimulated but no dominant follicle develops and completes the maturity process. Two types of benign ovarian cysts are corpus luteum cysts and follicular cysts. The corpus albicans is what is left of the corpus luteum after being broken down by macrophages.

PTS: 1 DIF: Cognitive Level: Remembering

14. Which term is used to identify benign uterine tumors that develop from smooth muscle cells in the myometrium and are commonly called *uterine fibroids*?
- Endometrial polyps
 - Myometrial polyps
 - Leiomyomas
 - Myometriomas

ANS: C

Leiomyomas, commonly called *myomas* or *uterine fibroids*, are benign smooth muscle tumors in the myometrium. A polyp is a mass covered by endometrial tissue.

PTS: 1 DIF: Cognitive Level: Remembering

15. What theory is used to describe the cause of endometriosis?
- Obstruction within the fallopian tubes prevents the endometrial tissue from adhering to the lining of the uterus.
 - Endometrial tissue passes through the fallopian tubes and into the peritoneal cavity and remains responsive to hormones.
 - Inflammation of the endometrial tissue develops after recurrent sexually transmitted diseases.
 - Endometrial tissue lies dormant in the uterus until the ovaries produce sufficient hormone to stimulate its growth.

ANS: B

It has been proposed that endometriosis is caused by the implantation of endometrial cells during retrograde menstruation, during which menstrual fluids move through the fallopian tubes and empty into the pelvic cavity. Similar to normal endometrial tissue, the ectopic (out of place) endometrium responds to the hormonal fluctuations of the menstrual cycle.

PTS: 1 DIF: Cognitive Level: Remembering

16. In order to help prevent a preadolescent girl from developing later cervical cancer, which virus does the healthcare professional recommend vaccination against to the parent?
- Human papillomavirus (HPV)
 - Epstein-Barr virus (EBV)
 - Herpes simplex II virus (HSV)
 - Cytomegalovirus (CMV)

ANS: A

Infection with high-risk (oncogenic) types of HPV (predominantly 16 and 18) is a necessary precursor to the development of precancerous dysplasia of the cervix that leads to invasive cancer. EBV, HSV, and CMV are not precursors to CIN and cervical cancer.

PTS: 1 DIF: Cognitive Level: Remembering

17. A woman has been diagnosed with cervical carcinoma in situ and asks the healthcare professional to explain it to her. What description by the professional is *best*?
- It involves the full epithelial thickness of the cervix.
 - It involves abnormal cells growing on the cervix.
 - It is when cancer has spread to the peritoneum.
 - It is when only the top layer of the cervix is affected.

ANS: A

The progressive neoplastic changes of cervical cells are classified on a continuum from cervical intraepithelial neoplasia (dysplasia) to cervical carcinoma in situ (full epithelial thickness of the cervix is involved), which is generally a precursor of invasive carcinoma of the cervix to invasive carcinoma of the cervical tissue. Dysplasia is the condition of having abnormal cells that have replaced normal ones and could become cancerous. Invasive cancer is one that has spread. In CIN grade, only the top layer of the endothelium is affected.

PTS: 1 DIF: Cognitive Level: Remembering

18. Which factor increases the risk for ovarian cancer after the age of 40 years?
- Never having children
 - Oral contraceptive use
 - Multiple pregnancies
 - Prolonged lactation

ANS: A

Ovarian cancer in women older than 40 years of age is associated with prolonged ovulation over the lifetime due to circumstances such as early menarche, late menopause, and nulliparity. Use of fertility drugs, oral contraceptives, and prolonged lactation would not lead to prolonged exposure to ovulation over a lifetime.

PTS: 1 DIF: Cognitive Level: Remembering

19. Infertility is defined as the inability to conceive after how many months of unprotected intercourse with the same partner?
- 6
 - 12
 - 18
 - 24

ANS: B

Infertility is defined as the inability to conceive after 1 year of unprotected intercourse with the same partner. Although some experts say that women over 35 years of age should be evaluated after not conceiving after 6 months; this is not the standard definition.

PTS: 1 DIF: Cognitive Level: Remembering

20. A woman has been diagnosed with galactorrhea. Which condition would the healthcare provider be *least* likely to assess the woman for?
- Proliferation of the lactiferous ducts of the breast
 - Hypothyroidism, resulting from a decrease in thyroid-releasing hormone
 - Excess prolactin secretion from the pituitary
 - Drugs such as phenothiazines

ANS: A

Galactorrhea is a consequence of physiologic changes in the body and is not a primary breast disorder. The most common cause of galactorrhea is nonpuerperal hyperprolactinemia, or excessive amounts of prolactin. A variety of exogenous agents (such as drugs) and disorders can trigger one of these three mechanisms, thereby causing hyperprolactinemia. Hypothyroidism causes increased secretion of hypothalamic thyroid-releasing hormone, which stimulates the release of prolactin from the pituitary. Other causes include some drugs such as phenothiazines and some physical causes. The proliferation of lactiferous breast ducts is not associated with galactorrhea.

PTS: 1 DIF: Cognitive Level: Understanding

21. A woman's chart reveals she has superficial breast cysts. What assessment finding does the healthcare professional correlate with this condition?
- Hard, painful lump
 - Reddened skin surrounding the lump
 - Squishy feeling and easily palpated
 - Dimpling on the surface of the breast

ANS: C

Cysts (fluid-filled sacs) are a specific type of lump that commonly occurs in women in their 30s, 40s, and early 50s. Cysts feel squishy when they occur close to the surface of the breast; however, when deeply embedded, cysts can feel hard. A reddened area surrounding a lump might signify an infection. Dimpling on the surface of the breast may indicate cancer.

PTS: 1 DIF: Cognitive Level: Remembering

22. A woman has been diagnosed with a simple fibroadenoma. What treatment does the healthcare provider educate the woman about?
- A repeat biopsy in 6 months
 - More frequent mammograms
 - Nothing; no treatment is needed.
 - Rapid surgical excision and chemotherapy

ANS: C

Simple fibroadenomas are benign, and if asymptomatic, do not require treatment. A complex fibroadenoma with surrounding proliferative changes needs further treatment. If the woman has a family history of breast cancer, she may wish to have it removed to decrease worry.

PTS: 1 DIF: Cognitive Level: Understanding

23. What are the majority of the small percentage of ovarian cancers that are associated with a known pattern of inheritance associated with?
- Mutation of the BRCA1 gene*
 - Mutations of the *BRCA2* gene
 - Hereditary nonpolyposis colorectal cancer (HNPCC) syndrome
 - Low progesterone levels

ANS: A

The majority (approximately 90%) of ovarian cancers are sporadic and not associated with a known pattern of inheritance. Of the 5% to 10% that have a familial component, the majority are associated with the breast cancer susceptibility gene 1 (*BRCA1*) and a smaller number with mutations of the *BRCA2* or mismatched repair genes (HNPCC syndrome). Low progesterone levels are not associated with ovarian cancers.

PTS: 1 DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. A woman has a pelvic organ prolapse. What treatments does the healthcare professional teach the woman about? (*Select all that apply.*)
- Pessary
 - Kegel exercises
 - Estrogen therapy
 - Surgical repair
 - Bearing down exercises

ANS: A, B, C, D

A common first-line treatment is a *pessary*, which is a removable mechanical device that holds the uterus in position. The pelvic fascia may be strengthened through Kegel exercises (repetitive isometric tightening and relaxing of the pubococcygeal muscles) or by estrogen therapy in menopausal women. Maintaining a healthy body mass index, preventing constipation, and treating chronic cough may help as well. Surgical repair with or without a hysterectomy is the treatment of last resort. Bearing down would likely exacerbate the problem.

PTS: 1 DIF: Cognitive Level: Remembering

2. The size of benign uterine tumors, such as leiomyomas, is thought to be caused by the influence of which hormones? (*Select all that apply.*)
- a. Progesterone
 - b. Estrogen
 - c. Luteinizing hormone
 - d. Gonadotropin-stimulating hormone
 - e. Growth factors

ANS: A, B, E

The cause of uterine leiomyomas is unknown, although their size appears to be related to estrogen, progesterone, growth factors, angiogenesis, and apoptosis. Luteinizing hormone and gonadotropin-stimulating hormone have no suspected role in leiomyomas.

PTS: 1 DIF: Cognitive Level: Remembering

3. What are the common clinical manifestations of endometriosis? (*Select all that apply.*)
- a. Back and flank pain
 - b. Infertility
 - c. Dysuria
 - d. Amenorrhea
 - e. Dysmenorrhea

ANS: B, E

Common clinical manifestations primarily include infertility, dysmenorrhea, dyschezia (pain on defecation), and dyspareunia (pain on intercourse).

PTS: 1 DIF: Cognitive Level: Remembering

4. A woman has been diagnosed with compartment IV primary amenorrhea. What assessments would the healthcare professional perform as priorities? (*Select all that apply.*)
- a. Weight and body mass index
 - b. Signs of systemic infection
 - c. Stress self-assessment questionnaire
 - d. Genetic family history
 - e. Presence of secondary sex characteristics

ANS: A, B, C, E

Compartment IV primary amenorrhea is due to CNS dysfunction, specifically of the hypothalamus. The hypothalamus is unable to synthesize GnRH, so the pituitary fails to secrete LH and FSH. Therefore, the ovary does not receive the hormonal signals required to stimulate estrogen production, and ovulation and menstruation do not occur. Because the ovarian hormones are absent, estrogen-dependent sex characteristics do not develop. Other possible causes of this condition include starvation or malnutrition, infections, and stress. The healthcare professional would assess for these contributing factors. Genetic testing/screening would be more appropriate for compartment II primary amenorrhea, which involves the ovaries and is often linked to genetic disorders.

PTS: 1

DIF: Cognitive Level: Applying

Chapter 26: Alterations of the Male Reproductive System

MULTIPLE CHOICE

1. In the 95% of boys with delayed puberty, the problem is caused by which condition?
 - a. Disruption in the hypothalamus
 - b. Disruption of the pituitary
 - c. Deficit in estrogen or testosterone
 - d. Physiologic hormonal delays

ANS: D

In 95% of cases, delayed puberty is a physiologic delay; that is, hormonal levels are normal and the hypothalamic-pituitary-gonadal (HPG) axis is intact, but maturation is happening slowly. Hypothalamic and pituitary problems and hormone deficits account for the other 5% of cases.

PTS: 1 DIF: Cognitive Level: Remembering

2. What is the first sign of puberty in boys?
 - a. Thickening of the scrotal skin
 - b. Growth of pubic hair
 - c. Enlargement of the testes
 - d. Change in voice

ANS: C

The first sign of puberty in boys is an enlargement of the testes and a thinning of the scrotal skin. Growth of pubic hair and voice changes come later.

PTS: 1 DIF: Cognitive Level: Remembering

3. A student reads in a chart that a child has been diagnosed with mixed precocious puberty and asks for an explanation. What explanation by the healthcare professional is *most* accurate?
 - a. When a child develops some secondary sex characteristics of the opposite sex
 - b. When a child does not develop any identifiable external sex organs
 - c. When early puberty occurs due to multiple, integrated causative effects
 - d. When early puberty has signs of physical and hormonal abnormalities

ANS: A

Mixed precocious puberty (i.e., virilization of a girl or feminization of a boy) causes the child to develop some secondary sex characteristics of the opposite sex. It is not the lack of identifiable external sex organs, the effect of many causative factors mixed together, or a combination of physical and hormonal abnormalities specifically. The latter statement is accurate to a point but is too vague to be the best answer.

PTS: 1 DIF: Cognitive Level: Understanding

4. A healthcare professional sees a patient in the clinic who reports that his foreskin cannot be retracted back over the glans penis. What term does the professional use to document this condition?
- Paraphimosis
 - Priapism
 - Prephimosis
 - Phimosis

ANS: D

Phimosis is the term used to identify the condition in which the foreskin cannot be retracted back over the glans. Paraphimosis is the opposite condition where the foreskin is retracted and cannot be pulled back over the glans. Prephimosis is not a term used in the text. The healthcare professional would document this patient's condition as phimosis.

PTS: 1

DIF: Cognitive Level: Remembering

5. A student in the medical clinic is reviewing a patient's medical record and sees the diagnosis of Peyronie's disease and asks the healthcare professional for an explanation of this disorder. What statement by the professional is *most* accurate?
- When the man's foreskin is retracted and cannot go back over the glans
 - When the man's foreskin cannot be retracted over the glans penis
 - A very painful condition of prolonged erection seen in some diseases
 - A fibrotic condition that leads to curvature of the penis and sexual dysfunction

ANS: D

Peyronie's disease (bent nail syndrome) is a fibrotic condition of the tunica albuginea of the penis, resulting in varying degrees of curvature and sexual dysfunction. Although the exact cause is unknown, a local vasculitis-like inflammatory reaction occurs and decreased tissue oxygenation results in fibrosis and calcification. A retracted foreskin that will not reduce back over the glans is known as phimosis. Paraphimosis is the opposite condition where the foreskin is retracted and cannot be pulled back over the glans. Priapism is the term for the painful, prolonged erection.

PTS: 1

DIF: Cognitive Level: Understanding

6. A man has balanitis. What action by the healthcare professional is *most* appropriate?
- Educate the man on the side effects of chemotherapy.
 - Perform a finger stick for a blood glucose reading.
 - Administer pain medication before retracting the foreskin.
 - Prepare the man for a needle aspiration of the corpus.

ANS: B

Balanitis is an inflammation of the glans penis that is usually associated with poor hygiene and most often in men with poorly controlled diabetes mellitus. The health care professional should test the man's blood glucose. Chemotherapy is not used to treat this condition. There is no difficulty retracting the foreskin so pain medication is not needed. Needle aspiration is one treatment for priapism.

PTS: 1

DIF: Cognitive Level: Understanding

7. A 7-year-old child has cryptorchidism. What action by the healthcare professional is most appropriate?
- Educate the child and parents on orchiectomy.
 - Instruct the parents to give the child all the antibiotics.
 - Describe skin precautions used during radiation therapy.
 - Describe the correct administration of GnRH.

ANS: D

Cryptorchidism is a condition of testicular maldescent. Treatment often begins with administration of GnRH or human chorionic gonadotropin (hCG), hormones that may initiate descent. If medical treatment does not work the child may need to have the testis moved surgically (orchiopexy). In children over 10 years of age and adults, the testis is removed in an orchiectomy. Neither Antibiotics nor radiation therapy is needed.

PTS: 1

DIF: Cognitive Level: Applying

8. What is the most common infectious cause of orchitis in postpubertal boys?
- Herpes
 - Escherichia coli*
 - Mumps
 - Cytomegalovirus

ANS: C

Of the options available, mumps is the most common infectious cause of orchitis and usually affects postpubertal boys.

PTS: 1

DIF: Cognitive Level: Remembering

9. The risk of which cancer is greater if the man has a history of cryptorchidism?
- Penile
 - Testicular
 - Prostate
 - Epididymal

ANS: B

The risk of testicular cancer is 35 to 50 times greater in men with cryptorchidism or in those with a history of cryptorchidism than it is for the general male population. Cryptorchidism does not increase the risk of penile, prostate, or epididymal cancer.

PTS: 1

DIF: Cognitive Level: Remembering

10. What are the clinical manifestations of testicular cancer?
- Firm, nontender testicular mass
 - Painful, mobile, firm testicular mass
 - Painful fluid-filled testicular mass
 - Soft, nontender testicular mass

ANS: A

A firm, painless testicular enlargement is commonly identified as the first sign of testicular cancer.

PTS: 1 DIF: Cognitive Level: Remembering

11. How does the epididymis become infected?
- The pathogenic microorganisms ascend the vasa deferentia from an already infected urethra or bladder.
 - The pathogenic microorganisms are attached to sperm that travel through the genital tract.
 - The pathogenic microorganisms from the tunica vaginalis are transported to the epididymis.
 - The pathogenic microorganisms from the prostate fluid ascend to the epididymis.

ANS: A

The pathogenic microorganisms usually reach the epididymis by ascending the vasa deferentia from an already infected urethra or bladder.

PTS: 1 DIF: Cognitive Level: Remembering

12. A healthcare professional is educating a community men's group on symptoms of benign prostatic hyperplasia (BPH). The professional relates that most symptoms are a result of which pathophysiologic condition?
- Infection of the prostate
 - Obstruction of the urethra
 - Ischemia of the urethra
 - Compression of the urethra

ANS: D

BPH becomes problematic as prostatic tissue compresses the urethra, where it passes through the prostate. BPH is not related to infection, obstruction, or ischemia.

PTS: 1 DIF: Cognitive Level: Understanding

13. A man reports to the healthcare professional that he had a sudden onset of malaise, low back pain, and perineal pain with high fever and chills, dysuria, nocturia, and urinary retention. What action by the healthcare professional is *most* appropriate?
- Assess the man's recent sexual history.
 - Recommend heat and acetaminophen for back pain.
 - Prepare the man for prostatic massage.
 - Assist the man in obtaining a urine sample.

ANS: D

Bacterial prostatitis can exhibit common manifestations that include a sudden onset of malaise, low back and perineal pain, high fever (up to 40°C [104°F]), and chills, as well as dysuria, inability to empty the bladder, nocturia, and urinary retention. Since it is most often associated with a urinary tract infection (UTI), the specific causative organism can usually be identified from a urinalysis. The professional should assist and educate the man on obtaining the appropriate specimen. While possible that prostatitis could be sexually transmitted, that is not as common as developing the infection secondary to a UTI. Heat and mild analgesics are helpful, but do nothing to identify the causative organism for appropriate treatment. A sample of fluid may be obtained for culture by prostatic massage, but this is very painful and would most likely not be done if other diagnostic tools are available.

PTS: 1 DIF: Cognitive Level: Applying

14. Priapism has been associated with the abuse of what substance?
- Marijuana
 - Alcohol
 - Cocaine
 - Heroin

ANS: C

Priapism has been associated with cocaine use due to local ischemia.

PTS: 1 DIF: Cognitive Level: Remembering

15. Which age group should be targeted for testicular cancer education and screening?
- 15 to 35 year olds
 - 20 to 45 year olds
 - 30 to 55 year olds
 - 45 to 70 year olds

ANS: A

Overall, testicular cancers are rare, yet they are the most common form of cancer in young men between the ages of 15 and 35 years.

PTS: 1 DIF: Cognitive Level: Remembering

16. What is the reason breast cancer in men has such a poor prognosis?
- Breast cancer is extremely aggressive in men.
 - Treatment is usually delayed as a result of late detection.
 - Chemotherapies are not as effective in men.
 - Breast tumors tend to be small and hard to isolate.

ANS: B

Breast cancer is relatively uncommon in men, but it has a poor prognosis because men tend to delay seeking treatment until the disease is advanced.

PTS: 1 DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. Which information about urethritis does the student learn? (*Select all that apply.*)
- a. A purulent drainage may be present.
 - b. A clear mucus-like discharge may be present.
 - c. Symptoms include urethral tingling and itching or burning on urination.
 - d. A 24-hour urine test is required to diagnose the disorder.
 - e. Treatment includes appropriate antibiotic therapy.

ANS: A, B, C, E

Symptoms of urethritis include urethral tingling and itching or a burning sensation on urination (dysuria), frequency, and urgency. The individual may note a purulent or clear mucus-like discharge from the urethra. Nucleic acid detection amplification tests allow easy detection of *Neisseria gonorrhoeae* and *Chlamydia trachomatis* in first-void urine. Treatment consists of appropriate antibiotic therapy for infectious urethritis and an avoidance of future chemical or mechanical irritation. A first-void urine is collected for diagnostic purposes.

PTS: 1

DIF: Cognitive Level: Remembering

2. A healthcare professional is educating a community men's group about prostate cancer. What information should the professional include in the presentation? (*Select all that apply.*)
- a. It ranks second to lung cancer as being most common among American men.
 - b. A familial history of prostate cancer is a risk factor.
 - c. Dietary habits seem to play a role in its development.
 - d. African-American men have an increased risk for its development.
 - e. Being over 65 years of age increases the risk for developing prostate cancer.

ANS: B, C, D, E

Prostate cancer is the most commonly diagnosed non-skin cancer in American men, and the incidence varies greatly worldwide. Possible causes include a genetic predisposition, environmental and dietary factors, inflammation, and alterations in levels of hormones (e.g., testosterone, dihydrotestosterone, estradiol) and growth factors. Incidence is greatest among northwestern European and North American men (particularly African Americans) older than 65 years of age.

PTS: 1

DIF: Cognitive Level: Understanding

Chapter 27: Sexually Transmitted Infections

MULTIPLE CHOICE

1. What unique factor causes adolescent girls to have a high risk for sexually transmitted infections (STIs)?
 - a. They are in an experimental phase and believe they are resistant to developing STIs.
 - b. The position of susceptible cells on the adolescent cervix is different than in older women.
 - c. The length of the vaginal canal is short in adolescents
 - d. In adolescent girls, the anus to the vaginal introitus is in close proximity.

ANS: B

Partly, perhaps, because of risk-taking behavior (unprotected intercourse or selection of high-risk partners), many adolescents have an increased risk for STI exposure and infection. The unique factor for adolescent women is that they have a physiologically increased susceptibility to infection because of the position of susceptible cells on the surface of the cervix. The remaining options are not considered legitimate risk factors for STIs.

PTS: 1

DIF: Cognitive Level: Remembering

2. How is gonorrhea transmitted from a pregnant woman to her fetus?
 - a. Unbound in the blood via the placenta
 - b. Attached to immunoglobulin G (IgG) via the placenta
 - c. By direct inoculation with the fetal scalp electrodes exposed to maternal body fluids
 - d. Predominately through infected cervical and secretions during the birth process

ANS: D

A pregnant woman can transmit gonorrhea to her fetus during the birth process. The infection passes from mother to child predominately through infected cervical and vaginal secretions. This vertical transmission is not associated with the causative organism being unbound in the blood, attached to IgG, or through direct inoculation.

PTS: 1

DIF: Cognitive Level: Remembering

3. A healthcare professional is learning about how gonococci ascend into a woman's uterus and fallopian tubes. Which statement is *inconsistent* about the factors that facilitate this ascent?
 - a. Ascent of gonococci is facilitated because the cervical plug disintegrates during menstruation.
 - b. Ascent of gonococci is facilitated because the vaginal pH decreases to 2 or 3.
 - c. Ascent of gonococci is facilitated because the uterine contractions may cause retrograde menstruation into the fallopian tubes.
 - d. Ascent of gonococci is facilitated because the bacteria may adhere to sperm and be transported to the fallopian tubes.

ANS: B

Several factors can facilitate the ascent of gonococci into the uterus and the fallopian tubes, where they cause pelvic inflammatory disease (PID). Among these factors are (1) disintegration of the cervical mucous plug and (2) a rise in vaginal pH greater than 4.5 during menstruation (not decreases to 2 or 3), and (3) uterine contractions that may cause retrograde menstruation. The bacteria can also adhere to sperm for transport.

PTS: 1

DIF: Cognitive Level: Remembering

4. In women, what is the usual site of original gonococcal infection?
- Endocervical canal
 - Vagina
 - Fallopian tube
 - Labia majora

ANS: A

In women, the endocervical canal (inner portion of the cervix) is the usual site of original gonococcal infection, although urethral colonization and infection of Skene or Bartholin glands also are common. The original infection does not normally start in the vagina, fallopian tubes, or labia.

PTS: 1

DIF: Cognitive Level: Remembering

5. A male comes to the health clinic and reports a recent exposure to gonorrhea. Where should the healthcare professional focus the physical exam on as the *priority*?
- Epididymis
 - Lymph nodes
 - Urethra
 - Prostate

ANS: C

Uncomplicated local infections are observed primarily as urethral infections in men. The healthcare professional would examine this area for signs of the infection as the priority.

PTS: 1

DIF: Cognitive Level: Remembering

6. Which laboratory test is considered adequate for an accurate and reliable diagnosis of gonococcal urethritis in a symptomatic man?
- Ligase chain reaction (LCR)
 - Gram-stain technique
 - Polymerase chain reaction (PCR)
 - DNA testing

ANS: B

Microscopic evaluation of Gram-stained slides of clinical specimens is deemed positive for *Neisseria gonorrhoeae* if gram-negative diplococci with the typical “kidney bean” morphologic appearance are found inside polymorphonuclear leukocytes. Such a finding is considered adequate for the diagnosis of gonococcal urethritis in a symptomatic man. Diagnosis of gonorrhea is not obtained through LCR, PCR, and DNA testing.

PTS: 1 DIF: Cognitive Level: Remembering

7. How does an established gonococcal infection usually express itself in newborns?
- Generalized skin rash 4 to 6 days after birth
 - Systemic infection with fever
 - Bilateral corneal ulceration
 - Yellow vaginal or penile discharge approximately 10 days after birth

ANS: C

Established infection causes bilateral corneal ulceration. Infected infants do not usually present with a generalized skin rash, febrile systemic illness, or discharge.

PTS: 1 DIF: Cognitive Level: Remembering

8. A healthcare professional wants to join a research team working on treatments for gonococci infections. What is the major concern regarding the treatment the professional will likely work on?
- Antibiotic resistance
 - Changes in virulence
 - Changes in pathogenicity
 - Mutations into different strains

ANS: A

N. gonorrhoeae has developed resistance to many antibiotics and has the real potential to become resistant to all current treatments. The most likely work a researcher in this area would concentrate on would concern this. Changes in virulence, pathogenicity, and strains are not the major concern in treating gonococci infections.

PTS: 1 DIF: Cognitive Level: Remembering

9. Which sexually transmitted infection frequently coexists with gonorrhea?
- Syphilis
 - Herpes simplex virus
 - Chlamydia
 - Chancroid

ANS: C

The coexistence of chlamydial infection with gonorrhea frequently occurs and has led to the recommendation that a person being treated for one of these STIs needs treatment for both.

PTS: 1 DIF: Cognitive Level: Remembering

10. During which stage of syphilis do bloodborne bacteria spread to all the major organ systems?

- a. Primary
- b. Secondary
- c. Latent
- d. Tertiary

ANS: B

Bloodborne bacteria spread to all major organ systems during only stage II, secondary syphilis. Primary syphilis is characterized by the development of a local lesion and migration of the bacteria via the lymph system. Latent syphilis is the period of time the person does not have clinical manifestations, but the infection remains active and is transmissible. Tertiary syphilis includes organ and tissue involvement and destruction.

PTS: 1 DIF: Cognitive Level: Remembering

11. In which stage of syphilis would the following clinical manifestations be found: destructive skin, bone and soft tissue lesions, aneurysms, heart failure, and neurosyphilis?
- a. Primary
 - b. Secondary
 - c. Latent
 - d. Tertiary

ANS: D

Stage IV, tertiary syphilis, is the only stage during which significant morbidity and mortality occur, including destructive skin, bone, and soft-tissue lesions. Primary syphilis is characterized by the development of a local lesion and migration of the bacteria via the lymph system. Secondary syphilis is a systemic disease with bacterial spread to other organs and tissues. Latent syphilis is the period of time the person does not have clinical manifestations, but the infection remains active and is transmissible.

PTS: 1 DIF: Cognitive Level: Remembering

12. Which organism is responsible for the development of syphilis?
- a. *Neisseria syphilis*
 - b. *Treponema pallidum*
 - c. *Haemophilus ducreyi*
 - d. *Chlamydia trachomatis*

ANS: B

T. pallidum is the only cause of syphilis.

PTS: 1 DIF: Cognitive Level: Remembering

13. Which is a characteristic lesion of secondary syphilis?
- a. Condylomata lata
 - b. Gummas
 - c. Chancroid
 - d. Donovan bodies

ANS: A

The only secondary syphilis lesion is the condylomata lata. Gummas appear in tertiary syphilis. Chancroid is a separate disease. Donovan bodies are found in Granuloma inguinale.

PTS: 1 DIF: Cognitive Level: Remembering

14. By which method is the organism that causes syphilis *best* identified?
- Acid-fast stain
 - Gram-stained slide
 - In vitro culture
 - Dark-field microscopy

ANS: D

Because *Treponema pallidum* cannot be cultured in vitro, early definitive diagnosis of primary or secondary syphilis depends on dark-field microscopy of a specimen taken from a chancre, regional lymph node, or other lesion. The remaining options are not relevant.

PTS: 1 DIF: Cognitive Level: Remembering

15. A patient reports small, vesicular lesions that last between 10 and 20 days. What treatment does the healthcare professional educate the patient about?
- Acyclovir (Zovirax)
 - Three injections of penicillin
 - One time dose of azithromycin
 - Test of cure

ANS: A

Small (1 to 2 mm), multiple, vesicular lesions located on the labia minora, fourchette, or penis are characteristics of genital herpes. These lesions usually last approximately 10 to 20 days. Treatment includes oral antiviral medication including acyclovir. Injections of penicillin are used for syphilis. Azithromycin is used for chancroid and chlamydia. A test of cure is inappropriate because herpes cannot be cured.

PTS: 1 DIF: Cognitive Level: Understanding

16. A healthcare professional had taught a pregnant woman about the risk of transmitting herpes simplex virus (HSV) from her to her fetus. What statement by the woman indicates the professional needs to provide more information?
- Neonatal infection with HSV rarely occurs in the intrapartum or postpartum period.
 - The risk is higher in women who have a primary HSV infection.
 - The risk is higher in women who experience prolonged ruptured membranes.
 - The risk is higher when internal fetal monitoring devices are used.

ANS: A

Neonatal infections can occur in utero or, more commonly, during the intrapartum or postpartum period. As many as 50% of these infections occur when the mother contracted the virus near term. The professional would re-educate the woman if she made this statement. The other options are accurate statements.

PTS: 1 DIF: Cognitive Level: Evaluating

17. During the latent period of a herpes virus infection, where in the host cell is the genome of the virus maintained?
- Mitochondria
 - Lysosomes
 - Nucleus
 - Cytoplasm

ANS: C

During the latent period, the genome for the virus is maintained in the host cell nucleus without causing the death of the cell.

PTS: 1 DIF: Cognitive Level: Remembering

18. During reactivation, herpes virus genomes are transported through which nerves to the dermal surface?
- Somatic
 - Peripheral sensory
 - Autonomic
 - Peripheral motor

ANS: B

Only during reactivation are the viral genomes transported through the peripheral sensory nerves back to the dermal surface.

PTS: 1 DIF: Cognitive Level: Remembering

19. A healthcare professional is teaching a high school group about STIs. Which statement by the professional provides the most accurate information regarding the transmission of herpes simplex virus (HSV)?
- HSV is transmitted only when vesicles are present.
 - HSV is transmitted only while lesions are present.
 - The use of condoms prevents the transmission of HSV.
 - The risk of transmission is present even during latent periods.

ANS: D

Latent infections can become reactivated and cause a recurrent infection with similar manifestations. The other options are not accurate statements regarding the transmission of HSV.

PTS: 1 DIF: Cognitive Level: Remembering

20. Which of these causes condylomata acuminata or genital warts?
- Chlamydia
 - Adenovirus
 - Human papillomavirus (HPV)
 - Herpes simplex virus 1 (HSV-1)

ANS: C

Genital warts are quite contagious and are a result of infection with HPV.

PTS: 1 DIF: Cognitive Level: Remembering

21. A patient is found to have “strawberry spots” on the vagina and cervix. Which medication does the healthcare professional discuss with the patient?
- Metronidazole
 - Acyclovir
 - Lindane 1% cream
 - Tetracycline

ANS: A

“Strawberry spots” are sometimes seen in cases of trichomoniasis. They are small, punctate red marks. The treatment of choice for trichomoniasis is a single 2-gram dose of metronidazole (Flagyl) or tinidazole. Acyclovir is an antiviral medication often used for herpes virus infection. Lindane can be used for scabies. Tetracycline is an antibiotic used in some bacterial infections.

PTS: 1 DIF: Cognitive Level: Remembering

22. A woman diagnosed with trichomoniasis asks if her sexual partner should be treated as well. What is the appropriate response by the healthcare professional?
- Sexual partners should be treated only if symptoms are present.
 - Sexual partners should be treated even if they are asymptomatic.
 - Infections in men are self-limiting even without treatment.
 - Sexual partners should be treated to prevent infection.

ANS: B

Sexual partners, even if asymptomatic, are also treated and examined for coexisting sexually transmitted infections.

PTS: 1 DIF: Cognitive Level: Remembering

23. Which hepatitis virus is most commonly known to be sexually transmitted?
- A
 - B
 - C
 - D

ANS: B

Of the many different strains of hepatitis, Hepatitis B virus (HBV) is known to be sexually transmitted. Both A and C can be sexually transmitted, however; that is not their primary route of transmission.

PTS: 1 DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. What are the common modes of transmission for the hepatitis B virus (HBV)? (*Select all that apply.*)

- a. Needle punctures
- b. Blood transfusions
- c. Contact with infected body fluids
- d. Skin cuts
- e. Ingestion of infected substances

ANS: A, B, C, D

Transmission of HBV can occur through needle puncture, blood transfusion, cuts in the skin, and contact with infected body fluids. Ingestion is not a recognized transmission mode.

PTS: 1

DIF: Cognitive Level: Remembering

2. What information does the student learn about scabies? (*Select all that apply.*)
- a. Scabies is spread through skin-to-skin contact.
 - b. The crab lice, *Phthirus pubis*, cause scabies.
 - c. Severe pruritus is its major clinical manifestation.
 - d. Symptoms worsen at night.
 - e. Treatment is provided through oral medication therapy.

ANS: A, C, D

Scabies is a common parasitic infection that can be spread by skin-to-skin contact and sexual contact. The scabies mite burrows through the skin, depositing two or three large eggs per day. Intense pruritus, especially at night, is the most pronounced clinical manifestation. Treatment consists of topical application of a pediculicide. The causative organism is the *Sarcoptes scabiei* mite. Pediculosis pubis (crabs) is commonly transmitted sexually and is caused by the crab louse, *P. pubis*.

PTS: 1

DIF: Cognitive Level: Remembering

3. Which statements are *true* concerning the sexually transmitted infection (STI) lymphogranuloma venereum? (*Select all that apply.*)
- a. Lymphogranuloma venereum is an STI commonly diagnosed in the United States.
 - b. It begins in the skin or mucus membranes.
 - c. Lymphogranuloma venereum spreads to lymph tissues.
 - d. Rectal lesions are readily apparent with this STI.
 - e. A 60-day course of oral erythromycin is the recommended treatment.

ANS: B, C

Lymphogranuloma venereum is a chronic STI uncommon in the United States. The lesion begins in the skin or mucus membranes and spreads to the lymph tissue, causing inflammation, necrosis, buboes, and abscesses of the inguinal lymph nodes. Primary lesions appear on the penis and scrotum in men and on the cervix, vaginal wall, and labia in women. Rectal lesions, which are common, mimic inflammatory bowel disorders. Oral doxycycline or erythromycin are used to treat this disease.

PTS: 1

DIF: Cognitive Level: Remembering

Chapter 28: Structure and Function of the Hematologic System

MULTIPLE CHOICE

1. What is the most abundant class of plasma protein?

- a. Globulin
- b. Albumin
- c. Clotting factors
- d. Complement proteins

ANS: B

Albumin (approximately 60% of total plasma protein at a concentration of about 4 g/dL) is the most abundant plasma protein.

PTS: 1

DIF: Cognitive Level: Remembering

2. What is the effect of low plasma albumin?

- a. Clotting factors decrease, thus increasing the chance of prolonged bleeding.
- b. Fewer immunoglobulins are synthesized, thus impairing the immune function.
- c. Less iron is stored, thus increasing the incidence of iron deficiency anemia.
- d. Osmotic pressure decreases; thus water moves from the capillaries to the interstitium.

ANS: D

In the case of decreased production (e.g., cirrhosis, other diffuse liver diseases, protein malnutrition) or excessive loss of albumin (e.g., certain kidney diseases, extensive burns), the reduced oncotic pressure leads to excessive movement of fluid and solutes into the tissues and decreased blood volume. Low plasma albumin does not affect clotting factors, immunoglobulins, or iron.

PTS: 1

DIF: Cognitive Level: Remembering

3. What is the life span of an erythrocyte (*in days*)?

- a. 20 to 30
- b. 60 to 90
- c. 100 to 120
- d. 200 to 240

ANS: C

Because it cannot undergo mitotic division, the erythrocyte has a limited life span of up to approximately 120 days.

PTS: 1

DIF: Cognitive Level: Remembering

4. What does the student learn about erythrocytes?

- a. Erythrocytes contain a nucleus, mitochondria, and ribosomes.

- b. Erythrocytes synthesize proteins.
- c. Erythrocytes have the ability to change shape to squeeze through microcirculation.
- d. Erythrocytes are more abundant in women than men.

ANS: C

Reversible deformity enables the erythrocyte to assume a more compact torpedo-like shape, squeeze through the microcirculation, and return to normal. The mature erythrocyte lacks a nucleus and cytoplasmic organelles so it cannot synthesize protein or carry out oxidative reactions. Men have more erythrocytes than women (48% to 42% respectively).

PTS: 1

DIF: Cognitive Level: Remembering

5. What are granulocytes that contain granules of vasoactive amines, such as histamine, called?
- a. Neutrophils
 - b. Eosinophils
 - c. Monocytes
 - d. Basophils

ANS: D

Basophils contain cytoplasmic granules that hold an abundant mixture of biochemical mediators, including histamine, chemotactic factors, proteolytic enzymes, and an anticoagulant (heparin). These substances are not found in neutrophils, monocytes, or eosinophils.

PTS: 1

DIF: Cognitive Level: Remembering

6. Which of these are formed elements of the blood that are not cells but are disk-shaped cytoplasmic fragments essential for blood clotting?
- a. Monocytes
 - b. Platelets
 - c. Macrophages
 - d. Erythrocytes

ANS: B

Platelets (thrombocytes) are not true cells but are disk-shaped cytoplasmic fragments that are essential for blood coagulation and control of bleeding. Monocytes, macrophages, and erythrocytes are cells.

PTS: 1

DIF: Cognitive Level: Remembering

7. What are blood cells that differentiate into macrophages known as?
- a. Monocytes
 - b. Neutrophils
 - c. Eosinophils
 - d. Basophils

ANS: A

Monocytes migrate into a variety of tissues and fully mature into tissue macrophages and myeloid dendritic cells. Neutrophils, eosinophils, and basophils do not undergo this transformation.

PTS: 1 DIF: Cognitive Level: Remembering

8. Without prior exposure to an antigen, which cells are able to destroy some types of tumor cells and some virus-infected cells?
- Lymphocytes
 - Plasma cells
 - Megakaryocytes
 - Natural killer (NK) cells

ANS: D

NK cells, which resemble large granular lymphocytes, kill some types of tumor cells (in vitro) and some virus-infected cells without being induced by previous exposure to these antigens. This capability is not true of lymphocytes, plasma cells, or megakaryocytes.

PTS: 1 DIF: Cognitive Level: Remembering

9. What is the life span of platelets (*in days*)?
- 10
 - 30
 - 90
 - 120

ANS: A

A platelet circulates for approximately 8 to 11 days and ages. Macrophages of the mononuclear phagocyte system, mostly in the spleen, remove platelets.

PTS: 1 DIF: Cognitive Level: Remembering

10. Fetal hematopoiesis occurs *primarily* in which structure?
- Gut
 - Spleen
 - Bone marrow
 - Thymus

ANS: B

The spleen is the largest of the secondary lymphoid organs and the primary site of fetal hematopoiesis. The bone marrow and thymus are other primary lymphoid organs. Peyer patches in the small intestine are considered secondary lymphoid organs.

PTS: 1 DIF: Cognitive Level: Remembering

11. What is the consequence of a splenectomy?
- The level of iron in circulation increases.
 - Antibody production increases to improve immune function.
 - The number of defective cells in circulation increases.
 - The number of clotting factors increases.

ANS: C

Splenic absence from any cause (e.g., atrophy, traumatic injury, removal because of disease) has several secondary effects on the body, among them an increase in morphologically defective blood cells in the circulation, confirming the spleen's role in removing old or damaged cells. Loss of the spleen does not increase iron blood levels, increase antibody production, or increase the number of clotting factors.

PTS: 1 DIF: Cognitive Level: Remembering

12. A professor explains to a class that the reason lymph nodes enlarge and become tender during infection is because of what reason?
- B lymphocytes proliferate.
 - The nodes are inflamed.
 - The nodes fill with purulent exudate.
 - The nodes are not properly functioning.

ANS: A

The B lymphocyte proliferation in response to significant antigen (e.g., during infection) may result in lymph node enlargement and tenderness (reactive lymph node). The nodes are not specifically inflamed or filled with purulent exudate.

PTS: 1 DIF: Cognitive Level: Understanding

13. Which hemoglobin is made from oxidized ferric iron (Fe^{3+}) and lacks the ability to bind oxygen?
- Deoxyhemoglobin
 - Oxyhemoglobin
 - Methemoglobin
 - Glycosylated hemoglobin

ANS: C

Without reactivation by methemoglobin reductase, the Fe^{3+} -containing hemoglobin (methemoglobin) cannot bind oxygen. Deoxyhemoglobin is hemoglobin available for oxygen binding. Oxyhemoglobin is bound with oxygen. Glycosylated hemoglobin is hemoglobin with which glucose is bound.

PTS: 1 DIF: Cognitive Level: Remembering

14. A patient has pernicious anemia and asks the healthcare professional to explain the disease. Which statement by the professional is *most* accurate?
- The lack of certain foods in your diet
 - Your body cannot absorb vitamin B_{12} .
 - You are not getting enough vitamin C.
 - Your bone marrow has stopped working.

ANS: B

Dietary vitamin B_{12} is a large molecule that requires a protein secreted by parietal cells in the stomach (intrinsic factor [IF]) to transport across the ileum. Defects in IF production lead to decreased B_{12} absorption and pernicious anemia. A lack of certain foods (i.e., meat) might lead to iron-deficiency anemia. Vitamin C lack would not lead to anemia, but in a severe state could lead to scurvy. If the bone marrow had totally failed, that would be termed aplastic anemia.

PTS: 1 DIF: Cognitive Level: Understanding

15. By which structure are mature erythrocytes removed from the bloodstream?
- Liver
 - Lymph nodes
 - Thymus
 - Spleen

ANS: D

At the end of their life spans, old erythrocytes are removed by tissue macrophages, primarily in the spleen.

PTS: 1 DIF: Cognitive Level: Remembering

16. A patient has chronic anemia associated with chronic renal failure. What substance does the healthcare professional tell the patient is needed to treat this anemia?
- Iron
 - Erythropoietin
 - Cobalamin (vitamin B₁₂)
 - Folate

ANS: B

One of the most significant advances in the study of hematopoietic growth factors has been the development of erythropoietin for individuals with chronic renal failure. The other options are not associated with the treatment of chronic anemia.

PTS: 1 DIF: Cognitive Level: Understanding

17. What is the role of thromboxane A (TXA₂) in the secretion stage of hemostasis?
- Stimulates the synthesis of serotonin.
 - Promotes vasodilation.
 - Stimulates platelet aggregation.
 - Promotes formation of cyclooxygenase.

ANS: C

Platelet aggregation is primarily stimulated by TXA₂ and adenosine diphosphate (ADP), which induce functional fibrinogen receptors on the platelet. Thromboxane A is not involved with serotonin synthesis, vasodilation, or production of cyclooxygenase.

PTS: 1 DIF: Cognitive Level: Remembering

18. Which of these is the role of nitric oxide (NO) in hemostasis?
- Stimulates the release of fibrinogen to maintain the platelet plug.
 - Stimulates the release of clotting factors V and VII.
 - Causes vasoconstriction and stimulates platelet aggregation.
 - Controls platelet activation through in concert with prostacyclin.

ANS: D

Endothelial cell NO *synthase* produces NO, which controls platelet activation in concert with prostacyclin. The other options do not present an accurate description of the role of NO in hemostasis.

PTS: 1 DIF: Cognitive Level: Remembering

19. The drug heparin acts in hemostasis by which processes?
- Inhibiting thrombin and antithrombin III (AT-III)
 - Preventing the conversion of prothrombin to thrombin
 - Shortening the fibrin strands to retract the blood clot
 - Degrading the fibrin within blood clots

ANS: A

Clinically administered heparin binds to AT-III and induces a conformational change that greatly enhances its activity. Under normal conditions, the presence of endothelial cell heparin sulfate and available AT-III in the circulation cooperate to protect the vessels from the effects of spontaneously activated thrombin. Heparin does not prevent the conversion of prothrombin to thrombin, shorten fibrin strands, or degrade the fibrin in blood clots.

PTS: 1 DIF: Cognitive Level: Remembering

20. What is plasmin's role in the clotting process?
- Stimulates platelet aggregation.
 - Inhibits platelet adhesion and aggregation.
 - Prevents the conversion of prothrombin to degrade the fibrin within blood clots.
 - Degrades the fibrin within blood clots.

ANS: D

Plasmin (also called *fibrinase* or *fibrinolysin*) is a serine protease that degrades fibrin polymers in clots. It is not capable of stimulating platelet aggregation, inhibiting platelet adhesion, or preventing conversion of prothrombin.

PTS: 1 DIF: Cognitive Level: Remembering

21. Soon after birth, a newborn has cord blood drawn which shows hemoglobin of 28.2 mg/dL. What does the healthcare professional understand about this finding?
- The baby suffered from hypoxia in utero.
 - This is a normal finding from cord blood.
 - The newborn needs a blood transfusion.
 - The infant's bone marrow is immature.

ANS: A

A normal cord blood hemoglobin mean is 16.8 mg/dL, so this is a high value. A hypoxic intrauterine environment stimulates erythropoietin production in the fetus and accelerates fetal erythropoiesis, producing polycythemia. This value does not indicate a need for transfusion nor does it demonstrate immature bone marrow.

PTS: 1 DIF: Cognitive Level: Understanding

22. Where are Kupffer cells located?

- a. Kidneys
- b. Liver
- c. Pancreas
- d. Spleen

ANS: B

The liver macrophages are the only location for Kupffer cells.

PTS: 1

DIF: Cognitive Level: Remembering

23. The student learns that Langerhans cells are only found in which organ?

- a. Skin
- b. Intestinal lining
- c. Kidney
- d. Thyroid

ANS: A

The skin is the only location for Langerhans cells.

PTS: 1

DIF: Cognitive Level: Remembering

24. What does the student learn about the role of collagen in the clotting process?

- a. Initiates the clotting cascade
- b. Activates platelets
- c. Stimulates fibrin
- d. Deactivates fibrinogen

ANS: B

Collagen and thrombin are particularly strong stimuli for platelet aggregation. Collagen does not initiate the clotting cascade, stimulate fibrin, or deactivate fibrinogen.

PTS: 1

DIF: Cognitive Level: Remembering

25. Which form of iron (Fe) can be used in the formation of normal hemoglobin?

- a. Fe^+
- b. Fe^{2+}
- c. Fe^{3+}
- d. Fe^{4+}

ANS: B

It is crucial that the iron be correctly charged; only reduced ferrous iron (Fe^{2+}) can bind oxygen in the lungs and release it in the tissues. Fe^+ is simple iron. Fe^{3+} is bound with oxygen. Fe^{4+} is ferryl iron.

PTS: 1

DIF: Cognitive Level: Remembering

26. What change to the hematologic system is related to age?

- a. Platelet adhesiveness decreases.

- b. Lymphocyte function decreases.
- c. Cellular immunity increases.
- d. Erythrocyte reproduction accelerates.

ANS: B

Blood composition changes little with age. A delay in erythrocyte replenishment may occur after bleeding, presumably because of iron deficiency. Lymphocyte function appears to decrease with age. Particularly affected is a decrease in cellular immunity. Platelet adhesiveness probably increases with age.

PTS: 1

DIF: Cognitive Level: Remembering

27. What is the function of erythrocytes?
- a. Tissue oxygenation
 - b. Hemostasis
 - c. Infection control
 - d. Allergy response

ANS: A

Erythrocytes are solely responsible for tissue oxygenation. Hemostasis occurs due to the actions of multiple substances such as fibrin, collagen, and clotting factors. Infection control and allergic responses are mediated by white blood cells.

PTS: 1

DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. Which characteristics allow erythrocytes to function as gas carriers? (*Select all that apply.*)
- a. Permanent shape
 - b. Compactness
 - c. Reversible deformability
 - d. Presence of hyperactive mitochondria
 - e. Biconcavity

ANS: C, E

A red blood cell (RBC) is a small disk with two unique properties: (1) a *biconcave* shape and (2) the capacity to be *reversibly deformed*. Compactness is not a feature that promotes gas exchange. Erythrocytes do not contain mitochondria.

PTS: 1

DIF: Cognitive Level: Remembering

2. Which statements about plasma proteins are *correct*? (*Select all that apply.*)
- a. Provide clotting factors.
 - b. Transport triglycerides.
 - c. Synthesize complement proteins.
 - d. Create hydrostatic pressure.
 - e. Transport cholesterol.

ANS: A, B, C, E

Plasma proteins do not create hydrostatic pressure. The other options are all accurate statements regarding plasma proteins.

PTS: 1 DIF: Cognitive Level: Remembering

3. What are the primary anticoagulant mechanisms? (*Select all that apply.*)
- a. Antithrombin III
 - b. Tissue factor pathway inhibitor
 - c. Hematopoiesis
 - d. Protein C
 - e. Phagocytosis

ANS: A, B, D

The major regulatory factors that control hemostasis reside where the greatest probability of clotting would occur—on the endothelial cell surface. The primary anticoagulant mechanisms include thrombin inhibitors (e.g., antithrombin III), tissue factor inhibitors (e.g., tissue factor pathway inhibitor), and mechanisms for degrading activated clotting factors (e.g., protein C). Hematopoiesis and phagocytosis are processes that are not related to anticoagulation.

PTS: 1 DIF: Cognitive Level: Remembering

4. What does the student learn regarding the role of the endothelium in clot formation? (*Select all that apply.*)
- a. The surface of the endothelium produces plasma protease inhibitors.
 - b. Plasma protease inhibitors assist in preventing clot formation.
 - c. Thrombomodulin is a protein that is converted on the surface of endothelial cells.
 - d. Protein A binds to thrombomodulin.
 - e. Activated protein C enhances the adhesion ability of neutrophils.

ANS: A, B, C

The surface of the endothelium produces plasma protease inhibitors to resist clot formation. Thrombomodulin is a membrane thrombin-binding protein matter and is converted to activated protein C on the surface of endothelial cells. Protein C in the circulation binds to thrombomodulin. Activated protein C inhibits the adhesion of neutrophils to the endothelium.

PTS: 1 DIF: Cognitive Level: Remembering

5. Which statements characterize albumin? (*Select all that apply.*)
- a. It retains sodium to maintain water balance.
 - b. It provides colloid osmotic pressure.
 - c. It is synthesized in the liver.
 - d. It is a carrier for drugs that have low water solubility.
 - e. It is a small molecule.

ANS: B, C, D

Albumin is a plasma protein produced by the liver. It serves as a carrier molecule for the normal components of blood, as well as for drugs that have low solubility in water (e.g., free fatty acids, lipid-soluble hormones, thyroid hormones, bile salts). Albumin molecules are large and do not diffuse freely through the vascular endothelium; thus they maintain the critical colloidal osmotic pressure (or oncotic pressure) that regulates the passage of water and solutes into the surrounding tissues.

PTS: 1 DIF: Cognitive Level: Remembering

6. Which nutrients are necessary for the synthesis of DNA and the maturation of erythrocytes? (*Select all that apply.*)
- a. Protein
 - b. Iron
 - c. Cobalamin (vitamin B₁₂)
 - d. Folate
 - e. Pantothenic acid

ANS: C, D

Cobalamin and folate are necessary for the synthesis of DNA and for the maturation of erythrocytes. The remaining options are not necessary for these processes to occur.

PTS: 1 DIF: Cognitive Level: Remembering

7. Which nutrients are necessary for hemoglobin synthesis? (*Select all that apply.*)
- a. Protein
 - b. Iron
 - c. B₆ (pyridoxine)
 - d. Vitamin C
 - e. Cobalamin (vitamin B₁₂)
 - f. Pantothenic acid

ANS: B, C

Iron and B₆ (pyridoxine) are necessary for hemoglobin synthesis. The remaining options are not necessary for hemoglobin synthesis.

PTS: 1 DIF: Cognitive Level: Remembering

Chapter 29: Alterations of Erythrocytes, Platelets, and Hemostatic Function

MULTIPLE CHOICE

1. What term is used to describe the capacity of some erythrocytes to vary in size, especially in relationship to some anemias?
 - a. Poikilocytosis
 - b. Isocytosis
 - c. Anisocytosis
 - d. Microcytosis

ANS: C

Anisocytosis means assuming various sizes and is a term used to describe erythrocytes in some anemias. Poikilocytosis is used to describe erythrocytes that can assume various shapes. Isocytosis and microcytosis are not terms that are associated with this condition.

PTS: 1

DIF: Cognitive Level: Remembering

2. What is the fundamental physiologic manifestation of anemia?
 - a. Hypotension
 - b. Hyperesthesia
 - c. Hypoxia
 - d. Ischemia

ANS: C

The fundamental physiologic manifestation of anemia is a reduced oxygen-carrying capacity of the blood, resulting in tissue hypoxia. Hypotension may result when the initial compensatory mechanism, vasoconstriction, fails to provide adequate perfusion to tissues. Ischemia may result if the oxygen deficit in tissues and organs is severe or prolonged. Hyperesthesia is not a finding.

PTS: 1

DIF: Cognitive Level: Remembering

3. The paresthesia that occurs in vitamin B₁₂ deficiency anemia is a result of which of these?
 - a. Reduction in acetylcholine receptors in the postsynaptic nerves
 - b. Myelin degeneration in the spinal cord
 - c. Destruction of myelin in peripheral nerves
 - d. Altered function of neurons in the parietal lobe

ANS: B

Effects on the nervous system can occur if a vitamin B₁₂ deficiency causes anemia. Myelin degeneration may occur with the resultant loss of fibers in the spinal cord, producing paresthesia (numbness), gait disturbances, extreme weakness, spasticity, and reflex abnormalities. The paresthesia is not caused by reduction in acetylcholine receptors, destruction of myelin in peripheral nerves, or altered neuronal function in the parietal lobe.

PTS: 1

DIF: Cognitive Level: Remembering

4. Which of these describes how the body compensates for anemia?
- Increasing rate and depth of breathing
 - Decreasing capillary vasoconstriction
 - Hemoglobin holding more firmly onto oxygen
 - Kidneys releasing more erythropoietin

ANS: A

Tissue hypoxia from anemia creates additional demands and compensatory actions on the pulmonary and hematologic systems. The rate and depth of breathing increase in an attempt to increase the availability of oxygen. The body does not compensate by decreasing vasoconstriction, tightening the hemoglobin bonds with oxygen, or releasing more erythropoietin.

PTS: 1

DIF: Cognitive Level: Remembering

5. Which of these classified as a megaloblastic anemia?
- Iron deficiency
 - Pernicious
 - Sideroblastic
 - Hemolytic

ANS: B

Megaloblastic anemia is characterized by a low red blood cell count and larger-than-normal red blood cells. Pernicious anemia is the most common type of megaloblastic anemia. Iron deficiency is a hypochromic, microcytic anemia meaning the red blood cells are pale and small. The red blood cells in sideroblastic anemia are not abnormally large; they have an abnormal ring of iron around the nucleus of the RBC. Hemolytic anemia is normochromic, normocytic anemia caused by blood loss.

PTS: 1

DIF: Cognitive Level: Remembering

6. The students learn that deficiencies in folate and vitamin B₁₂ alter the synthesis of which of these?
- RNA
 - Cell membrane
 - DNA
 - Mitochondria

ANS: C

Deficiencies in folate and vitamin B₁₂ result in defective erythrocyte precursor DNA synthesis. These deficiencies are not associated with alterations of RNA, cell membranes, or mitochondria.

PTS: 1

DIF: Cognitive Level: Remembering

7. A patient has defective secretion of the intrinsic factor leading to anemia. What treatment option does the healthcare professional discuss with the patient?
- Increasing iron sources in the diet such as red meat.
 - Vitamin B₁₂ injections initially given once a week.

- c. Having relatives tested for bone marrow donation.
- d. Better control of the patient's underlying disorder.

ANS: B

Intrinsic factor (IF) is responsible for B₁₂ uptake from the gut. A lack of IF leads to pernicious anemia, which is treated with vitamin B₁₂ injections for the rest of the person's life. The injections are weekly at first then monthly. Increasing dietary iron would help with iron-deficiency anemia. A bone marrow transplant might be used to treat aplastic anemia. Better control of an underlying medical condition would be important in anemia of chronic disease.

PTS: 1

DIF: Cognitive Level: Applying

8. After a person has a subtotal gastrectomy for chronic gastritis, which type of anemia will result?
- a. Iron deficiency
 - b. Aplastic
 - c. Folic acid
 - d. Pernicious

ANS: D

A gastrectomy will lead to deficient intrinsic factor which is related to pernicious anemia. The gastrectomy would not lead to iron deficiency, aplastic, or folic acid anemia.

PTS: 1

DIF: Cognitive Level: Remembering

9. Which condition resulting from untreated pernicious anemia (PA) is fatal?
- a. Brain hypoxia
 - b. Liver hypoxia
 - c. Heart failure
 - d. Renal failure

ANS: C

Untreated PA is fatal, usually because of heart failure.

PTS: 1

DIF: Cognitive Level: Remembering

10. How is the effectiveness of vitamin B₁₂ therapy measured?
- a. Reticulocyte count
 - b. Serum transferrin
 - c. Hemoglobin
 - d. Serum vitamin B₁₂

ANS: A

The effectiveness of cobalamin replacement therapy is determined by a rising reticulocyte count. The other options are not used as indicators of the effectiveness of vitamin B₁₂ therapy.

PTS: 1

DIF: Cognitive Level: Remembering

11. A healthcare professional has educated a student on folic acid. Which statement by the student indicates that more teaching is needed?

- a. Folic acid absorption is dependent on the enzyme folacin.
- b. Folic acid is stored in the liver.
- c. Folic acid is essential for RNA and DNA synthesis within erythrocytes.
- d. Folic acid is absorbed in the upper small intestine.

ANS: A

Folic acid absorption is not dependent on the enzyme folacin. The professional would need to provide more teaching if the student made this statement. The other options are true statements regarding folic acid.

PTS: 1

DIF: Cognitive Level: Evaluating

12. Which anemia produces small, pale erythrocytes?

- a. Folic acid
- b. Hemolytic
- c. Iron deficiency
- d. Pernicious

ANS: C

The microcytic-hypochromic anemias, which include iron deficiency anemia (IDA), are characterized by erythrocytes that are abnormally small (microcytic) and contain abnormally reduced amounts of hemoglobin (hypochromic). Folic acid and pernicious anemias are megaloblastic. Hemolytic anemia consists of normal red blood cells that are destroyed more frequently than normal.

PTS: 1

DIF: Cognitive Level: Remembering

13. A patient in the healthcare clinic reports fatigue, weakness, and dyspnea, as well as pale conjunctiva of the eyes and brittle, concave nails. What assessment by the healthcare professional is *most* appropriate for the suspected anemia?

- a. Blood pressure and apical pulse
- b. Oral mucus membranes and tongue
- c. Ability to swallow foods and liquids
- d. Skin and sclera for normal coloration

ANS: B

Early symptoms of iron deficiency anemia (IDA) include fatigue, weakness, and shortness of breath. Pale earlobes, palms, and conjunctivae are also common signs. Progressive IDA causes more severe alterations, with structural and functional changes apparent in epithelial tissue. The nails become brittle, thin, coarsely ridged, and spoon-shaped or concave (koilonychia) as a result of impaired capillary circulation. The tongue becomes red, sore, and painful. The healthcare professional should assess the patient's mouth and tongue. Blood pressure and pulse readings would not be specific for any one type of anemia. Dysphagia (difficulty swallowing) could indicate pernicious anemia. Jaundice (most often seen in the sclera and on the skin) would be a characteristic of hemolytic anemia, although it is not always noticed.

PTS: 1

DIF: Cognitive Level: Applying

14. A healthcare professional in an urban clinic is seeing a patient who has iron deficiency anemia (IDA). What question by the professional is *most* appropriate to assess for the cause of IDA?
- “How many times a week do you have iron-rich foods?”
 - “Have you ever noticed any blood in your stool?”
 - “Do you have a history of heart valve replacement?”
 - “Have you had any recent viral infections?”

ANS: B

The most common causes of IDA in well-developed countries are pregnancy and chronic blood loss. The healthcare professional would assess for any sources of blood loss. A dietary deficiency of iron may be the cause, but is not common in developed countries. A mechanical heart valve can lead to hemolytic anemia. Recent infections are not associated with iron deficiency anemia.

PTS: 1 DIF: Cognitive Level: Applying

15. A healthcare professional works with recent refugees. A mother brings in her children who have been diagnosed with iron deficiency anemia. What action by the professional is *most* appropriate?
- Educate the mother on an iron-rich diet.
 - Arrange to test for parasitic infections.
 - Explain the weekly iron infusions.
 - Teach the mother to give iron supplements.

ANS: B

Children in developing countries often are affected by chronic parasite infestations that result in intestinal blood and iron loss that outpaces dietary intake. The professional should arrange testing for parasites in the newly arrived children. An iron-rich diet and iron supplements may be appropriate, but unless the cause is addressed, the problem will not be solved by those two actions. Weekly iron infusions are not needed.

PTS: 1 DIF: Cognitive Level: Applying

16. A patient has hepatomegaly, bronze-colored skin, and cardiac dysrhythmias. What condition does the healthcare professional prepare to teach the patient about?
- Aplastic anemia
 - Pernicious anemia
 - Hereditary hemochromatosis
 - Immune thrombocytopenia purpura

ANS: C

Hereditary hemochromatosis presents with hepatomegaly, bronze-colored skin, and cardiac dysrhythmias. Aplastic anemia specifically presents with total bone marrow failure. Pernicious anemia can be characterized with neurocognitive dysfunction in addition to the classic signs of all anemias. ITP presents with minor signs of bleeding such as petechiae but soon show major bleeding.

PTS: 1 DIF: Cognitive Level: Understanding

17. A healthcare professional is reviewing a patient's laboratory results and sees that the patient has a low reticulocyte count and a high iron level. Which type of anemia does the professional associate these findings with?
- Folate deficiency anemia
 - Iron deficiency anemia
 - Hemolytic anemia
 - Anemia of chronic disease

ANS: A

These results are characteristic of folate deficiency. Iron deficiency would manifest with normal reticulocyte count and high iron. Hemolytic anemia would show high reticulocyte count and normal or high iron levels. Anemia of chronic disease would have a normal reticulocyte count but low iron levels.

PTS: 1

DIF: Cognitive Level: Remembering

18. In aplastic anemia (AA), pancytopenia develops as a result of what?
- Suppression of erythropoietin to produce adequate amounts of erythrocytes
 - Suppression of the bone marrow to produce adequate amounts of erythrocytes, leukocytes, and thrombocytes
 - Lack of DNA to form sufficient quantities of erythrocytes, leukocytes, and thrombocytes
 - Lack of stem cells to form sufficient quantities of leukocytes

ANS: B

AA is a critical condition characterized by pancytopenia, which is a reduction or absence of all three blood cell types, resulting from the failure or suppression of bone marrow to produce adequate amounts of blood cells. It is not related to lack of DNA.

PTS: 1

DIF: Cognitive Level: Remembering

19. A student asks the professor what the most common pathophysiologic process is that triggers aplastic anemia (AA). What response by the professor is *most* accurate?
- Autoimmune disease against hematopoiesis by activated cytotoxic T (Tc) cells
 - Malignancy of the bone marrow in which unregulated proliferation of erythrocytes crowd out other blood cells
 - Autoimmune disease against hematopoiesis by activated immunoglobulins
 - Inherited genetic disorder with recessive X-linked transmission

ANS: A

Most cases of AA result from an autoimmune disease directed against hematopoietic stem cells. Tc cells appear to be the main culprits in this process. AA does not include proliferation of erythrocytes. The autoimmune process seems to be mediated by alterations in CD4+, CD8+, and Th-17 T-cell responses and reduced numbers of regulatory T cells. Only a small percentage of patients have an inherited or familial form.

PTS: 1

DIF: Cognitive Level: Understanding

20. An allogenic bone marrow transplantation remains the preferred method for treating which anemia?
- Polycythemia vera
 - Aplastic
 - Sideroblastic
 - Anemia of chronic disease (ACD)

ANS: B

Bone marrow and, most recently, peripheral blood stem cell transplantation from a histocompatible sibling are the preferred treatments for the underlying bone marrow failure observed in aplastic anemias. This is not a treatment for polycythemia vera, sideroblastic anemia, or anemia of chronic disease.

PTS: 1

DIF: Cognitive Level: Remembering

21. What does the student learn about warm autoimmune hemolytic anemia?
- Warm autoimmune hemolytic anemia occurs primarily in children.
 - It is self-limiting and rarely produces hemolysis.
 - Erythrocytes are bound to macrophages and sequestered in the spleen.
 - Immunoglobulin M coats erythrocytes and binds them to receptors on monocytes.

ANS: C

The immunoglobulin G-coated red blood cells bind to the Fc receptors on monocytes and splenic macrophages and are removed by phagocytosis. This disease occurs mainly in people older than 40 years of age. It is one of the hemolytic anemias and destruction of red blood cells occurs by extravascular processes. The erythrocytes are bound to macrophages, not monocytes.

PTS: 1

DIF: Cognitive Level: Remembering

22. A student asks the professor to explain the jaundice that accompanies hemolytic anemia. Which statement is by the professor is *most* accurate?
- Erythrocytes are destroyed in the spleen.
 - Heme destruction exceeds the liver's ability to conjugate and excrete bilirubin.
 - The patient has elevations in aspartate transaminase (AST) and alanine transaminase (ALT).
 - The erythrocytes are coated with an immunoglobulin.

ANS: B

Jaundice (icterus) is present when heme destruction exceeds the liver's ability to conjugate and excrete bilirubin. Jaundice is not as directly related to the destruction of the erythrocytes. It is also not related to liver enzyme elevation or being coated with an immunoglobulin.

PTS: 1

DIF: Cognitive Level: Understanding

23. Shortened erythrocyte life span, ineffective bone marrow response to erythropoietin, and altered iron metabolism describe the pathophysiologic characteristics of which type of anemia?
- Aplastic
 - Sideroblastic
 - Anemia of chronic disease

d. Iron deficiency

ANS: C

Anemia of chronic disease specifically results from a combination of (1) decreased erythrocyte life span, (2) suppressed production of erythropoietin, (3) ineffective bone marrow erythroid progenitor response to erythropoietin, and (4) altered iron metabolism and iron sequestration in macrophages.

PTS: 1

DIF: Cognitive Level: Remembering

24. A patient has polycythemia vera and presents to the Emergency Department with plethora and neurological changes. The student asks the healthcare professional to explain the primary cause of these symptoms. What response by the professional is *best*?
- Decreased erythrocyte count
 - Destruction of erythrocytes
 - Increased blood viscosity
 - Tissue destruction by macrophages

ANS: C

As polycythemia vera progresses, many of the symptoms are related to the increased blood cellularity and viscosity. These include plethora, engorgement of the retinal and cerebral veins. Individuals also may experience headache, drowsiness, delirium, mania, psychotic depression, chorea, and visual disturbances. The symptoms of polycythemia vera are not related to decreased erythrocyte counts, destruction of erythrocytes, or tissue destruction by macrophages.

PTS: 1

DIF: Cognitive Level: Understanding

25. What does treatment for polycythemia vera involve?
- Therapeutic phlebotomy and radioactive phosphorus
 - Restoration of blood volume by plasma expanders
 - Administration of cyanocobalamin
 - Blood transfusions

ANS: A

In low-risk individuals, the recommended therapy is phlebotomy and low-dose aspirin, whereas radioactive phosphorus has been used to suppress erythropoiesis. Plasma expanders, cyanocobalamin, and blood transfusions are not treatments for this disease.

PTS: 1

DIF: Cognitive Level: Remembering

26. An adult patient has been hospitalized with thrombocytopenia with a platelet count of $8000/\text{mm}^3$. What action by the healthcare professional is *most* appropriate?
- Tell the patient not to get out of bed without assistance.
 - Prepare the patient for transfusions of whole blood.
 - Educate the patient on side effects of heparin.
 - Nothing; this finding is normal in an adult.

ANS: A

Thrombocytopenia is a platelet count of less than $150,000/\text{mm}^3$. A platelet count of $8,000/\text{mm}^3$ is low enough to produce spontaneous bleeding, which would be devastating if it occurred in the brain. The healthcare professional should advise the patient not to get out of bed without assistance to help prevent falls. Whole blood is not needed since only platelets are deficient. The patient would not receive heparin as this would increase the chance of bleeding. A normal platelet count in an adult is $150,000$ to $350,000/\text{mm}^3$.

PTS: 1 DIF: Cognitive Level: Applying

27. A patient in the hospital has been receiving heparin injections. The platelet count on admission was $222,000/\text{mm}^3$ and four days later is $113,000/\text{mm}^3$. What action by the healthcare professional is *best*?
- Prepare to transfuse the patient with platelets.
 - Do nothing; this is an expected side effect.
 - Switch the heparin to lepirudin
 - Stop all the patient's medications.

ANS: C

After initiating heparin in the hospital this patient's platelet count dropped by 51%. A drop in more than 50% of the platelet count is seen in more than 95% of patients with heparin-induced thrombocytopenia. The treatment is to withdraw the heparin and use alternatives such as lepirudin. If the platelet count were severely low, transfusion would be indicated. There is no need to stop all the patient's medications.

PTS: 1 DIF: Cognitive Level: Applying

28. A patient is 8 hours postoperative after a long orthopedic procedure. The student asks why this patient is at particular risk of developing a thromboembolism. What response by the healthcare professional is *best*?
- Patients tend to have venous stasis from orthopedic operations.
 - Anesthetic agents often cause an immune response against clotting factors.
 - Endothelial damage occurs and repair is slowed by postoperative pain.
 - Atherosclerotic build up causes turbulent blood flow leading to clots.

ANS: A

Thromboembolic events are caused by some component of Virchow triad: endothelial injury, abnormal blood flow, and hypercoagulability of the blood. Long operative procedures such as orthopedic cases promote venous stasis. Anesthetic agents are not implicated. Endothelial repair is not appreciably hindered by postoperative pain. Atherosclerotic buildup can lead to endothelial injury but that is not specific to this patient.

PTS: 1 DIF: Cognitive Level: Understanding

29. A patient has been hospitalized for a large deep vein thrombosis and states he is the third person in his family to have this condition in the last 2 years. What response by the healthcare professional is *most* appropriate?
- "This condition is not transmitted genetically."
 - "We can test your blood for factor V Leiden."

- c. "Were they all men or both men and women?"
- d. "Familial thromboses tend to be very severe."

ANS: B

Factor V Leiden results from a single nucleotide mutation of guanine to adenine at nucleotide 1691 (G1691A) and is the most common hereditary thrombophilia. It is autosomal dominant so would not be confined to one sex. Most people with this disorder do not have clinically significant events.

PTS: 1

DIF: Cognitive Level: Applying

MULTIPLE RESPONSE

1. A healthcare professional is evaluating laboratory results for a patient who has disseminated intravascular coagulation (DIC). What results would the professional consider consistent with this condition? (*Select all that apply.*)
 - a. Elevated d-dimer
 - b. Elevated creatinine
 - c. Decreased protein C
 - d. Decreased lactate dehydrogenase
 - e. Increased pH

ANS: A, B, C

Lab results consistent with DIC include elevated d-dimer and creatinine (showing kidney damage), and decreased protein C. The lactate dehydrogenase would be elevated and the pH would be decreased.

PTS: 1

DIF: Cognitive Level: Remembering

2. A healthcare professional is caring for five patients. Which one would the professional assess for disseminated intravascular coagulation (DIC) as the priority? (*Select all that apply.*)
 - a. Heat stroke
 - b. Severe pancreatitis
 - c. Term delivery
 - d. HELLP syndrome
 - e. Snake bite

ANS: A, B, D, E

Common causes of DIC include heat stroke, severe pancreatitis, HELLP syndrome (and other OB complications), and snake bite. A normal term delivery would not put a patient at high risk for developing DIC.

PTS: 1

DIF: Cognitive Level: Remembering

Chapter 30: Alterations of Leukocyte and Lymphoid Function

MULTIPLE CHOICE

1. In infectious mononucleosis (IM), what does the Monospot test detect?
 - a. Immunoglobulin E (IgE)
 - b. Immunoglobulin M (IgM)
 - c. Immunoglobulin G (IgG)
 - d. Immunoglobulin A (IgA)

ANS: B

The Monospot test is used to diagnose infectious mononucleosis by detecting heterophile antibodies. These are a heterogeneous group of immunoglobulin M (IgM) antibodies that are agglutinins against nonhuman red blood cells and are present in IM.

PTS: 1 DIF: Cognitive Level: Remembering

2. A patient has been diagnosed with acute lymphocytic leukemia (ALL) and asks the healthcare professional to describe it. What description by the professional is *most* accurate?
 - a. ALL is a progressive neoplasm defined by the presence of greater than 30% lymphoblasts in the bone marrow or blood.
 - b. In ALL, immature blasts cells replace normal myelocytic cells, megakaryocytes, and erythrocytes.
 - c. B cells fail to mature into plasma cells that synthesize immunoglobulins.
 - d. The translocation of genetic material from genes 9 and 22 create an abnormal, fused gene identified as *BCR-ABL*.

ANS: A

ALL is a progressive neoplasm defined by the presence of greater than 30% lymphoblasts in the bone marrow or blood. Leukemia is a malignant disorder of leukocytes and does not involve immunoglobulins. The BCR-ABL gene has been identified in chronic myelogenous leukemia, not ALL.

PTS: 1 DIF: Cognitive Level: Understanding

3. Which description is consistent with chronic myelogenous leukemia (CML)?
 - a. Defects exist in the *ras* oncogene, *TP53* tumor-suppressor gene, and *INK4A*, the gene encoding a cell-cycle regulatory protein.
 - b. Leukocytosis and a predominance of blast cells characterize the bone marrow and peripheral blood. As the immature blasts increase, they replace normal myelocytic cells, megakaryocytes, and erythrocytes.
 - c. B cells fail to mature into plasma cells that synthesize immunoglobulins.
 - d. The translocation of genetic material from genes 9 and 22 creates an abnormal, fused protein identified as *BCR-ABL1*.

ANS: D

The presence of the *BCR-ABL1* fusion gene distinguishes CML from other myeloproliferative disorders.

PTS: 1 DIF: Cognitive Level: Remembering

4. A patient is admitted to the hospital with multiple myeloma (MM). Which diagnostic test should the healthcare professional assess as the *priority*?
- Serum potassium level
 - Serum calcium level
 - Bone scan or limb x-rays
 - Bone marrow biopsy

ANS: B

Many clinical manifestations of MM are due to hypercalcemia. Since calcium can affect cardiac conduction, the priority diagnostic test is serum calcium levels. Bone destruction does occur in MM, but obtaining images of bones is not a higher priority than the calcium. The patient already has been diagnosed with MM, so a bone marrow biopsy may not be needed at this time. Potassium and other electrolytes will be assessed but not as the priority.

PTS: 1 DIF: Cognitive Level: Applying

5. Reed-Sternberg (RS) cells represent malignant transformation and proliferation of which of these?
- Interleukin (IL)-1, IL-2, IL-5, and IL-6
 - Tumor necrosis factor-beta
 - B cells
 - T cells

ANS: C

Reed-Sternberg cells are associated with Hodgkin lymphoma and represent a malignant transformation of B cells. They are not related to interleukins, tumor necrosis factor-beta, or T cells.

PTS: 1 DIF: Cognitive Level: Remembering

6. Local signs and symptoms of Hodgkin disease-related lymphadenopathy are a result of what?
- Pressure and ischemia
 - Pressure and obstruction
 - Inflammation and ischemia
 - Inflammation and pressure

ANS: B

Local symptoms caused by pressure and obstruction of the lymph nodes are the result of lymphadenopathy. The other options do not contribute to the lymphadenopathy associated with Hodgkin disease.

PTS: 1 DIF: Cognitive Level: Remembering

7. Which virus is associated with Burkitt lymphoma in African children?

- a. Cytomegalovirus
- b. Adenovirus
- c. Human papillomavirus
- d. Epstein-Barr virus

ANS: D

Epstein-Barr virus, found in nasopharyngeal secretions, is associated with Burkitt lymphoma in African children. The other viruses are not associated with this malignancy.

PTS: 1

DIF: Cognitive Level: Remembering

8. A hospitalized patient's lab work is as follows: WBC 2000, bands 14.8%, and segmented neutrophils 5. The healthcare professional calculates the patient's absolute neutrophil count (ANC). What action does the professional take next?
- a. Implements protocols to prevent life-threatening infections
 - b. Encourages the patient to limit any visitors for the present time
 - c. Does nothing; this is a normal ANC for the white cell count
 - d. Holds the patient's medications until the ANC returns to normal

ANS: A

The ANC is calculated by multiplying the white blood cell count by the sum of the bands and segmented neutrophils. This patient's ANC is 396, placing him or her at extremely high risk of developing a life-threatening infection. Visitors may need to be limited but that will not protect the patient from all sources of infection. The patient's medications would not all be held because of this finding.

PTS: 1

DIF: Cognitive Level: Analyzing

9. A person has been diagnosed with acute lymphocytic leukemia (ALL) that is positive for the Philadelphia chromosome. What statement by the healthcare professional is *most* appropriate?
- a. "This is good news and means the ALL is not very aggressive."
 - b. "This is a very rare finding in adults who have ALL."
 - c. "We are planning to get your disease in remission, but it will be hard."
 - d. "You will need colony-stimulating support during your treatment."

ANS: C

The Philadelphia chromosome is seen in about 30% of adults with ALL and is a poor prognostic indicator. The healthcare professional should recognize this and reassure the patient that they will be doing everything they can to get the disease in remission. Colony-stimulating factor is given when the white blood cell count is too low, which can occur in nearly all neoplasms due to treatment.

PTS: 1

DIF: Cognitive Level: Understanding

10. A person comes to the healthcare clinic and reports night sweats and fever. The healthcare professional obtains a chest x-ray which shows a mediastinal mass. What other assessment or diagnostic test does the professional provide as a *priority*?
- a. Listen to heart sounds.
 - b. Assess the patient's skin.

- c. Arrange for familial DNA testing.
- d. Test blood for anemia.

ANS: A

This patient has signs of Hodgkin lymphoma (HL). Pericardial involvement can lead to pericardial friction rub and pericardial effusion. The professional should listen to the patient's heart for the sounds that characterize these conditions. The patient may demonstrate itchy skin lesions, but this would not take priority over heart sounds. Familial DNA testing would not be a priority. Anemia accompanies many healthcare conditions and so would be nonspecific for HL.

PTS: 1

DIF: Cognitive Level: Applying

MULTIPLE RESPONSE

1. Which classic clinical manifestations are symptoms of infectious mononucleosis (IM)? (*Select all that apply.*)
 - a. Lymph node enlargement
 - b. Hepatitis
 - c. Pharyngitis
 - d. Edema in the area of the eyes
 - e. Fever

ANS: A, C, E

At the time of diagnosis, the individual usually has the classic triad of symptoms: fever, pharyngitis, and lymphadenopathy of the cervical lymph nodes. The triad does not include hepatitis or orbital edema.

PTS: 1

DIF: Cognitive Level: Remembering

2. Early detection of acute leukemia would include which symptoms? (*Select all that apply.*)
 - a. Dizziness
 - b. Paresthesia
 - c. Anorexia
 - d. Bruising
 - e. Bone pain

ANS: C, D, E

Signs and symptoms related to bone marrow depression include fatigue caused by anemia, bleeding resulting from thrombocytopenia (reduced numbers of circulating platelets), and fever caused by infection. Anorexia can occur in all varieties of acute leukemia and is associated with weight loss. Pain in the bones and joints is thought to result from leukemia infiltration with secondary stretching of the periosteum. The other options are not generally associated with acute leukemia.

PTS: 1

DIF: Cognitive Level: Remembering

3. The student studying pathophysiology learns which facts about leukemias? (*Select all that apply.*)

- a. A single progenitor cell undergoes a malignant change.
- b. Leukemia is a result of uncontrolled cellular proliferation.
- c. Bone marrow becomes overcrowded.
- d. Leukocytes are under produced.
- e. Hematopoietic cell production is decreased.

ANS: A, B, C, E

In the leukemias, a single progenitor cell undergoes malignant transformation. The common feature of all forms of leukemia is an uncontrolled proliferation of malignant leukocytes, causing an overcrowding of bone marrow and decreased production and function of normal hematopoietic cells.

PTS: 1 DIF: Cognitive Level: Remembering

4. The two major forms of leukemia, acute and chronic, are classified by which criteria? (*Select all that apply.*)
- a. Predominant cell type
 - b. Rate of progression
 - c. Age of individual when cells differentiation occurs
 - d. Stage of cell development when malignancy first occurs
 - e. Serum level of leukocytes

ANS: A, B

The current classification of leukemia is based on (1) the predominant cell of origin (either myeloid or lymphoid) and (2) the rate of progression. A person's age, stage of cell development at the onset of malignancy, and serum blood levels of leukocytes are not part of the classification of leukemias.

PTS: 1 DIF: Cognitive Level: Remembering

5. What are the clinical manifestations of advanced non-African Burkitt lymphoma? (*Select all that apply.*)
- a. Abdominal swelling
 - b. Night sweats
 - c. Fever
 - d. Weight gain
 - e. Dementia

ANS: A, B, C

In non-African Burkitt lymphoma, the most common presentation is abdominal swelling. More advanced disease may exhibit night sweats, fever, and weight loss. Dementia is not associated with this disease.

PTS: 1 DIF: Cognitive Level: Remembering

6. A person has lab drawn and the white blood cell count is much higher than normal. The healthcare professional understands which facts about this finding? (*Select all that apply.*)
- a. The person has leukocytosis.
 - b. The person has leukopenia.

- c. The person may have an infection.
- d. The person may have a myeloproliferative disorder.
- e. The person needs a bone marrow biopsy.

ANS: A, C, D

Leukocytosis is a higher than normal white blood cell count and can indicate physiological stress, an infection, or a malignancy such as a myeloproliferative disorder. Leukopenia is a lower than normal white cell count. Depending on the rest of the person's history and physical examination, a bone marrow biopsy may or may not be needed.

PTS: 1

DIF: Cognitive Level: Applying

7. A student is learning about the functions of leukocytes. What statements about these cells are correct? (*Select all that apply.*)
- a. Eosinophilia can result from parasitic infections.
 - b. Basophilia can be seen in hypersensitivity reactions.
 - c. Monocytosis is usually seen in acute infections.
 - d. Lymphocytosis occurs rapidly in bacterial infections.
 - e. Granulocytopenia can be a life-threatening condition.

ANS: A, B, E

Eosinophilia can occur from parasitic infections or ingestion/inhalation of toxic particles. Basophilia occurs in hypersensitivity reactions because of the release of histamine. Monocytosis occurs in chronic infections or in the later stage of other infections. Lymphocytosis occurs in chronic infections, leukemia, lymphoma, and viral infections. Granulocytosis can be life-threatening if the person's defenses are so inadequate that sepsis results.

PTS: 1

DIF: Cognitive Level: Applying

8. A student studying microbiology learns which facts about the Epstein-Barr virus (EBV)? (*Select all that apply.*)
- a. Causative organism for infectious mononucleosis
 - b. Rare mutation may be seen in Burkitt Lymphoma.
 - c. Implicated in some nasopharyngeal cancers
 - d. Is only seen along with rare non-Hodgkin lymphomas
 - e. Immunodeficiency can lead to EBV-positive neoplasms.

ANS: A, C, E

EBV has been implicated as a causative organism for infectious mononucleosis, Burkitt lymphoma, some rare non-Burkitt lymphomas, and nasopharyngeal cancer.

PTS: 1

DIF: Cognitive Level: Remembering

9. A patient has splenomegaly on physical examination. What does the healthcare professional understand about this condition? (*Select all that apply.*)
- a. It may be normal so nothing further needs to be done
 - b. The patient may have an acute infection.
 - c. Splenomegaly can lead to hepatic failure.
 - d. Tumors or cysts can cause splenomegaly.

e. Some infiltrative processes can cause it.

ANS: B, D, E

While splenomegaly may be normal in some persons, it should never be ignored and requires further investigation. Splenomegaly can be caused by acute inflammatory disorders, acute infection, congestive disorders (heart failure), infiltrative processes, and tumors or cysts. It does not specifically lead to hepatic failure.

PTS: 1

DIF: Cognitive Level: Remembering

Chapter 31: Alterations of Hematologic Function in Children

MULTIPLE CHOICE

1. What is the cause of polycythemia in the fetus?
 - a. Fetal hemoglobin has a greater affinity for oxygen as a result of diphosphoglycerate (DPG).
 - b. The fetus has a different hemoglobin structure of two α - and two γ -chains rather than two α - and two β -chains.
 - c. Increased erythropoiesis occurs in response to the hypoxic intrauterine environment.
 - d. The lungs of the fetus are undeveloped and unable to diffuse oxygen adequately to the pulmonary capillaries.

ANS: C

The hypoxic intrauterine environment stimulates erythropoietin production in the fetus. Fetal polycythemia is not the result of hemoglobin having greater affinity for oxygen, different hemoglobin structure, or undeveloped lungs.

PTS: 1

DIF: Cognitive Level: Remembering

2. Why does fetal hemoglobin have a greater affinity for oxygen than adult hemoglobin?
 - a. The fetus does not have its own oxygen supply and must rely on oxygen from the maternal vascular system.
 - b. The fetus has two γ -chains on the hemoglobin, rather than two β -chains as in the adult.
 - c. Fetal hemoglobin interacts less readily with diphosphoglycerate (DPG), which inhibits hemoglobin-oxygen binding.
 - d. Fetal hemoglobin production occurs in the vessels and liver rather than in the bone marrow as in the adult.

ANS: C

Fetal hemoglobin has greater affinity for oxygen than adult hemoglobin does because it interacts less readily with the enzyme, DPG, which inhibits hemoglobin-oxygen binding. The lack of independent oxygen supply, the type of chains on the hemoglobin, and the location of hemoglobin production do not impact fetal hemoglobin's ability to bind more readily to oxygen than do adult hemoglobin.

PTS: 1

DIF: Cognitive Level: Remembering

3. Which blood cell type is elevated at birth and through the preschool years, but decreases to adult levels afterward?
 - a. Monocytes
 - b. Platelets
 - c. Neutrophils

d. Lymphocytes

ANS: A

Only monocyte counts are high in the newborn and through the preschool years. After this time period, they decrease to adult levels.

PTS: 1

DIF: Cognitive Level: Remembering

4. In a full-term infant, the normal erythrocyte life span is _____ days.
- 30 to 50
 - 60 to 80
 - 90 to 110
 - 120 to 130

ANS: B

In full-term infants, normal erythrocyte life span is 60 to 80 days.

PTS: 1

DIF: Cognitive Level: Remembering

5. What is the most common cause of insufficient erythropoiesis in children?
- Folic acid deficiency
 - Iron deficiency
 - Hemoglobin abnormality
 - Erythrocyte abnormality

ANS: B

Similar to the anemias of adulthood, ineffective erythropoiesis or premature destruction of erythrocytes causes the anemias of childhood. The most common cause of insufficient erythropoiesis is iron deficiency. The other options may be causes but are not common ones.

PTS: 1

DIF: Cognitive Level: Remembering

6. How does hemolytic disease of the fetus and newborn (HDFN) cause acquired congenital hemolytic anemia?
- HDFN develops when hypoxia or dehydration causes the erythrocytes to change shapes, which are then recognized as foreign and removed from circulation.
 - HDFN is an alloimmune disease in which the mother's immune system produces antibodies against fetal erythrocytes, which are recognized as foreign and removed from circulation.
 - HDFN develops when the polycythemia present in fetal life continues after birth, causing the excessive number of erythrocytes to be removed from circulation.
 - HDFN is an autoimmune disease in which the fetus's immune system produces antibodies against fetal erythrocytes, which are recognized as foreign and removed from circulation.

ANS: B

HDFN is an alloimmune disease in which maternal blood and fetal blood are antigenically incompatible, causing the mother's immune system to produce antibodies against fetal erythrocytes. Fetal erythrocytes that have been attacked by (or bound to) maternal antibodies are recognized as foreign or defective by the fetal mononuclear phagocyte system and are removed from the circulation by phagocytosis, usually in the fetal spleen. The other statements do not correctly explain this pathology.

PTS: 1 DIF: Cognitive Level: Remembering

7. How is erythroblastosis fetalis defined?
- Allergic disease in which maternal blood and fetal blood are antigenically incompatible
 - Alloimmune disease in which maternal blood and fetal blood are antigenically incompatible
 - Autoimmune disease in immature nucleated cells that are released into the bloodstream
 - Autosomal dominant hereditary disease

ANS: B

Erythroblastosis fetalis, also known as hemolytic disease of the fetus and newborn (HDFN), is an alloimmune disease in which maternal blood and fetal blood are antigenically incompatible, causing the mother's immune system to produce antibodies against fetal erythrocytes. This selection is the only option that accurately defines erythroblastosis fetalis.

PTS: 1 DIF: Cognitive Level: Remembering

8. A newborn displays pallor, tachycardia, and has a systolic murmur. What hemoglobin value does the healthcare professional correlate with these manifestations?
- 11 g/dL
 - 9 g/dL
 - 7 g/dL
 - 5 g/dL

ANS: D

When the hemoglobin falls below 5 g/dL, pallor, tachycardia, and systolic murmurs may occur.

PTS: 1 DIF: Cognitive Level: Understanding

9. A child has iron deficiency anemia. In addition to iron supplements, what else does the healthcare professional educate the parents on giving the child?
- Vitamin A
 - Magnesium
 - Vitamin C
 - Zinc

ANS: C

Vitamin C helps with absorption of iron, so the healthcare professional instructs the parents about giving it to the child with iron deficiency anemia. Vitamin A, magnesium, and zinc do not help promote the absorption of iron.

PTS: 1 DIF: Cognitive Level: Understanding

10. Which mother does the healthcare professional prepare to administer Rh immune globulin (Rho-GAM) to?
- Is Rh-positive and the fetus is Rh-negative
 - Is Rh-negative and the fetus is Rh-positive
 - Has type A blood and the fetus has type O
 - Has type AB blood and the fetus has type B

ANS: B

Hemolytic disease of the fetus and newborn (HDFN) can occur only if antigens on fetal erythrocytes differ from antigens on maternal erythrocytes. Maternal–fetal incompatibility exists only if the mother and fetus differ in ABO blood type or if the fetus is Rh-positive and the mother is Rh-negative. The healthcare professional would plan to administer Rho-GAM to the mother who is Rh-negative whose baby is Rh positive.

PTS: 1 DIF: Cognitive Level: Applying

11. When diagnosed with hemolytic disease of the fetus and newborn (HDFN), why does the newborn develop hyperbilirubinemia after birth but not in utero?
- Excretion of unconjugated bilirubin through the placenta into the mother's circulation is no longer possible.
 - Hemoglobin does not breakdown into bilirubin in the intrauterine environment.
 - The liver of the fetus is too immature to conjugate bilirubin from a lipid-soluble to water-soluble form.
 - The destruction of erythrocytes producing bilirubin is greater after birth.

ANS: A

Hyperbilirubinemia occurs in the neonate after birth because excretion of lipid-soluble unconjugated bilirubin through the placenta is no longer possible. HDFN is not related to hemoglobin failing to breakdown, an immature liver, or destruction of erythrocytes being greater after birth.

PTS: 1 DIF: Cognitive Level: Remembering

12. The healthcare professional is caring for a woman whose baby died of hydrops fetalis. How does the professional explain this condition to a student?
- Inherited condition where the RBC skeletal membrane is abnormal
 - Hyperbilirubinemia that occurs shortly after birth and can affect the brain
 - Hemolytic disease of the fetus and newborn
 - Severe intrauterine anemia that leads to edema of the entire body

ANS: D

Fetuses with hydrops fetalis who do not survive anemia in utero are usually stillborn with gross edema in the entire body. The inherited abnormal RBC skeletal membrane is called spherocytosis. The hyperbilirubinemia is known as icterus gravis neonatorum. Erythroblastosis fetalis is another name for hemolytic disease of the fetus and newborn.

PTS: 1 DIF: Cognitive Level: Understanding

13. What is the name of the disorder in which levels of bilirubin remain excessively high in the newborn and are deposited in the brain?
- Kernicterus
 - Icterus neonatorum
 - Jaundice
 - Icterus gravis neonatorum

ANS: A

Without replacement transfusions, during which the child receives Rh-negative erythrocytes, the bilirubin is deposited in the brain, a condition called *kernicterus*. This is the only condition where bilirubin is deposited in the brain.

PTS: 1 DIF: Cognitive Level: Remembering

14. An infant was born with hemolytic disease of the fetus and newborn (HDFN). What treatment does the healthcare professional anticipate for this baby?
- Administration of intravenous fluids to dilute the blood
 - Replacement transfusion of Rh-positive blood not contaminated with anti-Rh antibodies
 - Performance of a splenectomy to prevent the destruction of abnormal erythrocytes
 - Replacement transfusion of Rh-negative erythrocytes

ANS: B

If antigenic incompatibility of the mother's erythrocytes is not discovered in time to administer Rh immunoglobulin and the child is born with HDFN, then the treatment consists of exchange transfusions in which the neonate's blood is replaced with new Rh-positive blood that is not contaminated with anti-Rh antibodies. This treatment is administered during the first 24 hours of extrauterine life to prevent kernicterus. Kernicterus is not prevented by diluting the blood with IV fluids, splenectomy, or by giving Rh-negative blood.

PTS: 1 DIF: Cognitive Level: Remembering

15. The healthcare professional explains to a student that glucose 6-phosphate dehydrogenase (G6PD) deficiency is what type of inherited disorder?
- X-linked dominant
 - X-linked recessive
 - Autosomal dominant
 - Autosomal recessive

ANS: B

G6PD deficiency is an inherited, X-linked recessive disorder.

PTS: 1 DIF: Cognitive Level: Understanding

16. A healthcare professional is teaching a community group about inherited disorders. What pattern of inheritance does the professional describe for sickle cell disease?
- Inherited X-linked recessive disorder

- b. Inherited autosomal recessive disorder
- c. Disorder initiated by hypoxemia and acidosis
- d. Disorder that is diagnosed equally in men and women

ANS: B

Sickle cell disease is an inherited autosomal recessive disorder. Sickling is an occasional, intermittent phenomenon that can be triggered or sustained by one or more of these stressors: decreased oxygen tension (PO_2) of the blood (hypoxemia), increased hydrogen ion concentration in the blood (decreased pH), increased plasma osmolality, decreased plasma volume, and low temperature. However, this does not describe the inheritance pattern.

PTS: 1 DIF: Cognitive Level: Understanding

17. Hemoglobin S (HbS) is formed in sickle cell disease as a result of which process?
- a. Deficiency in glucose 6-phosphate dehydrogenase (G6PD) that changes hemoglobin A (HbA) to HbS.
 - b. Genetic mutation in which two amino acids (histidine and leucine) are missing.
 - c. Genetic mutation in which one amino acid (glutamate) is replaced by another (valine).
 - d. Autoimmune response in which one amino acid (proline) is detected as an antigen by abnormal immunoglobulin G (IgG).

ANS: C

HbS is formed by a genetic mutation in which one amino acid (valine) replaces another (glutamic acid). G6PD deficiency is the most common RBC disorder in which RBCs are not protected against oxidative stress. HbS is not formed as the result of an autoimmune process.

PTS: 1 DIF: Cognitive Level: Remembering

18. A child has sickle cell disease (SCD). What treatment or therapy does the healthcare professional discuss with the parents and child?
- a. Hydroxyurea
 - b. Low-dose daily aspirin
 - c. Heparin injections
 - d. Genetic testing

ANS: A

A common therapy for sickle cell disease is hydroxyurea which is an inhibitor of DNA synthesis. It increases HbF synthesis, which decreases the proportion of HbS. Aspirin is not used as the potential blood loss could worsen SCD. The same is true of heparin, plus blood clotting is not the major issue in the disorder. Genetic testing would not be used as a treatment or therapy.

PTS: 1 DIF: Cognitive Level: Understanding

19. Which manifestations of vasoocclusive crisis are associated with sickle cell disease (SCD) in children?
- a. Atelectasis and pneumonia
 - b. Edema of the hands and feet
 - c. Stasis ulcers of the hands, ankles, and feet

d. Splenomegaly and hepatomegaly

ANS: B

Symmetric, painful swelling of the hands and feet (hand-foot syndrome) caused by infarction in the small vessels of the extremities is often the initial manifestation of SCD in children. Acute chest syndrome manifests with cough, fever, and lung infiltrates and has a high mortality rate. Splenomegaly occurs in sequestration crises. Stasis ulcers are not a typical finding.

PTS: 1

DIF: Cognitive Level: Remembering

20. A couple who both carry the sickle cell trait wish to have children. What does the healthcare professional tell them is the chance that each pregnancy will result in a child who has sickle cell disease (SCD)?
- 20%
 - 25%
 - 33%
 - 50%

ANS: B

A 25% chance exists with each pregnancy that a child born to two parents with sickle cell trait will have SCD. Genetic counseling enables people with SCD or with the sickle cell trait to make informed decisions about transmitting this genetic disorder to their offspring.

PTS: 1

DIF: Cognitive Level: Understanding

21. A patient has microcytic, hypochromic anemia. Which type of treatment or procedure does the healthcare professional discuss as a potential cure with the patient?
- Cord blood transplantation
 - Scheduled infusion of gamma globulins
 - Massive blood transfusions
 - Repeated injections of Rho-GAM

ANS: A

Microcytic, hypochromic anemia is one manifestation of thalassemia. The only definitive cures for this disorder are allogeneic hematopoietic stem cell transplantation (HSCT) from a matched family or unrelated donor or cord blood transplantation from a related donor. Gamma globulins protect the body against infectious diseases. Blood transfusions can be used to correct low hemoglobin. Rho-GAM is used in postpartum women who are Rh-negative after delivering an Rh-positive baby to prevent development of maternal antibodies against the baby's blood.

PTS: 1

DIF: Cognitive Level: Applying

22. A patient has thalassemia major. After receiving multiple blood transfusions over the last several months, what complication does the healthcare professional assess the patient for?
- Hemochromatosis
 - Iron deficiency anemia
 - Vitamin C depletion
 - Rh autoimmunity

ANS: A

A complication of multiple blood transfusions is hemochromatosis (iron overload) which is a major cause of death in these patients. Iron deficiency anemia does not occur. Vitamin C depletion does not occur with transfusions. Rh autoimmunity is related to pregnant women and not blood transfusions.

PTS: 1

DIF: Cognitive Level: Understanding

23. The alpha- and beta-thalassemias are considered what types of inherited disorder?
- Autosomal recessive
 - Autosomal dominant
 - X-linked recessive
 - X-linked dominant

ANS: A

The alpha- and beta-thalassemias are inherited autosomal recessive disorders.

PTS: 1

DIF: Cognitive Level: Remembering

24. Hemophilia B is caused by a deficiency of which clotting factor?
- V
 - VIII
 - IX
 - X

ANS: C

Only factor IX deficiency causes hemophilia B (Christmas disease). Factor VIII causes hemophilia A or classic hemophilia. Elimination of coagulation factor IX leads to a very severe form of hemophilia A. Deficiency of factor V can lead to a tendency for hemorrhage but can also contain mutations that lead to thrombosis.

PTS: 1

DIF: Cognitive Level: Remembering

25. A student asks the professor why hemophilia A is seen mostly in men. The professor explains that hemophilia A is considered to be what type of inherited disorder?
- Autosomal dominant
 - Autosomal recessive
 - X-linked recessive
 - X-linked dominant

ANS: C

Hemophilia A (classic hemophilia) is inherited as an X-linked recessive disorder. That means that the genes for this disorder are carried on the X chromosome. In men, a single copy of the altered gene causes the condition. Females are carriers.

PTS: 1

DIF: Cognitive Level: Remembering

26. Which disease is an autosomal dominant inherited hemorrhagic disease?
- Hemophilia A

- b. von Willebrand disease
- c. Christmas disease
- d. Hemophilia B

ANS: B

The bleeding disorder, von Willebrand disease, usually results from an inherited autosomal dominant trait; however, some cases demonstrate an autosomal recessive or compound heterozygous pattern. The pattern of inheritance depends on the type of mutation that is present.

PTS: 1 DIF: Cognitive Level: Remembering

27. A patient has primary immune thrombocytopenic purpura (ITP) and is hospitalized after a bleeding episode. What treatment does the healthcare provider anticipate being ordered for this patient?
- a. Blood transfusions
 - b. Infusion of IVIG
 - c. Anticoagulants
 - d. Large doses of folic acid

ANS: B

ITP is an autoimmune disorder of platelet consumption. In cases of bleeding, infusions of IV immune globulin are preferred with short bursts of steroids in severe disease. Blood transfusions will not be helpful; however platelet transfusions may be used. Anticoagulants would make the bleeding more dangerous for the patient. Folic acid does not help treat the underlying pathophysiology or relieve symptoms.

PTS: 1 DIF: Cognitive Level: Understanding

28. When does fetal erythrocyte production shift from the liver to the bone marrow?
- a. Fourth month of gestation
 - b. Fifth month of gestation
 - c. Eighth month of gestation
 - d. At birth

ANS: B

By the fifth month of gestation, hematopoiesis begins to occur in the bone marrow and increases rapidly until hematopoietic (red) marrow fills the entire bone marrow space. By the time of delivery, the bone marrow is the only significant site of hematopoiesis.

PTS: 1 DIF: Cognitive Level: Remembering

29. A healthcare professional educates parents to monitor their child's dietary intake for sufficient iron during which period of time as the *priority*?
- a. Between 2 months and 1 year
 - b. Between 6 months and 2 years
 - c. Between 12 months and 3 years
 - d. Between 18 months and 4 years

ANS: B

Iron deficiency anemia is the most common blood disorder of infancy and childhood, with the highest incidence occurring between 6 months and 2 years of age.

PTS: 1 DIF: Cognitive Level: Understanding

30. A patient has leukemia. The healthcare professional explains to a patient about the significance of hyperdiploidy. What statement by the professional is *most* accurate?
- It indicates a good prognosis.
 - It indicates a poor prognosis.
 - It limits treatment options.
 - Hyperdiploidy demonstrates remission.

ANS: A

Hyperdiploidy (increased number of chromosome copies) is associated with a good prognosis. The other options are incorrect regarding the significance of hyperdiploidy.

PTS: 1 DIF: Cognitive Level: Understanding

MULTIPLE RESPONSE

1. What are the common triggers for sickle cell crisis? (*Select all that apply.*)
- Fever
 - Infection
 - Dehydration
 - Alkalosis
 - Exposure to the cold

ANS: A, B, C, E

Crises can be prevented by avoiding fever, infection, acidosis, dehydration, constricting clothes, and exposure to cold.

PTS: 1 DIF: Cognitive Level: Remembering

2. A pediatric patient presents with pallor, fatigue, fever, petechiae, and purpura. What diagnostic testing does the healthcare professional help prepare the patient for? (*Select all that apply.*)
- Complete blood count
 - Renal function studies
 - Bone marrow biopsy
 - Chest x-ray
 - Joint fluid sampling

ANS: A, B, C, D

This child has manifestations of a leukemia. Since hemoglobin and platelets may be low and white cells may be very high, a complete blood count will be done. Renal failure occurs frequently in ALL so renal function studies will be ordered. A bone marrow biopsy will be done in order to differentiate the type of leukemia the child has. A chest x-ray will be helpful to evaluate the cause of the fever which could be from an infection. Joint aspiration is not needed.

PTS: 1

DIF: Cognitive Level: Remembering

Chapter 32: Structure and Function of the Cardiovascular and Lymphatic Systems

MULTIPLE CHOICE

1. Which statement made by a student indicates the healthcare professional needs to describe the pericardium again?
 - a. The pericardium is a double-walled membranous sac that encloses the heart.
 - b. It is made up of connective tissue and a surface layer of squamous cells.
 - c. The pericardium protects the heart against infection and inflammation from the lungs and pleural space.
 - d. It contains pain and mechanoreceptors that can elicit reflex changes in blood pressure and heart rate.

ANS: B

The pericardium is made up of a surface layer of mesothelium over a thin layer of connective tissue. The healthcare professional would need to re-explain if the student stated the pericardium is made up of connective tissue and a layer of squamous cells. The other statements are accurate.

PTS: 1

DIF: Cognitive Level: Evaluating

2. Which cardiac chambers have the thinnest wall and why?
 - a. The right and left atria; they are low-pressure chambers that serve as storage units and conduits for blood.
 - b. The right and left atria; they are not directly involved in the preload, contractility, or afterload of the heart.
 - c. The left ventricle; the mean pressure of blood coming into this ventricle is from the lung, which has a low pressure.
 - d. The right ventricle; it pumps blood into the pulmonary capillaries, which have a lower pressure compared with the systemic circulation.

ANS: A

The two atria have the thinnest walls because they are low-pressure chambers that serve as storage units and conduits for blood that is emptied into the ventricles. The ventricles have thicker walls in order to pump blood against resistance.

PTS: 1

DIF: Cognitive Level: Remembering

3. Which chamber of the heart endures the highest pressures?
 - a. Right atrium
 - b. Left atrium
 - c. Left ventricle
 - d. Right ventricle

ANS: C

Pressure is greatest in the left ventricle with a systolic range of 90 to 140 mmHg. The right ventricle is next with a systolic range of 15 to 28 mmHg, followed by the left and right atria, respectively.

PTS: 1 DIF: Cognitive Level: Remembering

4. What is the process that ensures mitral and tricuspid valve closure after the ventricles are filled with blood?
- Chordae tendineae relax, which allows the valves to close.
 - Increased pressure in the ventricles pushes the valves to close.
 - Trabeculae carneae contract, which pulls the valves closed.
 - Reduced pressure in the atria creates a negative pressure that pulls the valves closed.

ANS: B

During ventricular relaxation, the two atrioventricular valves open and blood flows from the higher pressure atria to the relaxed ventricles. With increasing ventricular pressure, these valves close and prevent backflow into the atria as the ventricles contract. The chordae tendineae attach the bottom end of the AV valves to the papillary muscles. The endocardium covers beamlike projections of muscle tissue, called trabeculae carneae. The valves are not pulled closed by reduced atrial pressure.

PTS: 1 DIF: Cognitive Level: Remembering

5. A student asks the healthcare professional to explain the function of the papillary muscles. What response by the professional is *best*?
- The papillary muscles close the semilunar valves.
 - These muscles prevent backward expulsion of the atrioventricular valves.
 - They open the atrioventricular valves.
 - The papillary muscles open the semilunar valves.

ANS: B

The papillary muscles are extensions of the myocardium that pull the cusps of the AV valves together and downward at the onset of ventricular contraction, thus preventing their backward expulsion into the atria. They do not close the semilunar valves or open the AV valves or semilunar valves.

PTS: 1 DIF: Cognitive Level: Understanding

6. During the cardiac cycle, why do the aortic and pulmonic valves close after the ventricles relax?
- Papillary muscles relax, which allows the valves to close.
 - Chordae tendineae contract, which pulls the valves closed.
 - Reduced pressure in the ventricles creates a negative pressure, which pulls the valves closed.
 - Blood fills the cusps of the valves and causes the edges to merge, closing the valves.

ANS: D

When the ventricles relax, blood fills the cusps and causes their free edges to meet in the middle of the vessel, closing the valve and preventing any backflow. The papillary muscles function in the tricuspid and mitral valves as do the chordae tendineae. Reduced pressure does not pull the valves closed.

PTS: 1 DIF: Cognitive Level: Remembering

7. Oxygenated blood flows through which vessel?
- Superior vena cava
 - Pulmonary veins
 - Pulmonary artery
 - Coronary veins

ANS: B

The four pulmonary veins, two from the right lung and two from the left lung, carry oxygenated blood from the lungs to the left side of the heart. All other veins carry deoxygenated blood. The superior vena cava returns deoxygenated blood from systemic circulation to the right atrium. The pulmonary arteries carry deoxygenated blood from the right side of the heart into the lungs.

PTS: 1 DIF: Cognitive Level: Remembering

8. A healthcare professional tells a student that a patient has lost atrial kick. What would the student expect to see when examining this patient?
- Improvement in atrial dysrhythmias
 - Increased blood pressure
 - Signs of decreased cardiac output
 - Elevations in serum troponin levels

ANS: C

Left atrial contraction, the *atrial kick*, provides a significant increase of blood to the left ventricle. This would help to increase cardiac output. With the loss of this atrial kick, the student would expect to find signs of decreased cardiac output such as decreased blood pressure or tachycardia. Loss of atrial kick would not improve dysrhythmias or increase serum troponin levels which usually indicate myocardial damage.

PTS: 1 DIF: Cognitive Level: Applying

9. Occlusion of the left anterior descending artery during a myocardial infarction would interrupt blood supply to which structures?
- Left and right ventricles and much of the interventricular septum
 - Left atrium and the lateral wall of the left ventricle
 - Upper right ventricle, right marginal branch, and right ventricle to the apex
 - Posterior interventricular sulcus and the smaller branches of both ventricles

ANS: A

The left anterior descending artery (LAD), also called the *anterior interventricular artery*, delivers blood to portions of the left and right ventricles and much of the interventricular septum. The circumflex artery supplies the left atrium and lateral wall of the left ventricle. The right coronary artery supplies the right ventricle and one of its branches is the right marginal branch. The interventricular sulcus and smaller branches of both ventricles are also supplied by the right coronary artery.

PTS: 1 DIF: Cognitive Level: Remembering

10. Where are the coronary ostia located?

- a. Left ventricle
- b. Aortic valve
- c. Coronary sinus
- d. Aorta

ANS: D

Coronary arteries receive blood through openings in the aorta, called the *coronary ostia*.

PTS: 1 DIF: Cognitive Level: Remembering

11. The coronary sinus empties into which cardiac structure?

- a. Right atrium
- b. Left atrium
- c. Superior vena cava
- d. Aorta

ANS: A

The cardiac veins empty only into the right atrium through another ostium, the opening of a large vein called the *coronary sinus*.

PTS: 1 DIF: Cognitive Level: Remembering

12. During the cardiac cycle, which structure directly delivers action potential to the ventricular myocardium?

- a. Sinoatrial (SA) node
- b. Atrioventricular (AV) node
- c. Purkinje fibers
- d. Bundle branches

ANS: C

Each cardiac action potential travels from the SA node to the AV node to the bundle of His (AV bundle), through the bundle branches, and finally to the Purkinje fibers and the ventricular myocardium, where the impulse is stopped.

PTS: 1 DIF: Cognitive Level: Remembering

13. A patient has a problem with Phase 0 of the cardiac cycle. What electrolyte imbalance would the healthcare professional associate most directly with this problem?

- a. Hyperkalemia

- b. Hyponatremia
- c. Hypercalcemia
- d. Hypomagnesemia

ANS: B

Phase 0 consists of depolarization and represents rapid sodium entry into the cell. A deficit of sodium could be a possible contributor. The other electrolyte disturbances would not be directly correlated to this problem.

PTS: 1

DIF: Cognitive Level: Understanding

14. A healthcare professional is caring for a patient who has a delay in electrical activity reaching the ventricle as seen on ECG. What ECG finding would the healthcare professional associate with this problem?
- a. A prolonged ST interval
 - b. Variability in measurement with heart rate
 - c. PR interval measuring 0.28 sec
 - d. A QRS complex measuring 0.08 sec

ANS: C

The PR interval is a measure of time from the onset of atrial activation to the onset of ventricular activation; it normally ranges from 0.12 to 0.20 sec. The PR interval represents the time necessary to travel from the sinus node through the atrium, the atrioventricular (AV) node, and the His–Purkinje system to activate ventricular myocardial cells. The measured PR of 0.28 sec is too long, signifying a delay in the conduction process from atrium to ventricle. The ST interval represents the time needed for ventricular depolarization. The QT interval is normally around 0.4 sec, but varies inversely with heart rate. The QRS measurement is within the normal range of less than or equal to 0.12 sec.

PTS: 1

DIF: Cognitive Level: Applying

15. The cardiac electrical impulse normally begins spontaneously in the sinoatrial (SA) node because of what reason?
- a. It has a superior location in the right atrium.
 - b. It is the only area of the heart capable of spontaneous depolarization.
 - c. It has rich sympathetic innervation via the vagus nerve.
 - d. It depolarizes more rapidly than other automatic cells of the heart.

ANS: D

The electrical impulse normally begins in the SA node because its cells depolarize more rapidly than other automatic cells at a rate of 60 to 100 beats/min. The SA node's location does not influence this activity. Other areas of the heart include the AV node and the Purkinje fibers. The vagus nerve causes the heart rate to slow as part of the parasympathetic nervous system.

PTS: 1

DIF: Cognitive Level: Remembering

16. What period follows depolarization of the myocardium and represents a period during which no new cardiac potential can be propagated?
- a. Refractory

- b. Hyperpolarization
- c. Threshold
- d. Sinoatrial (SA)

ANS: A

During the absolute refractory period, no new cardiac action potential can be initiated by a stimulus. The other options do not reflect the time period in which no stimulation will produce a new cardiac potential.

PTS: 1 DIF: Cognitive Level: Remembering

17. A patient has a disorder affecting ventricular depolarization. What ECG finding would the healthcare professional associate with this condition?
- a. Shortened PR interval
 - b. Prolonged QRS interval
 - c. QT interval variability
 - d. Absence of P waves

ANS: B

The QRS complex represents the sum of all ventricular muscle cell depolarizations. If a patient had ECG findings suggestive of problems with this activity, there would be prolongation of the QRS interval. The PR interval reflects the amount of time needed for the action potential to travel from the atrium to the ventricle. QT interval variability is normal. An absence of P waves would indicate a problem with the SA node.

PTS: 1 DIF: Cognitive Level: Understanding

18. What can shorten the conduction time of action potential through the atrioventricular (AV) node?
- a. Parasympathetic nervous system
 - b. Catecholamines
 - c. Vagal stimulation
 - d. Sinoatrial node (SA)

ANS: B

Catecholamines speed the heart rate, shorten the conduction time through the AV node, and increase the rhythmicity of the AV pacemaker fibers. The vagal nerve is part of the sympathetic nervous system and stimulation will decrease heart rate. The SA node is responsible for generating the electrical activity of the heart, but is not responsible for the time it takes for it to travel through the AV node.

PTS: 1 DIF: Cognitive Level: Remembering

19. A patient had a myocardial infarction that damaged the SA node, which is no longer functioning as the pacemaker of the heart. What heart rate would the healthcare provider expect the patient to have?
- a. 60 to 70 beats/min
 - b. 40 to 60 beats/min
 - c. 30 to 40 beats/min
 - d. 10 to 20 beats/min

ANS: B

If the SA node is damaged, then the AV node will become the heart's pacemaker at a rate of approximately 40 to 60 spontaneous depolarizations per minute. The SA node normally fires at a rate of 60 to 100 beats/min. The Purkinje fibers can function as the heart's pacemaker and will fire at a rate of around 40 beats/min.

PTS: 1

DIF: Cognitive Level: Remembering

20. What is the effect of epinephrine on β_3 receptors on the heart?
- Decreases coronary blood flow
 - Supplements the effects of both β_1 and β_2 receptors
 - Increases the strength of myocardial contraction
 - Prevents overstimulation of the heart by the sympathetic nervous system

ANS: D

β_3 receptors are found in the myocardium and coronary vessels. In the heart, stimulation of these receptors opposes the effects of β_1 - and β_2 -receptor stimulation and negative inotropic effect. Thus β_3 receptors may provide a safety mechanism that decreases myocardial contractility to prevent overstimulation of the heart by the sympathetic nervous system.

PTS: 1

DIF: Cognitive Level: Remembering

21. Where in the heart are the receptors for neurotransmitters located?
- Semilunar and atrioventricular (AV) valves
 - Endocardium and sinoatrial (SA) node
 - Myocardium and coronary vessels
 - Epicardium and AV node

ANS: C

Sympathetic neural stimulation of the myocardium and coronary vessels depends on the presence of adrenergic receptors, which specifically bind with neurotransmitters of the sympathetic nervous system. The β_1 receptors are found mostly in the heart, specifically the conduction system (AV and SA nodes, Purkinje fibers) and the atrial and ventricular myocardium, whereas the β_2 receptors are found in the heart and also on vascular smooth muscle. β_3 receptors are also found in the myocardium and coronary vessels. This selection is the only option that accurately identifies the location of the receptors for neurotransmitters.

PTS: 1

DIF: Cognitive Level: Remembering

22. What enables electrical impulses to travel in a continuous cell-to-cell fashion in myocardial cells?
- Sarcolemma sclerotic plaques
 - Intercalated disks
 - Trabeculae carneae
 - Bachmann bundles

ANS: B

The intercalated disks are thickened portions of the sarcolemma and enable electrical impulses to spread quickly in a continuous cell-to-cell (syncytial) fashion. A sarcolemma is a transparent sheath that surrounds nerve fibers. They are not subject to plaque buildup. The trabeculae carneae are beam-like projections of myocardial tissue. Bachmann bundles are part of the conduction system.

PTS: 1 DIF: Cognitive Level: Remembering

23. Within a physiologic range, what does an increase in left ventricular end-diastolic volume (preload) result in?
- a. Increase in force of contraction
 - b. Decrease in refractory time
 - c. Increase in afterload
 - d. Decrease in repolarization

ANS: A

This concept is expressed in the Frank-Starling law; the cardiac muscle, like other muscles, increases its strength of contraction when it is stretched. An inotropic substance would increase the force of contraction and consist of hormones, neurotransmitters, or medications, and do not include volume. Afterload is the force against which the heart must pump. A decrease in repolarization would affect electrical activity.

PTS: 1 DIF: Cognitive Level: Remembering

24. The healthcare professional explains to a student that the amount of volume of blood in the heart is directly related to the _____ of contraction.
- a. Pressure
 - b. Strength
 - c. Viscosity
 - d. Speed

ANS: B

As stated in the Frank-Starling law, the volume of blood in the heart at the end of diastole (the length of its muscle fibers) is directly related to the force (strength) of contraction during the next systole. This selection is the only option that accurately describes the relationship associated with the Frank-Starling law.

PTS: 1 DIF: Cognitive Level: Understanding

25. Pressure in the left ventricle must exceed pressure in which structure before the left ventricle can eject blood?
- a. Superior vena cava
 - b. Aorta
 - c. Inferior vena cava
 - d. Pulmonary veins

ANS: B

Pressure in the ventricle must exceed aortic pressure before blood can be pumped out during systole. The aorta is the only structure in which pressure must be less than the amount of blood in the left ventricle for ejection to occur.

PTS: 1 DIF: Cognitive Level: Remembering

26. A healthcare professional is caring for a patient who has continuous increases in left ventricular filling pressures. What disorder would the professional assess the patient for?
- Mitral regurgitation
 - Mitral stenosis
 - Pulmonary edema
 - Jugular vein distention

ANS: C

Pressure changes are important because increased left ventricular filling pressures back up into the pulmonary circulation, where they force plasma out through vessel walls, causing fluid to accumulate in lung tissues (pulmonary edema). Problems such as mitral regurgitation and mitral stenosis are valve problems, not directly related to this patient's situation. Jugular vein distention can be a sign of fluid overload.

PTS: 1 DIF: Cognitive Level: Applying

27. The resting heart rate in a healthy person is primarily under the control of which nervous system?
- Sympathetic
 - Parasympathetic
 - Somatic
 - Spinal

ANS: B

The resting heart rate in healthy individuals is primarily under the control of parasympathetic stimulation.

PTS: 1 DIF: Cognitive Level: Remembering

28. The Bainbridge reflex is thought to be initiated by sensory neurons in which cardiac location?
- Atria
 - Aorta
 - Sinoatrial (SA) node
 - Ventricles

ANS: A

The Bainbridge reflex causes changes in the heart rate after intravenous infusions of blood or other fluid. The changes in heart rate are thought to be caused by a reflex mediated by volume receptors found only in the atria that are innervated by the vagus nerve.

PTS: 1 DIF: Cognitive Level: Remembering

29. A healthcare professional cares for older adults in a skilled nursing facility. What should the professional assess for in these individuals related to cardiovascular functioning?

- a. Increased rate of falling and dizzy spells
- b. Improved exercise tolerance
- c. A gradual slowing of the heart rate
- d. Progressive ECG changes

ANS: A

The baroreceptor reflex is important in blood pressure control. Baroreceptor activity can decrease with age, slowing response to changes in blood pressure and posture. An older adult may not adjust rapidly to position changes, leading to falls and dizzy spells.

PTS: 1

DIF: Cognitive Level: Remembering

30. Reflex control of total cardiac output and total peripheral resistance is controlled by what mechanism?
- a. Parasympathetic stimulation of the heart, arterioles, and veins
 - b. Sympathetic stimulation of the heart, arterioles, and veins
 - c. Autonomic control of the heart only
 - d. Somatic control of the heart, arterioles, and veins

ANS: B

Reflex control of total cardiac output and peripheral resistance includes (1) sympathetic stimulation of the heart, arterioles, and veins; and (2) parasympathetic stimulation of the heart only. Neither autonomic nor somatic controls are involved in this process.

PTS: 1

DIF: Cognitive Level: Remembering

31. What is the most important negative inotropic agent?
- a. Norepinephrine
 - b. Epinephrine
 - c. Acetylcholine
 - d. Dopamine

ANS: C

Chemicals affecting contractility are called *inotropic agents*. The most important negative inotropic agent is acetylcholine released from the vagus nerve. The most important positive inotropic agents produced by the body are norepinephrine released from the sympathetic nerves that supply the heart and epinephrine released by the adrenal cortex. Other positive inotropes include thyroid hormone and dopamine.

PTS: 1

DIF: Cognitive Level: Remembering

32. The right lymphatic duct drains into which structure?
- a. Right subclavian artery
 - b. Right atrium
 - c. Right subclavian vein
 - d. Superior vena cava

ANS: C

The right lymphatic duct drains lymph into the right subclavian vein only.

PTS: 1 DIF: Cognitive Level: Remembering

33. A patient had a motor vehicle crash and suffered critical injuries to the brainstem. What physiological responses would the healthcare professional expect to see?
- Prolonged QRS segment
 - Shortened PR interval
 - Pulse and blood pressure changes
 - Fluid overload

ANS: C

The major cardiovascular control center is in the brainstem in the medulla with secondary areas in the hypothalamus, the cerebral cortex, the thalamus, and the complex networks of exciting or inhibiting interneurons (connecting neurons) throughout the brain. The brainstem specifically controls blood pressure and pulse, so a severe injury to this area would manifest with changes in blood pressure and pulse. Changes on the ECG and fluid overload would not occur due to this injury.

PTS: 1 DIF: Cognitive Level: Applying

34. What is an expected change in the cardiovascular system that occurs with aging?
- Arterial stiffening
 - Decreased left ventricular wall tension
 - Decreased aortic wall thickness
 - Arteriosclerosis

ANS: A

Arterial stiffening occurs with aging even in the absence of clinical hypertension. Aging is not responsible for the other conditions.

PTS: 1 DIF: Cognitive Level: Remembering

35. What is the major determinant of the resistance that blood encounters as it flows through the systemic circulation?
- Volume of blood in the systemic circulation
 - Muscle layer of the metarterioles
 - Muscle layer of the arterioles
 - Force of ventricular contraction

ANS: C

The muscle layer of the arterioles constricts or dilates depending on the stimulation it receives. The change in the diameter of the vessels determines the resistance to blood flow. Blood viscosity usually stays the same; however severe fluid loss can increase it, leading to an increase in resistance. This is not the major determinant however. The force of contraction does not determine resistance to flow.

PTS: 1 DIF: Cognitive Level: Remembering

36. What physical sign does the healthcare professional relate to the result of turbulent blood flow through a vessel?
- Increased blood pressure during periods of stress
 - Bounding pulse felt on palpation
 - Cyanosis observed on exertion
 - Murmur heard on auscultation

ANS: D

Where flow is obstructed, the vessel turns or blood flows over rough surfaces. The flow becomes *turbulent* with whorls or eddy currents that produce noise, causing a murmur to be heard on auscultation. Increased blood pressure during stress is the result of sympathetic nervous system stimulation. A bounding pulse usually indicates fluid overload. Cyanosis would relate to a decrease in gas exchange and oxygenation.

PTS: 1

DIF: Cognitive Level: Understanding

37. What is the major effect of a calcium channel blocker such as verapamil on cardiac contractions?
- Increases the rate of cardiac contractions
 - Decreases the strength of cardiac contractions
 - Stabilizes the rhythm of cardiac contractions
 - Stabilizes the vasodilation during cardiac contractions

ANS: B

The L-type, or long-lasting, channels are the predominant type of calcium channels and are the channels blocked by calcium channel-blocking drugs (verapamil, nifedipine, diltiazem). The major effect of these medications is to decrease the strength of cardiac contraction. These medications do not increase the rate of contractions or stabilize either rhythm of contractions or vessel response during contractions.

PTS: 1

DIF: Cognitive Level: Remembering

38. An early diastole peak caused by filling of the atrium from peripheral veins is identified by which intracardiac pressure?
- A wave
 - V wave
 - C wave
 - X descent

ANS: B

The V wave is an early diastolic peak caused by the filling of the atrium from the peripheral veins. The A wave is generated by atrial contraction. The C wave is a small pressure increase seen after the A wave in early systole. The X descent follows the A wave and is produced by the descent of the tricuspid valve ring and by the ejection of blood from both ventricles.

PTS: 1

DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. Which statements are *true* concerning the method in which substances pass between capillaries and the interstitial fluid? (*Select all that apply.*)
- a. Substances pass through junctions between endothelial cells.
 - b. Substances pass through pores or oval windows (fenestrations).
 - c. Substances pass between vesicles by active transport across the endothelial cell membrane.
 - d. Substances pass across the endothelial cell membrane by osmosis.
 - e. Substances pass through endothelial cell membranes by diffusion.

ANS: A, B, C, E

Substances pass between the capillary lumen and the interstitial fluid in several ways: (1) through junctions between endothelial cells, (2) through fenestrations in endothelial cells, (3) in vesicles moved by active transport across the endothelial cell membrane, or (4) by diffusion through the endothelial cell membrane.

PTS: 1

DIF: Cognitive Level: Remembering

Chapter 33: Alterations of Cardiovascular Function

MULTIPLE CHOICE

1. What is the initiating event that leads to the development of atherosclerosis?
 - a. Release of the inflammatory cytokines
 - b. Macrophages adhere to vessel walls.
 - c. Injury to the endothelial cells that line the artery walls
 - d. Release of the platelet-derived growth factor

ANS: C

Atherosclerosis begins with an injury to the endothelial cells that line the arterial walls. Possible causes of endothelial injury include the common risk factors for atherosclerosis, such as smoking, hypertension, diabetes, increased levels of low-density lipoprotein (LDL), decreased levels of high-density lipoprotein (HDL), and autoimmunity. The remaining options occur only after the endothelial cells are injured.

PTS: 1 DIF: Cognitive Level: Remembering

2. When endothelial cells are injured, what alteration contributes to atherosclerosis?
 - a. The release of toxic oxygen radicals that oxidize low-density lipoproteins (LDLs)
 - b. Cells are unable to make the normal amount of vasodilating cytokines.
 - c. Cells produce an increased amount of antithrombotic cytokines.
 - d. Cells develop a hypersensitivity to homocysteine and lipids.

ANS: B

Injured endothelial cells become inflamed and cannot make normal amounts of antithrombotic and vasodilating cytokines. They do not release toxic oxygen radicals or develop hypersensitivity to homocysteine and lipids.

PTS: 1 DIF: Cognitive Level: Remembering

3. Which factor is responsible for the hypertrophy of the myocardium associated with hypertension?
 - a. Increased norepinephrine
 - b. Adducin
 - c. Angiotensin II
 - d. Insulin resistance

ANS: C

Angiotensin II is responsible for the hypertrophy of the myocardium and much of the renal damage associated with hypertension. Increased SNS activity with norepinephrine leads to increases in heart rate and systemic vasoconstriction. Diabetes and glucose intolerance are risk factors for developing hypertension. Polymorphisms in some adducin proteins have been linked to hypertension but more study is needed.

PTS: 1 DIF: Cognitive Level: Remembering

4. What pathologic change occurs to the kidney's glomeruli as a result of hypertension?
- Compression of the renal tubules
 - Ischemia of the tubule
 - Increased pressure from within the tubule
 - Obstruction of the renal tubule

ANS: B

In the kidney, ischemia causes inflammation and dysfunction of the glomeruli and tubules. This leads to increased sodium retention. Neither the renal tubules are compressed nor do they generate increased pressure. There is no obstruction.

PTS: 1 DIF: Cognitive Level: Remembering

5. What effect does atherosclerosis have on the development of an aneurysm?
- Atherosclerosis causes ischemia of the intima.
 - It increases nitric oxide.
 - Atherosclerosis erodes the vessel wall.
 - It obstructs the vessel.

ANS: C

Atherosclerosis is a common cause of aneurysms because plaque formation erodes the vessel wall. Atherosclerosis does not lead to ischemia of the intima, increase nitric oxide, or obstruct the vessel.

PTS: 1 DIF: Cognitive Level: Remembering

6. Regarding the endothelium, what is the difference between healthy vessel walls and those that promote clot formation?
- Inflammation and roughening of the endothelium of the artery are present.
 - Hypertrophy and vasoconstriction of the endothelium of the artery are present.
 - Excessive clot formation and lipid accumulation in the endothelium of the artery are present.
 - Evidence of age-related changes that weaken the endothelium of the artery is present.

ANS: A

Atherosclerosis causes roughening of the intima of blood vessels, which subsequently leads to activation of the coagulation cascade. Clot promotion is not caused by vasoconstriction of the endothelium, or age-related changes that weaken the endothelium. This process occurs in the intima of the artery.

PTS: 1 DIF: Cognitive Level: Remembering

7. A healthcare professional is caring for four patients. Which patient does the professional assess for pulmonary emboli (PE) as the *priority*?
- Deep venous thrombosis
 - Endocarditis

- c. Valvular disease
- d. Left heart failure

ANS: A

Pulmonary emboli originate in the venous circulation (mostly from the deep veins of the legs) or in the right heart. While any patient can develop a PE, the patients with endocarditis, valvular disease, and left heart failure do not have as big a risk as the patient with the deep vein thrombosis.

PTS: 1 DIF: Cognitive Level: Understanding

8. Which factor can trigger an immune response in the bloodstream that may result in an embolus?
- a. Amniotic fluid
 - b. Fat
 - c. Bacteria
 - d. Air

ANS: A

Amniotic fluid displaces blood, thereby reducing oxygen, nutrients, and waste exchange; however, it also introduces antigens, cells, and protein aggregates that trigger inflammation, coagulation, and the immune response in the bloodstream. Fat, bacteria, and air emboli do not trigger an immune response.

PTS: 1 DIF: Cognitive Level: Remembering

9. Which statement best describes thromboangiitis obliterans (Buerger disease)?
- a. Inflammatory disorder of small- and medium-size arteries in the feet and sometimes in the hands
 - b. Vasospastic disorder of the small arteries and arterioles of the fingers and, less commonly, of the toes
 - c. Autoimmune disorder of the large arteries and veins of the upper and lower extremities
 - d. Neoplastic disorder of the lining of the arteries and veins of the upper extremities

ANS: A

Buerger disease is an inflammatory disease of the peripheral arteries. Inflammation, thrombus formation, and vasospasm can eventually occlude and obliterate portions of small- and medium-size arteries. The digital, tibial, and plantar arteries of the feet and the digital, palmar, and ulnar arteries of the hands are typically affected. Vasospasm in the small arteries and arterioles of the fingers and occasionally the toes describes Raynaud disease. It does not involve larger arteries and veins and it is not a neoplastic disease.

PTS: 1 DIF: Cognitive Level: Remembering

10. A patient has been diagnosed with Raynaud disease and asks for an explanation. What statement by the healthcare professional is *best*?
- a. Inflammatory disorder of small- and medium-size arteries in the feet and sometimes in the hands
 - b. Neoplastic disorder of the lining of the arteries and veins of the upper extremities

- c. Vasospastic disorder of the small arteries and arterioles of the fingers and, less commonly, of the toes
- d. Autoimmune disorder of the large arteries and veins of the upper and lower extremities

ANS: C

Attacks of vasospasm in the small arteries and arterioles of the fingers and, less commonly, of the toes characterize Raynaud phenomenon and Raynaud disease. The inflammatory disorder of small- and medium-size arteries in the feet and sometimes in the hands is Buerger disease. Reynaud disease is not neoplastic and does not involve large arteries and veins.

PTS: 1

DIF: Cognitive Level: Understanding

11. A patient who has lung cancer calls the clinic reports facial and neck swelling severe enough so that shirts no longer fit. What question by the healthcare professional there would be *most* appropriate?
- a. "Have you gained weight recently?"
 - b. "Are your feet and ankles swollen?"
 - c. "Does your voice sound hoarse?"
 - d. "When was your last chemotherapy?"

ANS: C

Patients with certain kinds of cancer (small cell and nonsmall cell cancers of the lung, and lymphoma) can develop superior vena cava syndrome (SVCS) which is a progressive occlusion of the superior vena cava. This leads to venous distention in the upper extremities and head. Other symptoms include hoarse voice, dyspnea, dysphagia, stridor, cough, and chest pain. The professional should ask about the other symptoms. A large weight gain would occur slowly. Asking about edema elsewhere would be a question if the patient denied any other symptoms of SVCS. The date of the last chemotherapy is not relevant.

PTS: 1

DIF: Cognitive Level: Applying

12. What term is used to identify when a cell is temporarily deprived of blood supply?
- a. Infarction
 - b. Ischemia
 - c. Necrosis
 - d. Inflammation

ANS: B

Ischemia is a local state in which cells are temporarily deprived of blood supply. Infarction is cell death due to lack of blood flow caused by an obstruction in a vessel. Necrosis is death of cells or tissue from any cause. Inflammation is a local response that leads to redness, warmth, swelling, pain, and possibly loss of function.

PTS: 1

DIF: Cognitive Level: Remembering

13. A person wishes to reduce the risk of developing coronary artery disease. This person has a normal lipid panel. What risk factor reduction would the healthcare professional advise for this person?

- a. Eating a low-fat diet
- b. Controlling the blood pressure
- c. Avoiding air pollution
- d. Moderate alcohol use

ANS: B

Hypertension is responsible for a twofold-to-threefold increased risk of atherosclerotic cardiovascular disease. Of the listed options, controlling blood pressure would have the greatest effect in reducing the risk of developing coronary artery disease. The person's lipid panel is already normal, so eating a low-fat diet is not the priority. Air pollution and ionizing radiation are considered novel risk factors. Although people should be advised to drink in moderation, alcohol is not a significant risk factor for coronary artery disease.

PTS: 1 DIF: Cognitive Level: Understanding

14. Nicotine increases atherosclerosis by the release of which neurotransmitter?
- a. Histamine
 - b. Nitric oxide
 - c. Angiotensin II
 - d. Epinephrine

ANS: D

Nicotine stimulates the release of catecholamines (e.g., epinephrine, norepinephrine), which increases the heart rate and causes peripheral vascular constriction. As a result, blood pressure increases, as do both cardiac workload and oxygen demand. Nicotine does not stimulate the release of histamine, nitric oxide or angiotensin II.

PTS: 1 DIF: Cognitive Level: Remembering

15. Which substance primarily contains cholesterol and protein?
- a. Very low-density lipoproteins (VLDLs)
 - b. Low-density lipoproteins (LDLs)
 - c. High-density lipoproteins (HDLs)
 - d. Triglycerides

ANS: B

LDLs contain primarily cholesterol and protein. VLDLs are primarily triglycerides and protein and HDLs are mainly phospholipids and proteins. Triglycerides are the major form of fat stored in the body.

PTS: 1 DIF: Cognitive Level: Remembering

16. Which elevated value may be protective of the development of atherosclerosis?
- a. Very low-density lipoproteins (VLDLs)
 - b. Low-density lipoproteins (LDLs)
 - c. High-density lipoproteins (HDLs)
 - d. Triglycerides

ANS: C

Low levels of HDL cholesterol are also a strong indicator of coronary risk, whereas high levels of HDLs may be more protective for the development of atherosclerosis than low levels of LDLs. Neither VLDLs nor elevated triglycerides are associated with a protective mechanism.

PTS: 1 DIF: Cognitive Level: Remembering

17. Which laboratory test is an indirect measure of atherosclerotic plaque?
- Homocysteine
 - Low-density lipoprotein (LDL)
 - Erythrocyte sedimentation rate (ESR)
 - C-reactive protein (CRP)

ANS: D

Highly sensitive CRP (hs-CRP) is an acute phase reactant or protein mostly synthesized in the liver and is an indirect measure of atherosclerotic plaque-related inflammation and plaque progression. High levels of homocysteine are considered a cardiac risk factor but not a measurement of atherosclerotic plaque. LDL is a type of lipid that confers risk with higher levels. The ESR is a nonspecific measure of inflammation.

PTS: 1 DIF: Cognitive Level: Remembering

18. Cardiac cells can withstand ischemic conditions and still return to a viable state for how many minutes?
- 10
 - 15
 - 20
 - 25

ANS: C

Cardiac cells remain viable for approximately 20 min under ischemic conditions. If blood flow is restored, then aerobic metabolism resumes, contractility is restored, and cellular repair begins. If the coronary artery occlusion persists beyond 20 min, then myocardial infarction (MI) occurs.

PTS: 1 DIF: Cognitive Level: Remembering

19. A patient reports chest pain that occurs most often during sleep. What treatment does the healthcare professional discuss with the patient?
- Treatment of obstructive sleep apnea
 - Short-acting nitroglycerin tablets
 - A low-dose aspirin regimen
 - Oral calcium channel blockers

ANS: D

Prinzmetal angina (also called *variant angina*) is chest pain attributable to transient ischemia of the myocardium that occurs unpredictably and almost exclusively at rest. The typical treatment for this condition is long-acting nitrites or calcium channel blockers. Treating sleep apnea, taking short-acting nitroglycerin, or taking low dose aspirin will not benefit the patient.

PTS: 1 DIF: Cognitive Level: Applying

20. A patient who had a myocardial infarction is going to cardiac rehabilitation where progressive exercise is monitored by health care professionals. When would this patient be most vulnerable to injury and complications?
- Between 5 and 9 days
 - Between 10 and 14 days
 - Between 15 and 20 days
 - Between 20 and 30 days

ANS: B

After a myocardial infarction, healing takes place in a graduated fashion. Within 10 to 14 days, a collagen matrix is deposited as the beginning of a scar that is initially weak, mushy, and vulnerable to reinjury. It is during this time period, as the patient feels better and increases activity, that the scar is most susceptible to injury from increasing stress.

PTS: 1

DIF: Cognitive Level: Remembering

21. A patient in the Emergency department is suspected of having a myocardial infarction (MI). The initial cardiac troponin 1 level was negative. What action by the healthcare professional is *best*?
- Prepare the patient for thrombolytic therapy.
 - Dismiss the patient because the lab was negative.
 - Schedule repeat lab within a few hours.
 - Give the patient oxygen and pain medication.

ANS: C

Several cardiac biomarkers exist including the most specific, cardiac troponin 1 (cTnI), cTnI begins to rise within 2 to 4 hours after cardiac injury, so if the initial result is normal, the test should be repeated within 6 to 9 hours and again at 12 to 24 hours. It is not known yet if the patient has had an MI so treatment with thrombolytic therapy would be premature. The patient should not be dismissed since the professional suspected an MI. The patient does need oxygen and pain medication (if pain is present) but that option is not directly related to the question.

PTS: 1

DIF: Cognitive Level: Applying

22. What electrocardiogram (ECG) change would the healthcare professional assess for when a patient's myocardial infarction extends through the myocardium from the endocardium to the epicardium?
- Prolonged QT interval
 - ST elevation
 - ST depression
 - Prolonged PR interval

ANS: B

Individuals with this pattern on an ECG usually have significant elevations in the ST segments and are categorized as having STEMI (ST segment elevation myocardial infarction). A prolonged QT interval can lead to dysrhythmias. A prolonged PR interval is a benign first degree AV block.

PTS: 1

DIF: Cognitive Level: Remembering

23. How does angiotensin II increase the workload of the heart after a myocardial infarction (MI)?
- By increasing the peripheral vasoconstriction
 - By causing dysrhythmias as a result of hyperkalemia
 - By reducing the contractility of the myocardium
 - By stimulating the sympathetic nervous system

ANS: A

Angiotensin II is released during myocardial ischemia and contributes to the pathogenesis of a myocardial infarction (MI) in several ways, including causing peripheral vasoconstriction and fluid retention. These homeostatic responses increase myocardial work and thus exacerbate the effects of the loss of myocyte contractility. Angiotensin II does not cause hyperkalemia and dysrhythmias; it does not reduce cardiac contractility, and it does not stimulate the SNS.

PTS: 1

DIF: Cognitive Level: Remembering

24. A healthcare provider is assessing a patient who has a pericardial effusion and notes a pulsus paradoxus. A student asks for an explanation of how this occurs. What description by the professional is *best*?
- Diastolic filling pressures of the right ventricle and reduction of blood volume in both ventricles
 - Blood ejected from the right atrium and reduction of blood volume in the right ventricle
 - Blood ejected from the left atrium and reduction of blood volume in the left ventricle
 - Diastolic filling pressures of the left ventricle and reduction of blood volume in all four heart chambers

ANS: D

Pulsus paradoxus means that the arterial blood pressure during expiration exceeds arterial pressure during inspiration by more than 10 mmHg. This clinical finding reflects impairment of diastolic filling of the left ventricle plus a reduction of blood volume within all four cardiac chambers.

PTS: 1

DIF: Cognitive Level: Understanding

25. A patient reports sudden onset of severe chest pain that radiates to the back and worsens with breathing and when lying down. What action by the healthcare professional is *most* appropriate?
- Prepare to assist with an immediate pericardiocentesis.
 - Inform the patient about the side effects of diuretics.
 - Facilitate the patient getting an immediate ECG.
 - Teach the patient about a course of antiinflammatory medications.

ANS: D

This patient has manifestations of acute pericarditis, which also include dysphagia, restlessness, irritability, anxiety, malaise, and weakness. The treatment is generally a course of nonsteroidal antiinflammatory medication. A pericardiocentesis would be used for a cardiac tamponade. The patient does not need an ECG or diuretics.

PTS: 1 DIF: Cognitive Level: Applying

26. A disproportionate thickening of the interventricular septum is the hallmark of which form of cardiomyopathy?
- Dystrophic
 - Hypertrophic
 - Restrictive
 - Dilated

ANS: B

Only hypertrophic obstructive cardiomyopathy is characterized by a thickening of the septal wall, which may cause outflow obstruction to the left ventricle outflow tract.

PTS: 1 DIF: Cognitive Level: Remembering

27. Amyloidosis, hemochromatosis, or glycogen storage disease usually causes which form of cardiomyopathy?
- Infiltrative
 - Restrictive
 - Septal
 - Hypertrophic

ANS: B

Restrictive cardiomyopathy may occur idiopathically or as a cardiac manifestation of systemic diseases, such as scleroderma, amyloidosis, sarcoidosis, lymphoma, and hemochromatosis, or a number of inherited storage diseases. This characterization is not true of the other forms of cardiomyopathy.

PTS: 1 DIF: Cognitive Level: Remembering

28. Which condition is a cause of acquired aortic regurgitation?
- Congenital malformation
 - Cardiac failure
 - Rheumatic fever
 - Coronary artery disease (CAD)

ANS: C

Rheumatic heart disease, bacterial endocarditis, syphilis, hypertension, connective tissue disorders (e.g., Marfan syndrome, ankylosing spondylitis), appetite suppressing medications, trauma, or atherosclerosis can cause acquired aortic regurgitation.

PTS: 1 DIF: Cognitive Level: Remembering

29. A patient in the clinic reports fever, arthralgia, a rash, and nosebleeds. What other information should the healthcare professional elicit from this patient?
- Family history of Marfan's disease
 - History of a recent bacterial infection
 - History of any recent chest trauma
 - Any illnesses in family members

ANS: B

These manifestations are characteristic of rheumatic fever and usually occur 1 to 5 weeks after a streptococcal infection of the nasopharynx. The professional should inquire about recent illnesses and infections. Other family members may or may not have been sick too, so this is not the best question. These symptoms are not seen after chest trauma or with Marfan syndrome.

PTS: 1

DIF: Cognitive Level: Applying

30. What is the most common cause of infective endocarditis?

- a. Virus
- b. Fungus
- c. Bacterium
- d. Rickettsiae

ANS: C

Infective endocarditis is a general term used to describe infection and inflammation of the endocardium—especially the cardiac valves. Bacteria are the most common cause of infective endocarditis, especially streptococci, staphylococci, or enterococci.

PTS: 1

DIF: Cognitive Level: Remembering

31. A patient is diagnosed with chronic obstructive pulmonary disease (COPD) and has elevated pulmonary vascular resistance. Which complication would the health care professional assess the patient for?

- a. Right heart failure
- b. Left heart failure
- c. Restrictive cardiomyopathy
- d. Hypertrophic cardiomyopathy

ANS: A

Right heart failure is most often caused by left heart failure, but if it occurs in isolation it is usually due to pulmonary conditions such as pulmonary hypertension, COPD, or cystic fibrosis. The professional would assess the patient for this condition at healthcare visits. Eventually the left side of the heart will fail if right-sided failure is left untreated. Restrictive cardiomyopathy is caused by infiltrative diseases. Hypertrophic cardiomyopathy is caused by hypertension.

PTS: 1

DIF: Cognitive Level: Applying

32. What cardiac pathologic condition contributes to ventricular remodeling?

- a. Left ventricular hypertrophy
- b. Right ventricular failure
- c. Myocardial ischemia
- d. Contractile dysfunction

ANS: C

Myocardial ischemia contributes to inflammatory, immune, and neurohumoral changes that mediate a process called *ventricular remodeling*.

PTS: 1 DIF: Cognitive Level: Remembering

33. In systolic heart failure, what effect does the renin-angiotensin-aldosterone system (RAAS) have on stroke volume?
- Increases preload and decreases afterload
 - Increases preload and increases afterload
 - Decreases preload and increases afterload
 - Decreases preload and decreases afterload

ANS: B

Activation of the RAAS increases preload through the effects of aldosterone secretion, a sequela of the RAAS activity. RAAS also increases afterload through vasoconstriction mediated by angiotensin II.

PTS: 1 DIF: Cognitive Level: Remembering

34. What is the cause of the dyspnea resulting from a thoracic aneurysm?
- Pressure on surrounding organs
 - Poor oxygenation
 - Formation of atherosclerotic lesions
 - Impaired blood flow

ANS: A

Clinical manifestations of an aneurysm depend on the location of the aneurysm. Pressure of a thoracic aneurysm on surrounding organs directly causes symptoms of dysphagia (difficulty in swallowing) and dyspnea (breathlessness). A thoracic aneurysm does not cause dyspnea through poor oxygenation, atherosclerotic lesions, or impaired blood flow.

PTS: 1 DIF: Cognitive Level: Remembering

35. Which statement is *true* concerning the cells' ability to synthesize cholesterol?
- Cell production of cholesterol is affected by the aging process.
 - Cells produce cholesterol only when dietary fat intake is low.
 - Most body cells are capable of producing cholesterol.
 - Most cholesterol produced by the cells is converted to the low-density form.

ANS: C

Although cholesterol can easily be obtained from dietary fat intake, most body cells can also manufacture cholesterol. It is not affected by aging nor do cells only produce cholesterol when dietary fat is low. Most is not converted to the low-density form.

PTS: 1 DIF: Cognitive Level: Remembering

36. What is the trigger for angina pectoris?
- Atherosclerotic lesions
 - Hyperlipidemia
 - Myocardial necrosis
 - Myocardial ischemia

ANS: D

Angina pectoris is chest pain caused by myocardial ischemia. Atherosclerotic lesions make angina more likely as vessel lumens narrow in coronary artery disease. High lipid levels are a risk factor for CAD. Myocardial necrosis is death of heart tissue and would be the consequence of ischemia that was not relieved.

PTS: 1

DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. Which information regarding fatty streaks does the pathophysiology student learn? (*Select all that apply.*)
- Fatty streaks progressively damage vessel walls.
 - Fatty streaks are capable of producing toxic oxygen radicals.
 - When present, inflammatory changes occur to the vessel walls.
 - Oxidized low-density lipoproteins (LDLs) are involved in their formation.
 - Fatty streaks are formed by killer T cells filled with oxidized LDLs.

ANS: A, B, C, D

The oxidized LDLs penetrate the intima of the arterial wall and are engulfed by macrophages. Macrophages filled with oxidized LDLs are called *foam*. Once these lipid-laden foam cells accumulate in significant amounts, they form a lesion called a *fatty streak*. Once formed, fatty streaks produce more toxic oxygen radicals and cause immunologic and inflammatory changes, resulting in progressive damage to the vessel wall. They are not formed by killer T cells.

PTS: 1

DIF: Cognitive Level: Remembering

2. What factors contribute to the development of orthostatic hypotension? (*Select all that apply.*)
- Altered body chemistry
 - Drug action of certain antihypertensive agents
 - Prolonged immobility
 - Effects of aging on postural reflexes
 - Any condition that produces volume overload

ANS: A, B, C, D

Orthostatic hypotension may be acute or chronic. Acute orthostatic hypotension (temporary type) may result from (1) altered body chemistry, (2) drug action (e.g., antihypertensives, antidepressants), (3) prolonged immobility caused by illness, (4) starvation, (5) physical exhaustion, (6) any condition that produces volume depletion (e.g., massive diuresis, potassium or sodium depletion), and (7) venous pooling (e.g., pregnancy, extensive varicosities of the lower extremities). Older adults are susceptible to this type of orthostatic hypotension, in which postural reflexes are slowed as part of the aging process. Volume overload would not produce orthostatic hypotension.

PTS: 1

DIF: Cognitive Level: Remembering

3. Which assessment findings would the health care professional correlate with aortic stenosis? (*Select all that apply.*)

- a. Jugular vein distention
- b. Bounding pulses
- c. Hypotension
- d. Angina
- e. Syncope

ANS: D, E

The classic manifestations of aortic stenosis are angina, syncope, and heart failure. None of the other options are associated with aortic stenosis.

PTS: 1 DIF: Cognitive Level: Remembering

4. A patient has infective endocarditis. Which risk factors should the healthcare professional assess this patient for? (*Select all that apply.*)
- a. Rheumatic fever
 - b. Intravenous drug use
 - c. Prosthetic heart valve
 - d. Aortic regurgitation
 - e. Heart valve disease

ANS: B, C, D, E

Risk factors for infective endocarditis include acquired valvular heart disease and valve replacements, intravenous drug abuse, long-term indwelling catheterization (e.g., for pressure monitoring, hyperalimentation, or hemodialysis), and recent cardiac surgery. Rheumatic fever is not considered a direct risk factor for infective endocarditis.

PTS: 1 DIF: Cognitive Level: Remembering

5. A person wishes to reduce the risk of developing varicose veins. What does the health care professional advise this person? (*Select all that apply.*)
- a. Avoid standing for long periods of time.
 - b. Maintain a healthy weight.
 - c. Drink plenty of fluids.
 - d. Wear compression stockings.
 - e. Choose a job that involves sitting.

ANS: A, B, D

Varicose veins result from incompetent valves, venous obstruction, muscle pump dysfunction, or a combination of these. Standing for prolonged periods of time and being overweight increase the hydrostatic pressure and lead to the characteristic remodeling of the vein. Wearing compression stockings can help by maintaining venous return from the legs. Drinking inadequate fluids is not a risk factor. Sitting for prolonged periods of time is a risk factor.

PTS: 1 DIF: Cognitive Level: Understanding

6. A person with diabetes mellitus does not realize that this disease contributes to coronary artery disease and asks the healthcare professional to explain. What information does the professional provide? (*Select all that apply.*)
- a. "High blood glucose directly attacks the heart cells."

- b. "Diabetes is associated with impaired lipid metabolism."
- c. "It can lead to more vasoconstriction in the blood vessels."
- d. "Diabetes can damage the inside of your blood vessel."
- e. "It causes inflammation and cells to clump together in the vessels."

ANS: B, C, D, E

Diabetes leads to endothelial damage, thickening of vessel walls, increased inflammation and leukocyte adhesion, increased thrombosis, glycation of vascular proteins, and decreased production of endothelial-derived vasodilators such as nitric oxide. Diabetes is also associated with dyslipidemia. High blood glucose does not directly attack the myocytes.

PTS: 1 DIF: Cognitive Level: Understanding

7. A healthcare professions student learns which facts about mitral valve stenosis? (*Select all that apply.*)
- a. It is an uncommon valvular disorder.
 - b. It mostly affects women.
 - c. May result from genetic factors
 - d. Most cases are asymptomatic.
 - e. Symptoms tend to be vague.

ANS: B, C, D, E

Mitral valve stenosis is the most common valve disorder in the United States and affects predominantly women. It may be related to genetic or environmental disruption in valvular development in early pregnancy. Most cases are asymptomatic and require no treatment. Symptoms, when they occur, tend to be vague and puzzling.

PTS: 1 DIF: Cognitive Level: Understanding

Chapter 34: Alterations of Cardiovascular Function in Children

MULTIPLE CHOICE

1. Most cardiovascular developments occur between which weeks of gestation?
 - a. Fourth and seventh weeks
 - b. Eighth and tenth weeks
 - c. Twelfth and fourteenth weeks
 - d. Fifteenth and seventeenth weeks

ANS: A

Cardiogenesis begins at approximately 3 weeks' gestation; however, most cardiovascular development occurs between 4 and 7 weeks' gestation.

PTS: 1 DIF: Cognitive Level: Remembering

2. The presence of the foramen ovale in a fetus allows what to occur?
 - a. Right-to-left blood shunting
 - b. Left-to-right blood shunting
 - c. Blood flow from the umbilical cord
 - d. Blood flow to the lungs

ANS: A

The nonfused septum secundum and ostium secundum result in the formation of a flapped orifice known as the *foramen ovale*, which allows the right-to-left shunting necessary for fetal circulation. The foramen ovale is not involved in left-to-right shunting, blood flow from the umbilical cord, or blood flow to the lungs.

PTS: 1 DIF: Cognitive Level: Remembering

3. The student studying pathophysiology learns which fact about circulation at birth?
 - a. Systemic resistance and pulmonary resistance fall.
 - b. Gas exchange shifts from the placenta to the lung.
 - c. Systemic resistance falls and pulmonary resistance rises.
 - d. Systemic resistance and pulmonary resistance rise.

ANS: B

At birth, gas exchange shifts from the placenta to the lungs. Systemic vascular resistance increases after birth and pulmonary resistance decreases.

PTS: 1 DIF: Cognitive Level: Remembering

4. When does systemic vascular resistance in infants begin to increase?
 - a. One month before birth
 - b. During the beginning stage of labor
 - c. One hour after birth

- d. Once the placenta is removed from circulation

ANS: D

The low-resistance placenta is removed from circulation, which causes an immediate increase in systemic vascular resistance to approximately twice of that before birth.

PTS: 1 DIF: Cognitive Level: Remembering

5. Which event triggers congenital heart defects that cause acyanotic congestive heart failure?
- Right-to-left shunts
 - Left-to-right shunts
 - Obstructive lesions
 - Mixed lesions

ANS: B

Congenital heart defects that cause acyanotic congestive heart failure usually involve left-to-right shunts. Right-to-left shunting causes hypoxemia and cyanosis. Obstructive and mixed lesions vary in their presentation, but obstructive lesions do not have shunting.

PTS: 1 DIF: Cognitive Level: Remembering

6. Older children with an unrepaired cardiac septal defect experience cyanosis because of which factor?
- Right-to-left shunts
 - Left-to-right shunts
 - Obstructive lesions
 - Mixed lesions

ANS: A

Older children who have an unrepaired septal defect with a left-to-right shunt may become cyanotic because of pulmonary vascular changes secondary to increased pulmonary blood flow. Left-to-right shunts are usually acyanotic. Obstructive and mixed lesions vary in their presentation but obstructive lesions do not include shunting.

PTS: 1 DIF: Cognitive Level: Remembering

7. A baby has been born with Down syndrome. What congenital heart defect does the healthcare professional assess this baby for?
- Coarctation of the aorta (COA)
 - Tetralogy of Fallot
 - Atrial septal defect (ASD)
 - Ventricular septal defect (VSD)

ANS: D

Congenital heart defects that are related to Down syndrome include VSD and ASVD. COA is associated with Turner syndrome. Tetralogy of Fallot does not have a strong association with chromosomal defects. An ASD is often seen in Cri du Chat syndrome, Turner syndrome, or Klinefelter variant syndrome.

PTS: 1

DIF: Cognitive Level: Understanding

8. An infant has a continuous machine-type murmur best heard at the left upper sternal border throughout systole and diastole. The healthcare professional suspects a congenital heart disorder. What other assessment finding is inconsistent with the professional's knowledge about this disorder?
- Bounding pulses
 - Active precordium
 - Thrill on palpation
 - Signs of heart failure

ANS: C

A machine-type murmur is a classic sign of a PDA. Other manifestations include bounding pulses, an active precordium, a thrill on chest palpation, and signs of pulmonary overcirculation.

PTS: 1

DIF: Cognitive Level: Understanding

9. An infant has a crescendo-decrescendo systolic ejection murmur located between the second and third intercostal spaces along the left sternal border. The healthcare professional suspects an atrial septal defect (ASD). For what other manifestation does the healthcare professional assess to confirm the suspicion?
- Wide, fixed splitting of the second heart sound
 - Loud, harsh holosystolic murmur
 - Cyanosis with crying and feeding
 - Rapid deterioration with acidosis

ANS: A

A wide fixed splitting of the second heart sound is also characteristic of ASD, reflecting volume overload to the RV, causing prolonged ejection time and delay of pulmonic valve closure. A loud, harsh holosystolic murmur is consistent with a ventricular septal defect. Cyanosis with crying and feeding (exertion) are classic "tet spells" associated with Tetralogy of Fallot. Rapid deterioration with acidosis, hypotension, and shock can accompany coarctation of the aorta.

PTS: 1

DIF: Cognitive Level: Understanding

10. An infant has a loud, harsh, holosystolic murmur and systolic thrill that can be detected at the left lower sternal border that radiates to the neck. These clinical findings are consistent with which congenital heart defect?
- Atrial septal defect (ASD)
 - Ventricular septal defect (VSD)
 - Patent ductus arteriosus (PDA)
 - Atrioventricular canal (AVC) defect

ANS: B

On physical examination of a child with a VSD, a loud, harsh, holosystolic murmur and systolic thrill can be detected at the left lower sternal border. An ASD is accompanied by a crescendo-decrescendo systolic ejection murmur located between the second and third intercostal spaces along the left sternal border. The PDA would present with a machine-like murmur. Physical findings in an AVC defect are similar to those found in individuals with VSDs with the addition of a holosystolic murmur radiating to the back and apex, reflecting mitral regurgitation.

PTS: 1 DIF: Cognitive Level: Remembering

11. Where can coarctation of the aorta (COA) be located?
- Exclusively on the aortic arch
 - Proximal to the brachiocephalic artery
 - Between the origin of the aortic arch and the bifurcation of the aorta in the lower abdomen
 - Between the origin of the aortic arch and the origin of the first intercostal artery

ANS: C

COA can occur anywhere between the origin of the aortic arch and the bifurcation of the aorta in the lower abdomen.

PTS: 1 DIF: Cognitive Level: Remembering

12. A parent brings a 10-year-old child to the clinic and reports a mottled appearance to the skin and legs cramps when the child is in physical education class. What diagnostic testing or treatment does the healthcare professional prepare the family for?
- Immediate cardiac catheterization
 - Administration of prostaglandin
 - Multiple-stage surgical correction
 - An echocardiogram

ANS: D

Clinical manifestations of coarctation of the aorta include hypertension noted in the upper extremities with decreased or absent pulses in the lower extremities. Children may also have cool mottled skin and occasionally experience leg cramps during exercise. An echocardiogram would be used to diagnose the condition. In an older child, percutaneous balloon dilation angioplasty with or without stent implantation may be a good treatment option, however; an immediate cardiac catheterization is not needed at this time. Prostaglandin is used to stabilize a newborn prior to surgical correction is typically straightforward unless the COA is part of another condition. The healthcare professional would educate the family on the echocardiogram.

PTS: 1 DIF: Cognitive Level: Applying

13. What is the initial manifestation of aortic coarctation observed in a neonate?
- Heart failure (HF)
 - Cor pulmonale
 - Pulmonary hypertension
 - Cerebral hypertension

ANS: A

Initially, the newborn usually exhibits symptoms of HF. Cor pulmonale, pulmonary hypertension, and cerebral hypertension are not associated with coarctation of the aorta.

PTS: 1 DIF: Cognitive Level: Remembering

14. A parent asks the healthcare professional to explain why a child diagnosed with Tetralogy of Fallot squats frequently. What explanation by the professional is *best*?
- Reduces the chest pain
 - Controls dizziness
 - Relieves hypoxia
 - Improves headache

ANS: C

Squatting is a spontaneous compensatory mechanism used by older children with Tetralogy of Fallot to alleviate hypoxic spells. Squatting and its variants increase systemic resistance while decreasing venous return to the heart from the inferior vena cava. Squatting does not reduce chest pain, control dizziness, or improve headaches.

PTS: 1 DIF: Cognitive Level: Understanding

15. An infant diagnosed with a small patent ductus arteriosus (PDA) would likely exhibit which symptom?
- Intermittent murmur
 - Lack of symptoms
 - Rapid decompensation
 - Triad of congenital defects

ANS: B

Infants with a small PDA usually remain asymptomatic. The infant may only have a murmur, but should be watched carefully in the future for worsening of the condition.

PTS: 1 DIF: Cognitive Level: Remembering

16. A newborn has chronic sustained hypertension but otherwise appears healthy. What diagnostic testing does the healthcare professional facilitate as the *priority*?
- Cardiac catheterization
 - Echocardiogram
 - Serum electrolytes
 - Renal function studies

ANS: D

Infants and newborns usually have secondary hypertension, which can be caused by many disease processes. Renal disorders are very common causes so the healthcare professional would facilitate getting blood work for renal function studies. Electrolytes would be obtained as well, but are not specific for a cause like renal studies are. Without any other manifestations, the professional would not facilitate cardiac catheterization or echocardiogram.

PTS: 1 DIF: Cognitive Level: Remembering

17. Which condition is consistent with the cardiac defect of transposition of the great vessels?
- The aorta arises from the right ventricle.
 - The pulmonary trunk arises from the right ventricle.
 - The right ventricle pumps blood to the lungs.
 - An intermittent murmur is present.

ANS: A

Transposition of the great arteries refers to a condition in which the aorta arises from the right ventricle and the pulmonary artery arises from the left ventricle. A transposition of the great vessels is not associated with the pulmonary trunk arising from the RV, the RV pumping blood into the lungs, or an intermittent murmur.

PTS: 1

DIF: Cognitive Level: Remembering

18. Which scenario describes total anomalous pulmonary venous return?
- The foramen ovale closes after birth.
 - Pulmonary venous return is to the right atrium.
 - Pulmonary venous return is to the left atrium.
 - The left atrium receives oxygenated blood.

ANS: B

Total anomalous pulmonary venous return occurs when the pulmonary veins abnormally connect to the right side of the heart either directly or through one or more systemic veins that drain into the right atrium. None of the other options accurately describe the presentation of a total anomalous pulmonary venous return.

PTS: 1

DIF: Cognitive Level: Remembering

19. A healthcare professional assesses a systolic ejection murmur at the right upper sternal border that transmits to the neck and left lower sternal border. What condition does the professional prepare to educate the parents on?
- Coarctation of the aorta
 - Pulmonic stenosis
 - Aortic stenosis
 - Hypoplastic left heart syndrome

ANS: C

Blood flow through the stenotic area of the aorta produces a systolic ejection murmur at the right upper sternal border that transmits to the neck and left lower sternal border. None of the other options produce the described assessment findings.

PTS: 1

DIF: Cognitive Level: Remembering

20. A healthcare professional is assessing a baby in the neonatal intensive care unit who is very unstable. The professional hears a systolic ejection click at the upper left sternal border with a thrill palpated at the upper left sternal border. What procedure does the professional prepare the parents for the baby to have?
- Heart transplant
 - Balloon angioplasty

- c. Prostaglandin infusion
- d. High dose aspirin

ANS: B

Pulmonary stenosis results in a systolic ejection murmur at the left upper sternal border, reflecting an obstruction to flow through the narrowed pulmonary valve. A variable systolic ejection click is present in some children, as well as valvular stenosis at the upper left sternal border. PS also produces a thrill that may be palpated at the upper left sternal border. Although mild cases may not need treatment, this critically ill infant needs immediate intervention with balloon angioplasty. A heart transplant might be used to treat hypoplastic left heart syndrome. Prostaglandin infusion is used to keep a patent ductus arteriosus open until surgical correction can be accomplished. Aspirin is used to treat Kawasaki disease.

PTS: 1 DIF: Cognitive Level: Applying

21. Which heart defect results in a single vessel arising from both ventricles, providing blood to both the pulmonary and systemic circulations?
- a. Coarctation of the aorta
 - b. Tetralogy of Fallot
 - c. Total anomalous pulmonary connection
 - d. Truncus arteriosus

ANS: D

Truncus arteriosus is the failure of the large embryonic artery, the truncus arteriosus, to divide into the pulmonary artery and the aorta, which results in a single vessel arising from both ventricles, providing blood flow to the pulmonary and systemic circulations. None of the other options produce the described structural malformation.

PTS: 1 DIF: Cognitive Level: Remembering

22. A 9-year-old child has a blood pressure of 112/72 mmHg in the school nurse's office. What action by the school nurse is *most* appropriate?
- a. Inform the parents the child might be dehydrated.
 - b. Note the normal finding in the child's records.
 - c. Calculate the child's Body Mass Index.
 - d. Refer the child for medication.

ANS: B

The suggested mean blood pressure for an 8- to 9-year-old child is 106/58 mmHg. The 95th percentile mean reading is 120/82 mmHg. Hypertension in children is defined as three readings above the 95th percentile, so this child's blood pressure is well within the normal range. The school nurse would document this reading in the child's records. There is no need for the nurse to worry about dehydration, the child's body mass index, or to refer the child for medication.

PTS: 1 DIF: Cognitive Level: Applying

MULTIPLE RESPONSE

1. What congenital heart defects are associated with intrauterine exposure to rubella? (*Select all that apply.*)
- a. Pulmonary stenosis (PS)
 - b. Cardiomegaly
 - c. Patent ductus arteriosus (PDA)
 - d. Coarctation of aorta (COA)
 - e. Ventricular septal defect (VSD)

ANS: A, C, D

PS, PDA, and COA are congenital heart defects associated with intrauterine exposure to rubella. Cardiomegaly and VSD are associated with maternal diabetes.

PTS: 1

DIF: Cognitive Level: Remembering

2. Which symptoms meet the diagnostic criteria for Kawasaki disease in a child? (*Select all that apply.*)
- a. Fever for 5 days or longer
 - b. "Strawberry tongue"
 - c. Peripheral edema
 - d. Inguinal lymphadenopathy
 - e. Bilateral conjunctival infection

ANS: A, B, C, E

The child must exhibit five of these six criteria: (1) fever for 5 days or longer, (2) bilateral conjunctival infection without exudation, (3) changes in oral mucus such as strawberry tongue, (4) a polymorphous rash, (5) cervical lymphadenopathy, and (6) changes in the extremities such as peripheral edema.

PTS: 1

DIF: Cognitive Level: Remembering

3. Which statements related to the ambulatory blood pressure monitoring (ABPM) system with children are *true*? (*Select all that apply.*)
- a. ABPM monitors blood pressure for a 24-hour period.
 - b. ABPM assists in identifying children with *white coat hypertension*.
 - c. ABPM is effective in identifying children at risk for target organ damage.
 - d. ABPM assists in identifying children who demonstrate *masked hypertension*.
 - e. ABPM is effective in determining blood pressure load for 48 hours.

ANS: A, B, C, D

ABPM records blood pressure over a 24-hour period to help identify those children with white coat hypertension and masked hypertension. ABPM is useful in documenting the *blood pressure load*, which is the total amount of time the blood pressure is elevated above normal limits during a 24-hour period. By measuring blood pressure load, the ABPM may be able to identify those children who are at greatest risk for target organ damage.

PTS: 1

DIF: Cognitive Level: Remembering

Chapter 35: Structure and Function of the Pulmonary System

MULTIPLE CHOICE

1. What pulmonary defense mechanism propels a mucous blanket that entraps particles moving toward the oropharynx?
 - a. Nasal turbinates
 - b. Alveolar macrophages
 - c. Cilia
 - d. Irritant receptors on the nares

ANS: C

The submucosal glands of the bronchial lining produce mucus, contributing to the mucous blanket that covers the bronchial epithelium. The ciliated epithelial cells rhythmically beat this mucous blanket toward the trachea and pharynx, where it can be swallowed or expectorated by coughing. Mucous is not propelled by nasal turbinates, alveolar macrophages, or irritant receptors.

PTS: 1

DIF: Cognitive Level: Remembering

2. Which term is used to identify the movement of gas and air into and out of the lungs?
 - a. Perfusion
 - b. Ventilation
 - c. Respiration
 - d. Diffusion

ANS: B

Ventilation is the term used to identify the mechanical movement of gas or air into and out of the lungs. Perfusion is the term used to describe blood that reaches the alveoli. Respiration is the exchange of gasses. Diffusion is the movement of particles through a semipermeable membrane from an area of higher concentration to an area of lower concentration.

PTS: 1

DIF: Cognitive Level: Remembering

3. When an individual aspirates food particles, where would the healthcare professional expect to hear decreased or absent breath sounds?
 - a. Left lung
 - b. Right lung
 - c. Trachea
 - d. Carina

ANS: B

The right mainstem bronchus extends from the trachea more vertically than the left main bronchus; therefore aspirated fluids or foreign particles tend to enter the right lung rather than into the left lung, trachea, or carina.

PTS: 1 DIF: Cognitive Level: Remembering

4. Air passage among alveoli is collateral and evenly distributed because of the function of which structures?
- Type I alveolar cells
 - Pores of Kohn
 - Acinus pores
 - Alveolar pores

ANS: B

Tiny passages called *pores of Kohn* permit some air to pass through the septa from alveolus to alveolus, promoting collateral ventilation and even distribution of air among the alveoli. Type I alveolar cells provide structure to the alveoli. The acinus is the conducting airways that terminate in the respiratory bronchioles, alveolar ducts, and alveoli. Alveolar pores would be the same as the pores of Kohn.

PTS: 1 DIF: Cognitive Level: Remembering

5. Where in the lung does gas exchange occur?
- Trachea
 - Segmental bronchi
 - Alveolocapillary membrane
 - Main bronchus

ANS: C

Gas exchange occurs only across the alveolocapillary membrane.

PTS: 1 DIF: Cognitive Level: Remembering

6. Surfactant produced by type II alveolar cells facilitates alveolar distention and ventilation by which mechanism?
- Decreasing thoracic compliance
 - Attracting water to the alveolar surface
 - Decreasing surface tension in the alveoli
 - Increasing surface tension in the alveoli

ANS: C

Surfactant, a lipoprotein produced by type II alveolar cells, has a detergent-like effect that separates the liquid molecules, thereby decreasing alveolar surface tension. Surfactant does not decrease thoracic compliance, attract water to the alveolar surface, or increase surface tension in the alveoli.

PTS: 1 DIF: Cognitive Level: Remembering

7. Which part of the brainstem provides basic automatic rhythm of respiration by sending efferent impulses to the diaphragm and intercostal muscles?
- Dorsal respiratory group (DRG)
 - Ventral respiratory group (VRG)
 - Pneumotaxic center

d. Apneustic center

ANS: B

The basic automatic rhythm of respiration is set by the VRG, a cluster of inspiratory nerve cells located in the medulla that sends efferent impulses to the diaphragm and inspiratory intercostal muscles. The DRG, also located in the medulla, receives afferent impulses from peripheral chemoreceptors in the carotid and aortic bodies; from mechanical, neural, and chemical stimuli; and from receptors in the lungs, and it alters breathing patterns to restore normal blood gases. The pneumotaxic center and apneustic center, situated in the pons, do not generate primary rhythm, but rather act as modifiers of the rhythm established by the medullary centers.

PTS: 1

DIF: Cognitive Level: Remembering

8. Which structures secrete surfactant?

- a. Type I alveolar cells
- b. Type II alveolar cells
- c. Alveolar macrophages
- d. Stretch receptors

ANS: B

Two major types of epithelial cells appear in the alveolus. Type I alveolar cells provide structure, and type II alveolar cells secrete surfactant, a lipoprotein that coats the inner surface of the alveolus and facilitates its expansion during inspiration, lowers alveolar surface tension at end expiration, and thereby prevents lung collapse. Neither alveolar macrophages nor stretch receptors secrete surfactant.

PTS: 1

DIF: Cognitive Level: Remembering

9. Which describes the pressure in the pleural space?

- a. Atmospheric
- b. Below atmospheric
- c. Above atmospheric
- d. Variable

ANS: B

Pressure in the pleural space is usually negative or subatmospheric (-4 to -10 mmHg).

PTS: 1

DIF: Cognitive Level: Remembering

10. A healthcare professional wants to determine the adequacy of a person's alveolar ventilation. What assessment finding is most important for the professional to consider?

- a. Respiratory rate of 12 breaths/min
- b. Ventilatory pattern is regular and rhythmic.
- c. Respiratory effort is strained with muscle involvement.
- d. Arterial blood gas shows a PaCO₂ of 44 mmHg.

ANS: D

Observation of the ventilatory rate, pattern, or effort *cannot* determine the adequacy of alveolar ventilation. If a healthcare professional needs to determine the adequacy of ventilation, then an arterial blood gas analysis must be performed to measure partial pressure of arterial carbon dioxide (PaCO_2). The professional would analyze the PaCO_2 for this determination.

PTS: 1 DIF: Cognitive Level: Applying

11. Which normal physiologic change occurs in the aging pulmonary system?
- Decreased flow resistance
 - Fewer alveoli
 - Stiffening of the chest wall
 - Improved elastic recoil

ANS: C

Aging decreases chest wall compliance and elastic recoil of the lungs. There is loss of alveolar wall tissue and alveolar enlargement, thus diminishing surface area available for gas diffusion with aging. Aging can also cause the PaO_2 to decrease. Vital capacity decreases and residual volume increases; however, total lung capacity remains unchanged.

PTS: 1 DIF: Cognitive Level: Remembering

12. How is most of the oxygen in the blood transported?
- Dissolved in plasma
 - Bound to hemoglobin
 - In the form of carbon dioxide (CO_2)
 - Bound to protein

ANS: B

Oxygen is transported in the blood in two forms. A small amount dissolves in plasma (3%), and the remainder (97%) binds to hemoglobin molecules. Oxygen is not transformed into carbon dioxide and it is not bound to protein.

PTS: 1 DIF: Cognitive Level: Remembering

13. Stretch receptors and peripheral chemoreceptors send afferent impulses regarding ventilation to which location in the brain?
- Pneumotaxic center in the pons
 - Apneustic center in the pons
 - Dorsal respiratory group (DRG) in the medulla oblongata
 - Ventral respiratory group (VRG) in the medulla oblongata

ANS: C

The respiratory center is made up of several groups of neurons located bilaterally in the brainstem: the DRG, the VRG, the pneumotaxic center, and the apneustic center. The basic automatic rhythm of respiration is set by the VRG, a cluster of inspiratory nerve cells located in the medulla that sends efferent impulses to the diaphragm and inspiratory intercostal muscles. The DRG, also located in the medulla, receives afferent impulses from peripheral chemoreceptors in the carotid and aortic bodies; from mechanical, neural, and chemical stimuli; and from receptors in the lungs, and it alters breathing patterns to restore normal blood gases. The pneumotaxic center and apneustic center, situated in the pons, do not generate primary rhythm, but rather act as modifiers of the rhythm established by the medullary centers.

PTS: 1 DIF: Cognitive Level: Remembering

14. If a patient develops acidosis, the nurse would expect the oxyhemoglobin dissociation curve to react in which manner?
- Shift to the right, causing more oxygen (O_2) to be released to the cells
 - Shift to the left, allowing less O_2 to be released to the cells
 - Show no change, allowing the O_2 concentration to remain stable
 - Show dramatic fluctuation, allowing the O_2 concentration to increase

ANS: A

A shift to the right depicts hemoglobin's decreased affinity for O_2 or an increase in the ease with which oxyhemoglobin dissociates and O_2 moves into the cells. The oxyhemoglobin dissociation curve is shifted to the right by acidosis (low pH), hyperthermia, increased 2,3-BPG, and hypercapnia (increased partial pressure of arterial carbon dioxide [$PaCO_2$]). A shift to the left would occur with alkalosis, hypocapnia, hypothermia, and decreased 2,3-BPG.

PTS: 1 DIF: Cognitive Level: Remembering

15. The sternocleidomastoid and scalene muscles are referred to as which group?
- Diaphragmatic muscles
 - Muscles of expiration
 - Intercostal muscles
 - Accessory muscles of inspiration

ANS: D

The accessory muscles of inspiration are the sternocleidomastoid and scalene muscles. The diaphragm is the major muscle of inspiration. Expiration is mainly passive and has no muscles associated with it. The intercostal muscles protect the lungs from injury and assist the diaphragm with inspiration.

PTS: 1 DIF: Cognitive Level: Remembering

16. A newborn has alveolar collapse, decreased lung expansion, increased work of breathing, and severe gas-exchange abnormalities and the student asks the healthcare professional for an explanation of what is happening. What response by the professional is *best*?
- A decrease in lung compliance from the trauma of a long childbirth process
 - A traumatic pneumothorax from a prolonged and difficult labor
 - Damage done to the alveoli from exposure to supplemental oxygen at birth

- d. Lack of surfactant leading to increased alveolar surface tension and fluid collection

ANS: D

The decrease in surface tension caused by surfactant is also responsible for keeping the alveoli free of fluid. In the absence of surfactant, the surface tension tends to attract fluid into the alveoli. If surfactant production is disrupted or surfactant is not produced in adequate quantities, then the alveolar surface tension increases, causing alveolar collapse, decreased lung expansion, increased work of breathing, and severe gas-exchange abnormalities. The decrease in surface tension caused by surfactant is also responsible for keeping the alveoli free of fluid. The newborn is most likely to be experiencing this condition. There is no information about the labor and delivery being long or traumatic or causing decreased compliance or a pneumothorax. There is also no information on the newborn receiving supplemental oxygen although for a short period of time, this would do no damage.

PTS: 1 DIF: Cognitive Level: Understanding

17. The student asks the professor to explain what characteristic is demonstrated by lungs with decreased compliance?
- Difficult deflation
 - Easy inflation
 - Stiffness
 - Inability to diffuse oxygen

ANS: C

A decrease in compliance indicates that the lungs or chest wall is abnormally stiff or difficult to inflate. Lung compliance is not related specifically to deflation or inability to diffuse oxygen.

PTS: 1 DIF: Cognitive Level: Understanding

18. The lung is innervated by the parasympathetic nervous system via which nerve?
- Vagus
 - Phrenic
 - Brachial
 - Pectoral

ANS: A

Fibers of the parasympathetic division of the autonomic nervous system (ANS) travel in the vagus nerve to the lung.

PTS: 1 DIF: Cognitive Level: Remembering

19. What event is characteristic of the function in Zone 1 of the lung?
- Blood flow through the pulmonary capillary bed increases in regular increments.
 - Alveolar pressure is lesser than venous and arterial pressures.
 - The capillary bed collapses, and normal blood flow ceases.
 - Blood flows through Zone 1, but it is impeded by alveolar pressure.

ANS: C

Alveolar pressure exceeds pulmonary arterial and venous pressures in Zone 1. The capillary bed collapses, and normal blood flow ceases. Zone II is the portion where alveolar pressure is greater than venous pressure but not greater than arterial pressure. Blood flows through zone II, but it is impeded by alveolar pressure. Zone II is normally above the level of the left atrium. In zone III, arterial and venous pressures are greater than alveolar pressure and blood flow is not affected by alveolar pressure. Zone III is in the base of the lung. Blood flow through the pulmonary capillary bed increases in regular increments from the apex to the base.

PTS: 1 DIF: Cognitive Level: Remembering

20. Hypoventilation that results in the retention of carbon dioxide will stimulate which receptors in an attempt to maintain a normal homeostatic state?
- Irritant receptors
 - Central chemoreceptors
 - Peripheral chemoreceptors
 - Stretch receptors

ANS: B

Central chemoreceptors indirectly monitor arterial blood by sensing changes in the pH of cerebrospinal fluid (CSF). The central chemoreceptors are sensitive to very small changes in the pH of CSF (equivalent to a 1 to 2 mmHg change in partial pressure of carbon dioxide [PCO_2]) and are able to maintain a normal partial pressure of arterial carbon dioxide (PaCO_2) under many different conditions, including strenuous exercise. The retention of carbon dioxide will not stimulate irritant receptors, peripheral chemoreceptors, or stretch receptors.

PTS: 1 DIF: Cognitive Level: Remembering

21. What is the most important cause of pulmonary artery constriction?
- Low alveolar partial pressure of arterial oxygen (PaO_2)
 - Hyperventilation
 - Respiratory alkalosis
 - Epinephrine

ANS: A

The most important cause of pulmonary artery constriction is a low alveolar PaO_2 .

PTS: 1 DIF: Cognitive Level: Remembering

22. A healthcare professional tells the student that a properly placed endotracheal tube for mechanical ventilation is 5 to 7 cm above the tracheal bifurcation. Where does this bifurcation occur?
- Larynx
 - Bronchi
 - Carina
 - Nasopharynx

ANS: C

The trachea, which is supported by U-shaped cartilage, connects the larynx to the bronchi, the conducting airways of the lungs. The trachea divides into the two main airways, or bronchi, at the carina. The healthcare professional would describe placement as being above the carina.

PTS: 1 DIF: Cognitive Level: Understanding

23. How low must the partial pressure of arterial oxygen (PaO_2) drop before the peripheral chemoreceptors influence ventilation?
- Below 100 mmHg
 - Below 80 mmHg
 - Below 70 mmHg
 - Below 60 mmHg

ANS: C

The PaO_2 must drop well below normal (to approximately 60 mmHg) before the peripheral chemoreceptors have much influence on ventilation.

PTS: 1 DIF: Cognitive Level: Remembering

24. Which receptors are located in the smooth muscles of airways?
- Central chemoreceptors
 - Stretch receptors
 - Peripheral chemoreceptors
 - J-receptors

ANS: B

Of the options available, only the stretch receptors are located in the smooth muscles of airways.

PTS: 1 DIF: Cognitive Level: Remembering

25. Which receptors are located near the respiratory center?
- Peripheral chemoreceptors
 - Stretch receptors
 - Central chemoreceptors
 - J-receptors

ANS: C

Of the options available, only the central chemoreceptors are located near the respiratory center.

PTS: 1 DIF: Cognitive Level: Remembering

26. Which receptors are located in the aortic bodies, aortic arch, and carotid bodies?
- Central chemoreceptors
 - Stretch receptors
 - J-receptors
 - Peripheral chemoreceptors

ANS: D

Of the options available, only the peripheral chemoreceptors are located in the aortic bodies, aortic arch, and carotid bodies at the bifurcation of the carotids, near the baroreceptors.

PTS: 1 DIF: Cognitive Level: Remembering

27. A patient is having a spirometry measurement done and asks the healthcare professional to explain this test. What response by the professional is *best*?
- To evaluate the cause of hypoxia
 - To measure the volume and flow rate during forced expiration
 - To measure the gas diffusion rate at the alveolocapillary membrane
 - To determine pH and oxygen and carbon dioxide concentrations

ANS: B

Spirometry measures volume and flow rate during forced expiration. The alveolar–arterial oxygen gradient is used to evaluate the cause of hypoxia. Diffusing capacity is a measure of the gas diffusion rate at the alveolocapillary membrane. Arterial blood gas analysis can be used to determine pH and oxygen and carbon dioxide concentrations.

PTS: 1 DIF: Cognitive Level: Understanding

MULTIPLE RESPONSE

1. Which structures belong to the upper conduction airway? (*Select all that apply.*)
- Oropharynx
 - Larynx
 - Nasopharynx
 - Trachea
 - Bronchi

ANS: A, C

The conducting airways are the portion of the pulmonary system that provides a passage for the movement of air into and out of the gas-exchange portions of the lung. The nasopharynx, oropharynx, and related structures are often called the *upper airway*. The larynx connects the upper and lower airways. The trachea connects the larynx to the bronchi, which are the conducting airways for the lungs.

PTS: 1 DIF: Cognitive Level: Remembering

2. What does the pathophysiology student learn about the respiratory process referred to as remodeling? (*Select all that apply.*)
- Remodeling involves the vascular walls.
 - Scarring and thickening occurs during this process.
 - Remodeling results in a permanent change.
 - Pulmonary artery hypotension results.
 - Remodeling increases blood flow resistance.

ANS: A, B, C, E

Remodeling is a process by which the vascular wall becomes scarred and thickened, thus resulting in permanent decreases in luminal diameter, increased resistance to blood flow, and permanent pulmonary artery hypertension.

PTS: 1 DIF: Cognitive Level: Remembering

3. A healthcare professional who works in a senior center knows about the effects of aging on the pulmonary system, which include which of these? (*Select all that apply.*)
- a. Decreased chest wall compliance
 - b. Decreased lung recoil
 - c. Reduced ventilatory reserve
 - d. Decreased partial pressure of arterial oxygen (PaO_2)
 - e. Reduced respiratory rate

ANS: A, B, C, D

Aging affects the mechanical aspects of ventilation by decreasing chest wall compliance and elastic recoil of the lungs. Changes in these elastic properties reduce ventilatory reserve. Aging causes the PaO_2 to decrease but does not affect the partial pressure of arterial carbon dioxide (PaCO_2) or respiratory rate.

PTS: 1 DIF: Cognitive Level: Remembering

4. Which of these cause the airway epithelium to constrict? (*Select all that apply.*)
- a. Histamines
 - b. Prostaglandins
 - c. Alveolar alkalosis
 - d. Alveolar acidosis
 - e. Serotonin

ANS: A, B, C, E

Epithelial constriction can be caused by histamines, prostaglandins, alveolar acidosis, and serotonin.

PTS: 1 DIF: Cognitive Level: Remembering

Chapter 36: Alterations of Pulmonary Function

MULTIPLE CHOICE

1. Besides dyspnea, what is the most common characteristic associated with pulmonary disease?
 - a. Chest pain
 - b. Digit clubbing
 - c. Cough
 - d. Hemoptysis

ANS: C

Pulmonary disease is associated with many signs and symptoms, and their specific characteristics often help in identifying the underlying disorder. The most common characteristics are dyspnea and cough. Others include abnormal sputum, hemoptysis, altered breathing patterns, hypoventilation and hyperventilation, cyanosis, clubbing of the digits, and chest pain.

PTS: 1 DIF: Cognitive Level: Remembering

2. A patient reports needing to sit up at night in order to breathe. What term does the healthcare professional document about this condition?
 - a. Hyperpnea
 - b. Orthopnea
 - c. Apnea
 - d. Atelectasis

ANS: B

Orthopnea is seen in patients with heart failure. When they lie down, abdominal pressure on the lungs causes dyspnea and the person needs to sit up in order to breathe. Hyperpnea is an increased rate and depth of breathing. Apnea is the absence of breathing. Atelectasis is the collapse of lung tissue.

PTS: 1 DIF: Cognitive Level: Remembering

3. Kussmaul respirations as a respiratory pattern may be associated with which characteristic(s)?
 - a. Alternating periods of deep and shallow breathing
 - b. Increased work of breathing
 - c. Inadequate alveolar ventilation in relation to metabolic demands
 - d. Slightly increased ventilatory rate, large tidal volumes, and no expiratory pause

ANS: D

Kussmaul respirations are characterized by a slightly increased ventilatory rate, very large tidal volume, and no expiratory pause. Alternating periods of deep and shallow breathing characterize Cheyne-Stokes breathing. Increased work of breathing is seen in labored breathing. Inadequate alveolar ventilation describes hypoventilation.

PTS: 1 DIF: Cognitive Level: Remembering

4. Respirations that are characterized by alternating periods of deep and shallow breathing are a result of which respiratory mechanism?
- Decreased blood flow to the medulla oblongata
 - Increased partial pressure of arterial carbon dioxide (PaCO_2)
 - Stimulation of stretch or J-receptors
 - Fatigue of the intercostal muscles and diaphragm

ANS: A

Alternating periods of deep and shallow breathing are characteristic of Cheyne-Stokes respirations and are the result of any condition that slows the blood flow to the brainstem, which in turn slows impulses that send information to the respiratory centers of the brainstem. The medulla oblongata contains the respiratory center and is where the autonomic functions of respiration originate. An increased PaCO_2 would lead to Kussmaul respirations. The intercostal muscles help move the chest wall during breathing and if fatigued, might lead to hypoventilation.

PTS: 1 DIF: Cognitive Level: Remembering

5. A hospitalized patient is complaining of shortness of breath, but the student does not notice cyanosis. The patient's hemoglobin is 9 g/dL, so the student asks the healthcare professional to explain. The professional tells the student that what amount of hemoglobin must be desaturated before cyanosis occurs?
- 3
 - 5
 - 7
 - 9

ANS: B

Cyanosis generally develops when 5 g/dL of hemoglobin is desaturated, regardless of hemoglobin concentration. So even though the patient is anemic and has less oxygen-carrying capacity, if less than 5 g/dL of hemoglobin is desaturated, the patient will not show cyanosis.

PTS: 1 DIF: Cognitive Level: Remembering

6. What does the student learn about ventilation?
- Hypoventilation causes hypocapnia.
 - Hypoventilation causes alkalosis.
 - Hyperventilation causes hypocapnia.
 - Hyperventilation causes acidosis.

ANS: C

Hyperventilation is alveolar ventilation that exceeds metabolic demands. The lungs remove carbon dioxide at a faster rate than produced by cellular metabolism, resulting in decreased PaCO_2 or hypocapnia. A decreased PaCO_2 would lead to alkalosis. Hypoventilation would lead to hypercapnia and acidosis.

PTS: 1 DIF: Cognitive Level: Remembering

7. A patient has long-standing pulmonary disease and chronic hypoxia. The student assesses the patient's fingertips and notices bulbous enlargement of the distal segment of the digits. How does the student document this finding?
- Edema
 - Clubbing
 - Angling
 - Osteoarthropathy

ANS: B

Clubbing is the selective bulbous enlargement of the end (distal segment) of a digit (finger or toe) and is commonly associated with diseases that interfere with oxygenation, such as bronchiectasis, cystic fibrosis, pulmonary fibrosis, lung abscess, and congenital heart disease. Edema is swelling caused by fluid retention. The normal angle of the fingernail at the nail plate/proximal end of the nail is 160 degrees or less. Angling would describe an angle of >180 degrees indicates clubbing. Osteoarthropathy is a generic term for any disease of bone or joint.

PTS: 1

DIF: Cognitive Level: Remembering

8. The student asks the healthcare professional to explain how pulmonary edema and pulmonary fibrosis cause hypoxemia. What description by the professional is *best*?
- Creates alveolar dead space
 - Decreases the oxygen in inspired gas
 - Creates a right-to-left shunt
 - Impairs alveolocapillary membrane diffusion

ANS: D

Diffusion of oxygen through the alveolocapillary membrane is impaired if the alveolocapillary membrane is thickened or if the surface area available for diffusion is decreased. Abnormal thickness, as occurs with edema (tissue swelling) and fibrosis (formation of fibrous lesions), increases the time required for diffusion across the alveolocapillary membrane. These diseases do not create dead space, decrease the $F_{I}O_2$ of inspired air, or create a shunt.

PTS: 1

DIF: Cognitive Level: Understanding

9. High altitudes may produce hypoxemia through which mechanism?
- Shunting
 - Hypoventilation
 - Decreased inspired oxygen
 - Diffusion abnormalities

ANS: C

The presence of adequate oxygen content of the inspired air is the first factor to consider regarding hypoxia. Oxygen content is lessened at high altitudes which can produce hypoxemia. High altitudes do not produce shunting, hypoventilation, or diffusion abnormalities.

PTS: 1

DIF: Cognitive Level: Remembering

10. Which condition is capable of producing alveolar dead space?
- Pulmonary edema

- b. Pulmonary emboli
- c. Atelectasis
- d. Pneumonia

ANS: B

A pulmonary embolus that impairs blood flow to a segment of the lung results in an area where alveoli are ventilated but not perfused, which causes alveolar dead space. Alveolar dead space is not the result of pulmonary edema, atelectasis, or pneumonia.

PTS: 1

DIF: Cognitive Level: Remembering

11. A patient has pulmonary edema. For what condition should the healthcare professional assess the patient as the *priority*?
- a. Right-sided heart failure
 - b. Left-sided heart failure
 - c. Mitral valve prolapse
 - d. Aortic stenosis

ANS: B

The most common cause of pulmonary edema is left-sided heart failure. When the left ventricle fails, filling pressures on the left side of the heart increase and cause a concomitant increase in pulmonary capillary hydrostatic pressure, leading to pulmonary edema.

PTS: 1

DIF: Cognitive Level: Understanding

12. A patient has a pulmonary capillary wedge pressure of 30mmHg. What assessment finding by the healthcare professional would be *most* consistent with this reading?
- a. Normal lung sounds
 - b. Pink, frothy sputum
 - c. Eupnea
 - d. Rhonchi

ANS: B

Pulmonary edema usually begins to develop at a pulmonary capillary wedge pressure or left atrial pressure of 20 mmHg. Signs of pulmonary edema include dyspnea, hypoxemia, and increased work of breathing. Physical examination may reveal inspiratory crackles (rales), dullness to percussion over the lung bases, and evidence of ventricular dilation (S_3 gallop and cardiomegaly). In severe edema, pink, frothy sputum is expectorated, hypoxemia worsens, and hypoventilation with hypercapnia may develop. Eupnea is normal work of breathing. Rhonchi are low-pitched rumbling lung sounds due to turbulent airflow due to obstruction or secretions in the large airways.

PTS: 1

DIF: Cognitive Level: Applying

13. A patient has a lung problem caused by dysfunction in the pores of Kohn. What action by the healthcare professional is *best*?
- a. Have the patient drink plenty of water.
 - b. Give the patient supplemental oxygen.
 - c. Have the patient do breathing exercises.

- d. Withhold pain medicine so the patient stays awake.

ANS: C

The pores of Kohn, which open only during deep breathing, allow air to pass from well-ventilated alveoli to obstructed alveoli. A dysfunction in this system would lead to absorption atelectasis, which is the result of gradual absorption of air from obstructed or hypoventilated alveoli. The professional should have the patient do breathing exercises, including using an incentive spirometer. Water will thin any secretions the patient has but will not directly improve ventilation. The patient may need oxygen if the oxygen saturations are low, but this does not address the cause. Withholding pain medication will lead to a patient being unwilling to move about or do breathing exercises.

PTS: 1

DIF: Cognitive Level: Applying

14. In what form of bronchiectasis do both constrictions and dilations deform the bronchi?
- Varicose
 - Symmetric
 - Cylindric
 - Saccular

ANS: A

Bronchiectasis is persistent abnormal dilation of the bronchi. Bronchial dilation may be *cylindrical* (cylindrical bronchiectasis), with symmetrically dilated airways, as can be seen after pneumonia and is reversible; *saccular* (saccular bronchiectasis), in which the bronchi become large and balloon-like; or *varicose* (varicose bronchiectasis), in which constrictions and dilations deform the bronchi, creating a bulbous appearance

PTS: 1

DIF: Cognitive Level: Remembering

15. A patient is brought to the Emergency Department with a gunshot wound to the chest. The healthcare professional assesses an abnormality involving a pleural rupture that acts as a one-way valve, permitting air to enter on inspiration but preventing its escape by closing during expiration. What action by the healthcare professional is the *priority*?
- Draw arterial blood gasses.
 - Assist with a chest tube insertion.
 - Give the patient low-flow oxygen.
 - Assess for clubbing of fingernails.

ANS: B

In a tension pneumothorax, the site of pleural rupture acts as a one-way valve, permitting air to enter on inspiration but preventing its escape by closing up during expiration. As more and more air enters the pleural space, air pressure in the pneumothorax begins to exceed barometric pressure. Air pressure in the pleural space pushes against the already recoiled lung, causing compression atelectasis, and against the mediastinum, compressing and displacing the heart, great vessels, and trachea. This is an emergency condition requiring chest tube insertion or immediate needle decompression. Arterial blood gas results will not change the treatment plan. This patient may need oxygen if definitive treatment is delayed, but it would need to be high-flow oxygen. Clubbing of fingernails occurs in chronic hypoxemic conditions. The professional should assist with immediate needle decompression or chest tube insertion.

PTS: 1 DIF: Cognitive Level: Applying

16. A patient has a transudative pleural effusion but has minimal symptoms. What action by the healthcare professional is *best*?
- Prepare for an immediate chest tube insertion.
 - Encourage the patient to use the incentive spirometer.
 - Facilitate a blood draw to check protein stores.
 - Arrange for an oncology consultation.

ANS: C

In transudative pleural effusion, the fluid, or transudate, is watery and diffuses out of the capillaries as a result of disorders that increase intravascular hydrostatic pressure or decrease capillary oncotic pressure. Examples are congestive heart failure, in which venous and left atrial pressures are increased, and liver or kidney disorders that cause hypoproteinemia. Hypoproteinemia decreases capillary oncotic pressure, which promotes diffusion of water out of the capillaries. The best action for the professional is to assess the patient's protein stores through blood analysis. The patient does not need a chest tube since the symptoms are minimal. An incentive spirometer will not provide definitive information to treat the problem. Exudative effusions are caused by inflammation, infection, or malignancy, so this patient does not need an oncology consult.

PTS: 1 DIF: Cognitive Level: Applying

17. Which condition involves an abnormally enlarged gas-exchange system and the destruction of the lung's alveolar walls?
- Transudative effusion
 - Emphysema
 - Exudative effusion
 - Abscess

ANS: B

Emphysema is abnormal permanent enlargement of gas-exchange airways (acini) accompanied by the destruction of alveolar walls without obvious fibrosis. An effusion is the presence of fluid in the pleural space that can be caused by hypoproteinemia (transudative) or malignancy, infection, or inflammation (exudative). An abscess is a collection of pus.

PTS: 1 DIF: Cognitive Level: Remembering

18. A patient has been diagnosed with pneumoconiosis and asks the healthcare professional to explain this disease. What description by the professional is *best*?
- Pneumococci bacteria
 - Inhalation of inorganic dust particles
 - Exposure to asbestos
 - Inhalation of cigarette smoke

ANS: B

Pneumoconiosis represents any change in the lung caused by the inhalation of inorganic dust particles, which usually occurs in the workplace. The dusts of silica, asbestos, and coal are the most common causes of pneumoconiosis. Others include talc, fiberglass, clays, mica, slate, cement, and metals. Pneumococci bacteria would cause pneumococcal pneumonia. Asbestos exposure can cause mesothelioma. Cigarette smoke is the leading cause of lung cancer.

PTS: 1

DIF: Cognitive Level: Remembering

19. A patient has been diagnosed with acute respiratory distress syndrome (ARDS). For what other health condition should the healthcare professional assess this patient for as the *priority*?
- Heart failure
 - Pneumonia
 - Pulmonary emboli
 - Acute pulmonary edema

ANS: B

ARDS is a fulminant form of respiratory failure characterized by acute lung inflammation and diffuse alveolocapillary injury not attributed to heart failure or fluid overload. All disorders causing ARDS cause acute immune cell-mediated injury to the alveolocapillary membrane producing massive inflammation, increased capillary permeability, and alveolar flooding with protein-rich fluid that overwhelms ion channels and lymphatic removal of fluid. The most common predisposing factors for ARDS are genetic factors, sepsis, and multiple trauma (especially when multiple transfusions are received). However, there are many other causes, including pneumonia, burns, aspiration, cardiopulmonary bypass surgery, pancreatitis, drug overdose, smoke or noxious gas inhalation, oxygen toxicity, radiation therapy, and disseminated intravascular coagulation. Alcohol abuse and smoking are preventable environmental risk factors.

PTS: 1

DIF: Cognitive Level: Applying

20. Which structure(s) in acute respiratory distress syndrome (ARDS) release inflammatory mediators such as proteolytic enzymes, oxygen-free radicals, prostaglandins, leukotrienes, and platelet-activating factor?
- Complement cascade
 - Mast cells
 - Macrophages
 - Neutrophils

ANS: D

The role of neutrophils is central to the development of ARDS. Activated neutrophils release a battery of inflammatory mediators, among them proteolytic enzymes, oxygen-free radicals (superoxide radicals, hydrogen peroxide, hydroxyl radicals), arachidonic acid metabolites (prostaglandins, thromboxanes, leukotrienes), and platelet-activating factor. These mediators cause extensive damage to the alveolocapillary membrane and greatly increase capillary membrane permeability. The described responses are not associated with the other options.

PTS: 1 DIF: Cognitive Level: Remembering

21. Pulmonary edema in acute respiratory distress syndrome (ARDS) is the result of an increase in what?
- Levels of serum sodium and water
 - Capillary permeability
 - Capillary hydrostatic pressure
 - Oncotic pressure

ANS: B

Increased capillary permeability, a hallmark of ARDS, allows fluids, proteins, and blood cells to leak from the capillary bed into the pulmonary interstitium and alveoli. The resulting pulmonary edema and hemorrhage severely reduce lung compliance and impair alveolar ventilation. The pulmonary edema seen in ARDS is not the result of sodium and water concentrations, capillary hydrostatic pressure, or oncotic pressure.

PTS: 1 DIF: Cognitive Level: Remembering

22. In acute respiratory distress syndrome (ARDS), alveoli and respiratory bronchioles fill with fluid as a result of which mechanism?
- Compression on the pores of Kohn, thus preventing collateral ventilation
 - Increased capillary permeability, which causes alveoli to fill with fluid
 - Inactivation of surfactant and the impairment of type II alveolar cells
 - Increased capillary hydrostatic pressure that forces fluid into the alveoli

ANS: C

Lung inflammation and injury damage the alveolar epithelium and the vascular endothelium in ARDS. Surfactant is inactivated, and its production by type II alveolar cells is impaired as alveoli and respiratory bronchioles fill with fluid or collapse. The other processes would not trigger the described response.

PTS: 1 DIF: Cognitive Level: Remembering

23. Which type of pulmonary disease requires more force to expire a volume of air?
- Restrictive
 - Obstructive
 - Acute
 - Communicable

ANS: B

Obstructive pulmonary disease is characterized by airway obstruction that is worse with expiration. Either more force (i.e., the use of accessory muscles of expiration) or more time is required to expire a given volume of air. Restrictive disorders are characterized by decreased lung tissue compliance. Acute means sudden onset, or severe. Communicable means transmittable.

PTS: 1 DIF: Cognitive Level: Remembering

24. Which immunoglobulin (Ig) may contribute to the pathophysiologic characteristics of asthma?
- IgA
 - IgE
 - IgG
 - IgM

ANS: B

Asthma is a familial disorder, and more than 100 genes have been identified that may play a role in the susceptibility of and the pathogenetic mechanisms that cause asthma, including those that influence the production of interleukin (IL)-4, IL-5, and IL-13; IgE; eosinophils; mast cells; adrenergic receptors; and leukotrienes. The pathophysiologic characteristics of asthma are not associated with other immunoglobulins.

PTS: 1 DIF: Cognitive Level: Remembering

25. A healthcare professional is educating a patient about asthma. The professional states that good control is necessary due to which pathophysiologic process?
- Norepinephrine causes bronchial smooth muscle contraction and mucus secretion but it also causes high blood pressure.
 - Uncontrolled inflammation leads to increased bronchial hyperresponsiveness and eventual scarring.
 - The release of epinephrine leads to development of cardiac dysrhythmias.
 - Immunoglobulin G causes smooth muscle contraction which will eventually weaken the respiratory muscles.

ANS: B

The *late asthmatic response* begins 4 to 8 hours after the early response when the release of toxic neuropeptides contributes to increased bronchial hyperresponsiveness. Untreated inflammation leads to increased scarring and remodeling of pulmonary tissue, so good control of asthma is necessary to prevent that complication. Poor asthma control does not specifically lead to hypertension or dysrhythmias, nor will it permanently weaken respiratory muscles.

PTS: 1 DIF: Cognitive Level: Understanding

26. A patient comes to the Emergency Department with inspiratory and expiratory wheezing, dyspnea, nonproductive cough, and tachypnea. What treatment does the healthcare professional anticipate for this patient as the *priority*?
- Sputum culture
 - History of illness exposure
 - Antibiotics

d. Inhaled bronchodilator

ANS: D

Asthma is characterized by expiratory wheezing, dyspnea, nonproductive coughing, prolonged expiration, tachycardia, and tachypnea. Severe attacks involve the use of accessory muscles of respiration, and wheezing is heard during both inspiration and expiration. The treatment consists of inhaled β -agonist bronchodilators, oxygen if needed, and corticosteroids. After the patient has been stabilized, the healthcare professional attempts to determine the cause of the attack, which would include a possible sputum culture and getting a history of any recent exposures to illness. Antibiotics will be given for a bacterial infection, such as pneumonia or pharyngitis, that led to the attack.

PTS: 1

DIF: Cognitive Level: Understanding

27. A healthcare professional is educating a patient on asthma. The professional tells the patient that the most successful treatment for chronic asthma begins with which action?
- Avoidance of the causative agent
 - Administration of broad-spectrum antibiotics
 - Administration of drugs that reduce bronchospasm
 - Administration of drugs that decrease airway inflammation

ANS: A

Chronic management of asthma begins with the avoidance of allergens and other triggers. The need for other treatments is reliant on the avoidance of triggers.

PTS: 1

DIF: Cognitive Level: Understanding

28. Which factor contributes to the production of mucus associated with chronic bronchitis?
- Airway injury
 - Pulmonary infection
 - Increased Goblet cell size
 - Bronchospasms

ANS: C

Continual bronchial inflammation causes bronchial edema and increases the size and number of mucous glands and goblet cells in the airway epithelium. Thick, tenacious mucus is produced and cannot be cleared because of impaired ciliary function. The lung's defense mechanisms are therefore compromised, increasing a susceptibility to pulmonary infection, which contributes to airway injury. Frequent infectious exacerbations are complicated by bronchospasm with dyspnea and productive cough.

PTS: 1

DIF: Cognitive Level: Remembering

29. A patient with emphysema comes to the clinic and reports increased, productive cough. What diagnostic test should the healthcare professional facilitate as the *priority*?
- Chest x-ray
 - Peak expiratory flow
 - Pulmonary function tests
 - Sputum culture

ANS: A

The cough in emphysema is generally not productive, unless the patient has an acute exacerbation, which can be caused by a pulmonary infection. The best way to diagnose an infection such as pneumonia is with a chest x-ray. A sputum culture would be helpful to specify the organism for tailored treatment, but is not required for the diagnosis. Pulmonary function studies might be ordered later to see if the patient's disease has progressed, but would not be ordered during an acute illness. Peak expiratory flow is usually used to monitor asthma. The professional should expedite a chest x-ray.

PTS: 1

DIF: Cognitive Level: Analyzing

30. A patient has been diagnosed with primary emphysema but claims there is no history of smoking. What action by the healthcare professional is *most* appropriate?
- Facilitate genetic testing on the patient.
 - Ask the family if the patient smokes.
 - Schedule pulmonary function studies.
 - Get baseline arterial blood gasses.

ANS: A

Although emphysema is usually caused by smoking, a mutation in the α_1 -antitrypsin gene results in the development of the disease in younger, nonsmokers. The healthcare professional would facilitate this test. There is no reason to ask the family of a patient about the patient's smoking history unless the patient was unable to answer questions on his or her own. Pulmonary function studies will be done at some time, but does not help determine the etiology of the disease. Baseline arterial blood gasses would not be needed.

PTS: 1

DIF: Cognitive Level: Analyzing

31. Which of these is the *most* common route of lower respiratory tract infection?
- Aspiration of oropharyngeal secretions
 - Inhalation of microorganisms
 - Microorganisms spread to the lung via blood
 - Poor mucous membrane protection

ANS: A

Aspiration of oropharyngeal secretions is the most common route of lower respiratory tract infection; thus the nasopharynx and oropharynx constitute the first line of defense for most infectious agents. Inhalation of microorganisms and spread of organisms via the blood do occur but much less frequently. Poor mucus membrane protection would increase a person's risk of infection but is not a common direct route of infection.

PTS: 1

DIF: Cognitive Level: Remembering

32. A patient has recently been diagnosed with emphysema. What initial step in management of this disease does the healthcare professional discuss with the patient?
- Inhaled anticholinergic agents
 - Beta agonists
 - Cessation of smoking

d. Surgical reduction of lung volume

ANS: C

Chronic management of emphysema begins with smoking cessation. As long as the patient continues to smoke, the disease will worsen. Pharmacologic management includes inhaled anticholinergic agents and beta agonists. Pulmonary rehabilitation, improved nutrition, and breathing techniques all can improve symptoms. Oxygen therapy is indicated in chronic hypoxemia but must be administered with care. In selected patients, lung volume reduction surgery or transplantation can be considered.

PTS: 1

DIF: Cognitive Level: Remembering

33. The student asks a professor to explain how tuberculosis (TB) can remain dormant in some people. What explanation by the professor is *best*?
- a. It does not remain dormant but some host defenses can kill the bacteria.
 - b. The bacilli can become isolated within tubercles in the lungs.
 - c. Macrophages attack and phagocytize new areas of infection.
 - d. Virulence factors in the bacilli weaken over time leading to apoptosis.

ANS: B

Neutrophils, lymphocytes, and macrophages seal off colonies of the TB bacilli, forming granulomatous tubercles of scar tissue that isolates them. In this manner, and with developing immunity, TB can remain dormant sometimes for years or for life. Some bacilli are killed by host defenses but not enough to rid to body of the disease. Macrophages do phagocytize some of the bacilli. Virulence factors do not weaken over time.

PTS: 1

DIF: Cognitive Level: Understanding

34. Pulmonary artery hypertension (PAH) results from which alteration?
- a. Narrowed pulmonary capillaries
 - b. Narrowed bronchi and bronchioles
 - c. Destruction of alveoli
 - d. Ischemia of the myocardium

ANS: A

PAH is characterized by endothelial dysfunction with an overproduction of vasoconstrictors (e.g., thromboxane, endothelin) and decreased production of vasodilators (e.g., nitric oxide, prostacyclin), resulting in narrowed pulmonary capillaries. This process does not occur in bronchi and bronchioles and does not include destruction of the alveoli or ischemia of the myocardium.

PTS: 1

DIF: Cognitive Level: Remembering

35. Squamous cell carcinoma of the lung is best described as a tumor that causes which alterations?
- a. Abscesses and ectopic hormone production
 - b. Pneumonia and atelectasis
 - c. Pleural effusion and shortness of breath
 - d. Chest wall pain and early metastasis

ANS: B

Typically, the tumors are centrally located near the hila and project into bronchi. Because of this central location, nonproductive cough or hemoptysis is common. Pneumonia and atelectasis are often associated with squamous cell carcinoma. Chest pain is a late symptom associated with large tumors. Ectopic hormone secretion can occur with small cell carcinoma of the lung. Adenocarcinoma, large cell carcinoma, and mesothelioma can produce pleural effusions. Early metastasis and chest wall pain occur with large cell carcinoma although many types do have early metastases. Chest pain is also a common finding, although chest wall pain is specific to large cell carcinoma.

PTS: 1

DIF: Cognitive Level: Remembering

36. A patient is diagnosed with a pneumothorax and asks the healthcare professional to explain this condition. What statement by the professional is *most* accurate?
- Blood in your chest cavity
 - Air in the pleural space
 - Pus in the pleural space
 - Collapse of small airways

ANS: B

Pneumothorax is the presence of air or gas in the pleural space caused by a rupture in the visceral pleura (which surrounds the lungs) or the parietal pleura and chest wall. Blood in the pleural space describes a hemothorax. Pus in the pleural space is an empyema. Collapse of small airways describes atelectasis.

PTS: 1

DIF: Cognitive Level: Understanding

37. A patient has been diagnosed with an empyema. What does the healthcare professional tell the patient about this condition?
- We will have to drain the pus out of your pleural space.
 - You will be given a long course of antiviral medication.
 - These blebs in your lungs can rupture with exercise.
 - We will watch you for respiratory muscle fatigue.

ANS: A

Empyema is the presence of pus in the pleural space. The usual treatment is drainage of the pleural space with a chest tube and administration of antibiotics (not antivirals). Blebs are the cause of some cases of spontaneous pneumothorax and they can rupture with exercise. Respiratory muscle fatigue may develop with empyema, but this is a vague finding not directly related to empyema.

PTS: 1

DIF: Cognitive Level: Understanding

38. Fluid in the pleural space characterizes which condition?
- Pleural effusion
 - Atelectasis
 - Bronchiectasis
 - Ischemia

ANS: A

Pleural effusion is the presence of fluid in the pleural space. Atelectasis is the collapse of small airways. Bronchiectasis is persistent and abnormal dilation of bronchi. Ischemia is inadequate blood supply to the tissues.

PTS: 1

DIF: Cognitive Level: Remembering

39. A patient has silicosis. Which medication classification does the healthcare professional educate the patient about?
- Corticosteroids
 - Antibiotics
 - Bronchodilators
 - Expectorants

ANS: A

No specific treatment exists for silicosis, although corticosteroids may produce some improvement in the early, more acute stages. Patients with silicosis are not usually treated with antibiotics, bronchodilators, or expectorants unless individual circumstances warrant these drugs.

PTS: 1

DIF: Cognitive Level: Understanding

40. What medical term is used for a condition that results from pulmonary hypertension, creating chronic pressure overload in the right ventricle?
- Hypoxemia
 - Hypoxia
 - Bronchiectasis
 - Cor pulmonale

ANS: D

Cor pulmonale develops as pulmonary hypertension and creates chronic pressure overload in the right ventricle similar to that created in the left ventricle by systemic hypertension. Hypoxemia is low oxygen in the blood. Hypoxia is low oxygen in tissues. Bronchiectasis is persistent abnormal dilation of bronchi.

PTS: 1

DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. A patient has dyspnea. Which of these should the healthcare professional assess the patient for? (*Select all that apply.*)
- Decreased partial pressure of arterial oxygen (PaO_2)
 - Presence of heart disease
 - Recent nasal surgery or trauma
 - Presence of anxiety
 - Presence of pain

ANS: A, B, D, E

Dyspnea is a subjective feeling of difficulty in breathing. Triggers include decreased PaO₂, heart disease, anxiety, and pain among others. Nasal surgery or trauma might impair nose breathing, but should not cause dyspnea as the person should be able to breathe through the mouth.

PTS: 1 DIF: Cognitive Level: Understanding

2. The student learns that which inflammatory mediators are produced in asthma? (*Select all that apply.*)
- Histamine
 - Bradykinin
 - Leukotrienes
 - Prostaglandins
 - Neutrophil proteases

ANS: A, B, C, D

A large number of inflammatory mediators, such as histamine, bradykinins, prostaglandins, and leukotrienes, are produced by asthma. Neutrophil proteases are not produced in relationship to asthma.

PTS: 1 DIF: Cognitive Level: Remembering

3. Which clinical manifestations would the healthcare professional assess for in a painter with pulmonary hypertension? (*Select all that apply.*)
- Systemic blood pressure greater than 130/90 mmHg
 - Rhonchi bilaterally
 - Dyspnea on exertion
 - Peripheral edema
 - Jugular venous distention

ANS: C, D, E

Symptoms of fatigue, chest discomfort, tachypnea, and dyspnea on exertion, palpitations, and cough are common in pulmonary hypertension. Examination may reveal peripheral edema, jugular venous distention, a precordial heave, and accentuation of the pulmonary compartment of the second heart sound. Neither rhonchi nor a systemic blood pressure of 130/90 mmHg is associated with pulmonary hypertension.

PTS: 1 DIF: Cognitive Level: Remembering

4. What does the student learn about exudative pleural effusion? (*Select all that apply.*)
- Contains high concentrations of white blood cells
 - Produces a very thick exudate
 - May occur in response to an inflammatory process
 - The presence of a malignant cancer can trigger exudative effusion.
 - Is the result of increased capillary permeability

ANS: A, C, D, E

Exudative effusion is less watery and contains high concentrations of white blood cells and plasma proteins. Exudative effusion occurs in response to inflammation, infection, or malignancy and involves inflammatory processes that increase capillary permeability. The exudate is thin or watery.

PTS: 1 DIF: Cognitive Level: Remembering

5. A patient is diagnosed in the Emergency Department with a flail chest. Which assessment findings would the healthcare professional expect to find in this patient? (*Select all that apply.*)
- a. Fracture of several consecutive ribs
 - b. Multiple fractures to individual ribs
 - c. Fracture of the sternum
 - d. A systemic inflammatory process
 - e. Paradoxical chest wall movement

ANS: A, B, C, E

A flail chest results from the fracture of several consecutive ribs in more than one place or the fracture of the sternum and several consecutive ribs. The loss of bony integrity of the chest wall leads to paradoxical chest wall movement during respiration.

PTS: 1 DIF: Cognitive Level: Remembering

6. A patient has been diagnosed with tuberculosis (TB). What does the student know about this condition? (*Select all that apply.*)
- a. Foreign-born people have the highest rate in the United States.
 - b. TB is rapidly becoming resistant to many different antibiotics.
 - c. It is transmitted through contact with patient secretions.
 - d. A positive skin test is the only reliable way to diagnose TB.
 - e. Treatment consists of a combination of antibiotics.

ANS: A, B, E

TB is a common worldwide health problem, but in the United States, most cases of TB are seen in foreign-born individuals. TB is rapidly developing multi-drug resistance. It is transmitted through inhaling infectious droplets. A positive skin test demonstrates exposure to TB, not specifically active disease; a chest x-ray is needed for confirmation. Treatment does consist of a multiple antibiotic regime.

PTS: 1 DIF: Cognitive Level: Remembering

7. A patient has pneumonia. For which clinical manifestations should the healthcare professional assess for? (*Select all that apply.*)
- a. Inspiratory crackles
 - b. Fremitus
 - c. Egophony
 - d. Whispered pectoriloquy
 - e. Absence of breath sounds

ANS: A, B, C, D

Pneumonia is characterized by inspiratory crackles, increased tactile fremitus (palpable chest vibrations), egophony (a voice sound heard on auscultation as a prolonged “a” over consolidated lung tissue when a person says “e”), and whispered pectoriloquy (the sound of whispering heard on auscultation over consolidated lung tissue which are normally not heard). An absence of breath sounds would not be consistent with this disease process.

PTS: 1

DIF: Cognitive Level: Remembering

Chapter 37: Alterations of Pulmonary Function in Children

MULTIPLE CHOICE

1. Why is nasal congestion a serious threat to young infants?
 - a. Infants are obligatory nose breathers.
 - b. Their nares are small in diameter.
 - c. Infants become dehydrated when mouth breathing.
 - d. Their epiglottis is proportionally greater than the epiglottis of an adult's.

ANS: A

Infants up to 2 to 3 months of age are obligatory nose breathers and are unable to breathe in through their mouths. Nasal congestion is therefore a serious threat to a young infant. This selection is the only option that accurately describes why nasal congestion is a serious threat to young infants. Although infants' nares are smaller than older children, this is not the main reason why congestion poses such a threat. Becoming dehydrated also is not a factor. The size of their epiglottis is also not as big a factor in young infants.

PTS: 1

DIF: Cognitive Level: Remembering

2. The risk for respiratory distress syndrome (RDS) decreases for premature infants when they are born between how many weeks of gestation?
 - a. 16 and 20
 - b. 20 and 24
 - c. 24 and 30
 - d. 30 and 36

ANS: D

A lack of surfactant leads to RDS. Surfactant is secreted into fetal airways between 30 and 36 weeks, so a baby born between these weeks would have less of developing RDS.

PTS: 1

DIF: Cognitive Level: Remembering

3. A healthcare professional is educating a community parent group and informs them that which type of croup is *most* common?
 - a. Bacterial
 - b. Viral
 - c. Fungal
 - d. Autoimmune

ANS: B

In 85% of children with croup, a virus is the cause, most commonly parainfluenza. The healthcare professional would inform the parent group of this fact.

PTS: 1

DIF: Cognitive Level: Remembering

4. What is the *primary* cause of respiratory distress syndrome (RDS) of the newborn?
- Immature immune system
 - Small alveoli
 - Surfactant deficiency
 - Anemia

ANS: C

RDS is primarily caused by surfactant deficiency and secondarily by a deficiency in alveolar surface area for gas exchange. RDS is not caused by having an immature immune system, small alveoli, or anemia.

PTS: 1 DIF: Cognitive Level: Remembering

5. What is the *primary* problem resulting from respiratory distress syndrome (RDS) of the newborn?
- Consolidation
 - Pulmonary edema
 - Atelectasis
 - Bronchiolar plugging

ANS: C

The primary problem is atelectasis, which causes significant hypoxemia and is difficult for the neonate to overcome because a significant negative inspiratory pressure is required to open the alveoli with each breath. Consolidation, pulmonary edema, and bronchiolar plugging are not the primary problems in RDS.

PTS: 1 DIF: Cognitive Level: Remembering

6. Bronchiolitis tends to occur during the first years of life and is *most* often caused by what type of infection?
- Respiratory syncytial virus (RSV)
 - Influenza virus
 - Adenoviruses
 - Rhinovirus

ANS: A

The most common associated pathogen is RSV, but bronchiolitis may also be associated with adenovirus, rhinovirus, influenza, parainfluenza virus (PIV), and *Mycoplasma pneumoniae*.

PTS: 1 DIF: Cognitive Level: Remembering

7. Which immunoglobulin (Ig) is present in childhood asthma?
- IgM
 - IgG
 - IgE
 - IgA

ANS: C

Included in the long list of asthma-associated genes are those that code for increased levels of immune and inflammatory mediators (e.g., interleukin [IL]-4, IgE, leukotrienes), nitric oxide, and transmembrane proteins in the endoplasmic reticulum. IgM, IgG, and IgA are not associated with childhood asthma.

PTS: 1 DIF: Cognitive Level: Remembering

8. Which T-lymphocyte phenotype is the key determinant of childhood allergic asthma?
- Cluster of differentiation (CD) 4 T-helper Th₁ lymphocytes
 - CD4 T-helper Th₂ lymphocytes
 - CD8 cytotoxic T lymphocytes
 - Memory T lymphocytes

ANS: B

Early onset allergic asthma is initiated by a type I hypersensitivity reaction primarily mediated by Th₂ lymphocytes whose cytokines activate mast cells, eosinophilia, leukocytosis, and enhance B-cell IgE production.

PTS: 1 DIF: Cognitive Level: Remembering

9. A student asks the healthcare professional why researchers are trying to link specific genes to specific asthma phenotypes. What response by the professional is *best*?
- Some types of asthma are easier to treat than others.
 - Some people could use cheaper medications.
 - It can lead to personalized approaches to treatment.
 - More and more asthma phenotypes are being recognized.

ANS: C

Linking specific genes to specific asthma phenotypes is leading to targeted therapies and personalized approaches to asthma treatment. It may be true that some types are easier to treat or that some people could use different, less expensive medications, but those responses are too narrow in focus to be the best answer. Several phenotypes of asthma have already been recognized.

PTS: 1 DIF: Cognitive Level: Understanding

10. Which statement by the healthcare professional accurately describes childhood asthma?
- An obstructive airway disease characterized by reversible airflow obstruction, bronchial hyperreactivity, and inflammation
 - A pulmonary disease characterized by severe hypoxemia, decreased pulmonary compliance, and diffuse densities on chest x-ray imaging
 - A pulmonary disorder involving an abnormal expression of a protein, producing viscous mucus that lines the airways, pancreas, sweat ducts, and vas deferens
 - An obstructive airway disease characterized by atelectasis and increased pulmonary resistance as a result of a surfactant deficiency

ANS: A

Asthma is an obstructive airway disease characterized by reversible airflow obstruction, bronchial hyperreactivity, and inflammation. A disease with severe hypoxemia, decreased compliance, and diffuse densities on chest x-ray is ARDS. The viscous mucus lining the airways and other organs and tissues is seen in cystic fibrosis. Surfactant deficiency is found in RDS of the newborn.

PTS: 1 DIF: Cognitive Level: Understanding

11. A 7 year-old-child presents to the clinic where parents report signs and symptoms consistent with asthma. What does the healthcare professional do in order to confirm this diagnosis?
- Assess for a parental history of asthma
 - Draw serum levels of immunoglobulin E (IgE) and eosinophil levels
 - Measure expiratory flow rate with spirometry testing
 - Give a trial of asthma medication and check for improvement

ANS: C

Confirmation of the diagnosis of asthma relies on pulmonary function testing using spirometry, which can be accomplished after the child is 5 to 6 years of age. Reduced expiratory flow rates that are reversible in response to an inhaled bronchodilator would be characteristic abnormalities. For younger children, an empiric trial of asthma medications is commonly initiated. A positive parental history of asthma and elevated levels of IgE and eosinophils are major historical and physical factors that contribute but do not confirm the diagnosis of asthma in children.

PTS: 1 DIF: Cognitive Level: Applying

12. Which statement by the professor best describes acute respiratory distress syndrome (ARDS)?
- An obstructive airway disease characterized by reversible airflow obstruction, bronchial hyperreactivity, and inflammation
 - A pulmonary disease characterized by severe hypoxemia, decreased pulmonary compliance, and the presence of bilateral infiltrates on chest x-ray imaging
 - A respiratory disorder involving an abnormal expression of a protein producing viscous mucus that lines the airways, pancreas, sweat ducts, and vas deferens
 - A pulmonary disorder characterized by atelectasis and increased pulmonary resistance as a result of a surfactant deficiency

ANS: B

ARDS is a condition that can result from either a direct or indirect pulmonary insult. It is defined as respiratory failure of acute onset characterized by severe hypoxemia that is refractory to treatment with supplemental oxygen, bilateral infiltrates on chest x-ray imaging, and no evidence of heart failure, as well as decreased pulmonary compliance. The disorder with reversible airflow limitation is asthma. The disease with viscous mucus that lines the airways and other organs and tissues is cystic fibrosis. A surfactant deficiency occurs in RDS of the newborn.

PTS: 1 DIF: Cognitive Level: Remembering

13. When assessing for the signs and symptoms of acute respiratory distress syndrome (ARDS), the absence of which condition is considered characteristic?
- Progressive respiratory distress

- b. Bilateral infiltrates
- c. Decreased pulmonary compliance
- d. Heart failure

ANS: D

ARDS is characterized by progressive respiratory distress, severe hypoxemia refractory to treatment with supplemental oxygen, decreased pulmonary compliance, bilateral infiltrates on chest x-ray imaging, and no evidence of heart failure.

PTS: 1 DIF: Cognitive Level: Remembering

14. Parents bring a 5-year-old to the Emergency Department and report sudden onset of high fever, drooling, and they describe a “hot potato voice.” What action by the healthcare professional takes *priority*?
- a. Immediate assessment for aspiration of a foreign body
 - b. Allow the child to remain in the parent’s lap.
 - c. Send the child to radiology for x-rays of the throat and chest.
 - d. Start the child and all family members on rifampin.

ANS: B

This child has manifestations of epiglottitis. Inflammation can lead to airway obstruction rapidly so the main focus of immediate care is securing the airway and keeping the child calm because agitation can worsen the airway problems. Allow the child to remain on the parent’s lap for all examinations and tests. Examination of the throat in this condition may trigger laryngospasm and cause respiratory collapse so this is not done. The child should not be sent out of the department for x-rays as death can occur quickly. After the child has been stabilized, family members can begin post-exposure prophylaxis with rifampin.

PTS: 1 DIF: Cognitive Level: Applying

15. Which statement *best* describes cystic fibrosis?
- a. Obstructive airway disease characterized by reversible airflow obstruction, bronchial hyperreactivity, and inflammation
 - b. Respiratory disease characterized by severe hypoxemia, decreased pulmonary compliance, and diffuse densities on chest x-ray imaging
 - c. Pulmonary disorder involving an abnormal expression of a protein-producing viscous mucus that obstructs the airways, pancreas, sweat ducts, and vas deferens
 - d. Pulmonary disorder characterized by atelectasis and increased pulmonary resistance as a result of a surfactant deficiency

ANS: C

Cystic fibrosis is best described as a pulmonary disorder involving an abnormal expression of a protein-producing viscous mucus that obstructs the airways, pancreas, sweat ducts, and vas deferens. Reversible airflow limitations are seen in asthma. Severe hypoxemia and diffuse densities seen on x-ray are characteristic of ARDS. Surfactant deficiency leads to RDS of the newborn.

PTS: 1 DIF: Cognitive Level: Remembering

16. Parents of a child with cystic fibrosis want to know the chance of their next baby having this disease. What response by the healthcare professional is *most* accurate?
- Each child will have a 25% chance of having the disease.
 - None of your male children will inherit this disease.
 - All of your children will probably be carriers.
 - There is no way to know because it is a random mutation.

ANS: A

Cystic fibrosis is an autosomal recessive inherited disorder. When two parents each have the trait (are carriers), each child will have a 25% chance of having normal genes and being unaffected, a 50% chance of inheriting one of the mutated genes and being a carrier, and a 25% chance of inheriting the mutated gene from both parents and having the disease.

PTS: 1

DIF: Cognitive Level: Remembering

17. What abnormalities lead to the mucus plugging seen in children with cystic fibrosis (CF)?
- Excess mucus plugs the gut and keeps it from absorbing water effectively.
 - A weak inflammatory response allows bacterial to colonize the mucus.
 - Defective chloride secretion and excess sodium absorption thicken the mucus.
 - Pulmonary vascular remodeling occurs that leads to chronic hypoxia.

ANS: C

Respiratory mucus in CF is dehydrated and viscous because of impaired chloride secretion and excess sodium absorption. The gut's ability to absorb water is not affected. The inflammatory response is active in this disease process. Pulmonary remodeling does lead to chronic hypoxia, but this is not related to mucus plugging.

PTS: 1

DIF: Cognitive Level: Remembering

18. Between which months of age does sudden infant death syndrome (SIDS) most often occur?
- 0 and 1
 - 2 and 4
 - 5 and 6
 - 6 and 7

ANS: B

The incidence of SIDS is low during the first month of life but sharply increases in the second month of life, peaking at 2 to 4 months and is unusual after 6 months of age.

PTS: 1

DIF: Cognitive Level: Remembering

19. What is the most common predisposing factor to obstructive sleep apnea in children?
- Chronic respiratory infections
 - Adenotonsillar hypertrophy
 - Obligatory mouth breathing
 - Paradoxical breathing

ANS: B

In otherwise healthy children, the most common predisposing factor is adenotonsillar hypertrophy, which causes physical impingement on the nasopharyngeal airway. The other options are not associated with obstructive sleep apnea in children.

PTS: 1

DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. What information does the student learn about alveoli? (*Select all that apply.*)
 - a. The number of functioning alveoli is determined by birth.
 - b. The alveoli begin to increase in size starting at 8 years of age.
 - c. The complexity of the alveoli increases into adulthood.
 - d. These structures produce surfactant.
 - e. Capillaries are the origin of alveoli.

ANS: C, E

Capillaries grow into the distal respiratory units that keep subdividing (alveolarization) to maximize the surface area for gas exchange. The number of alveoli continues to increase during the first 5 to 8 years of life, after which the alveoli increase in size and complexity. Surfactant is a lipid-protein mix that is produced by type II alveolar cells.

PTS: 1

DIF: Cognitive Level: Remembering

2. Children diagnosed with acute asthma are likely to exhibit which symptoms? (*Select all that apply.*)
 - a. Nasal flaring
 - b. Musical expiratory wheezing
 - c. Clubbing of fingers and toes
 - d. Substernal retractions
 - e. Diaphoresis

ANS: A, B, D, E

On physical examination, expiratory wheezing that is often described as high pitched and musical is exhibited, along with prolongation of the expiratory phase of the respiratory cycle. Hyperinflation is sometimes visible. The respiratory rate is elevated, as is the heart rate. Nasal flaring and accessory muscle use are evident, with retractions in the substernal, subcostal, intercostal, suprasternal, or sternocleidomastoid areas. Infants may appear to be “head bobbing” because of sternocleidomastoid muscle use. Pulsus paradoxus may also be present. The child may appear anxious or diaphoretic, which are important signs of respiratory compromise. Clubbing of fingers and toes is not typically associated with asthma as it is caused by chronic hypoxemia.

PTS: 1

DIF: Cognitive Level: Remembering

3. Which symptoms are least likely to be assessed in a child with croup? (*Select all that apply.*)
 - a. Congestion
 - b. Sore throat
 - c. Low-grade fever

- d. Barking cough
- e. Coarse rhonchi

ANS: A, E

Typically, a prodrome of rhinorrhea (not congestion), sore throat, and low-grade fever is exhibited for a few days with croup. The child then develops the characteristic harsh (seal-like) barking cough, hoarse voice, and inspiratory stridor. Rhonchi are associated with lower respiratory diseases.

PTS: 1 DIF: Cognitive Level: Remembering

4. What are the clinical manifestations of bacterial pneumonia in children? (*Select all that apply.*)
- a. Fever with chills
 - b. Productive cough
 - c. Dyspnea
 - d. Respiratory alkalosis
 - e. Malaise

ANS: A, B, C, E

The clinical presentation of bacterial pneumonia, particularly pneumococcal, may include a preceding viral illness, followed by fever with chills and rigors, shortness of breath, and an increasingly productive cough. Auscultation usually reveals such abnormalities as crackles or decreased breath sounds. Other less specific findings may include malaise, emesis, abdominal pain, and chest pain. Respiratory alkalosis is not usually associated with bacterial pneumonia in children.

PTS: 1 DIF: Cognitive Level: Remembering

5. A health professions student learns which facts about the pediatric differences in the respiratory system? (*Select all that apply.*)
- a. An adult's chest wall compliance is lower than an infant's.
 - b. Increased resiliency makes infants more tolerant to respiratory problems.
 - c. Infants are obligatory nose breathers.
 - d. A baby is born with all the alveoli he or she will ever have.
 - e. Airway obstruction occurs sooner in infants than in older children.

ANS: A, C, E

There are several age-related differences to consider when working with children. Chest wall compliance is higher in infants than it is in adults, particularly in premature infants. Immunological immaturity makes infants and small children more susceptible to infection. Until 2 to 3 months of age, infants are obligatory nose breathers which increases their risk for obstruction and poor gas exchange. A child grows and develops more alveoli until between 5 to 8 years of age. Airway obstruction does occur sooner in infants because an infant's airway is smaller in general and in any airway; resistance is proportional to the inverse of the *fourth* power of the radius; thus a decrease to half the original diameter increases resistance by 16-fold.

PTS: 1 DIF: Cognitive Level: Remembering

Chapter 38: Structure and Function of the Renal and Urologic Systems

MULTIPLE CHOICE

1. What is the area of the kidneys that contains the glomeruli and portions of the tubules called?
 - a. Medulla
 - b. Cortex
 - c. Pyramids
 - d. Columns

ANS: B

The cortex contains all the glomeruli and portions of the tubules of the kidneys. The medulla forms the inner part of the kidney and consists of regions called pyramids. The apices of the pyramids project into minor calyces (cup-shaped cavities) that unite to form major calyces. Renal columns are an extension of the cortex and lie between the pyramids and extend to the renal pelvis.

PTS: 1 DIF: Cognitive Level: Remembering

2. What is the functional unit of the kidney called?
 - a. Glomerulus
 - b. Nephron
 - c. Collecting duct
 - d. Pyramid

ANS: B

The nephron is the functional unit of the kidney. The glomerulus is a tuft of capillaries that loop into the circular Bowman glomerular capsule (Bowman space), like fingers pushed into bread dough and is the site of filtration. Final adjustments in urine composition are made by the distal tubule and collecting duct according to body needs. The apices of the pyramids project into minor calyces (cup-shaped cavities) that unite to form major calyces.

PTS: 1 DIF: Cognitive Level: Remembering

3. What is the only surface inside the nephron where cells are covered with microvilli to increase the reabsorptive surface area called?
 - a. Proximal convoluted tubules
 - b. Distal tubules
 - c. Ascending loop of Henle
 - d. Descending loop of Henle

ANS: A

The only surface inside the nephron where the cells are covered with microvilli (a brush border) is called the *proximal convoluted tubules*. This proximal convoluted tubular lumen consists of one layer of cuboidal cells with a surface layer of microvilli that increases the reabsorptive surface area.

PTS: 1 DIF: Cognitive Level: Remembering

4. What part of the kidney controls renal blood flow, glomerular filtration, and renin secretion?
- Macula densa
 - Visceral epithelium
 - Juxtaglomerular apparatus (JGA)
 - Filtration slits

ANS: C

Control of renal blood flow, glomerular filtration, and renin secretion occurs at the JGA. Together, the juxtaglomerular cells and macula densa cells form the JGA. The macula densa prevent large fluctuations in body water and salt. The visceral epithelium becomes the parietal epithelium. The filtration slits are intercellular clefts that modulate filtration.

PTS: 1 DIF: Cognitive Level: Remembering

5. Innervation of the bladder and internal urethral sphincter is supplied by which nerves?
- Peripheral nerves
 - Parasympathetic fibers
 - Sympathetic nervous system
 - Tenth thoracic nerve roots

ANS: B

The innervation of the bladder and internal urethral sphincter is supplied by parasympathetic fibers of the autonomic nervous system. The process is not dependent on peripheral nerves, the sympathetic nervous system, or the tenth thoracic nerve roots.

PTS: 1 DIF: Cognitive Level: Remembering

6. How much urine accumulates in the bladder before the mechanoreceptors sense bladder fullness?
- 75 to 100 mL
 - 100 to 150 mL
 - 250 to 300 mL
 - 350 to 400 mL

ANS: C

When the bladder accumulates 250 to 300 mL of urine, it contracts and the internal urethral sphincter relaxes through activation of the spinal reflex arc (known as the *micturition reflex*).

PTS: 1 DIF: Cognitive Level: Remembering

7. What is the trigone?
- A smooth muscle that comprises the orifice of the ureter
 - The inner mucosal lining of the kidneys
 - A smooth triangular area between the openings of the two ureters and the urethra
 - One of the three divisions of the loop of Henle

ANS: C

The trigone is a smooth triangular area lying between the openings of the two ureters and the urethra.

PTS: 1 DIF: Cognitive Level: Remembering

8. The glomerular filtration rate is directly related to which factor?
- Perfusion pressure in the glomerular capillaries
 - Diffusion rate in the renal cortex
 - Diffusion rate in the renal medulla
 - Glomerular active transport

ANS: A

The filtration of the plasma per unit of time is known as the *glomerular filtration rate* (GFR), which is directly related to the perfusion pressure in the glomerular capillaries. It is not related to diffusion rates in the renal cortex or medulla or on glomerular active transport.

PTS: 1 DIF: Cognitive Level: Remembering

9. On average, what percent of cardiac output do the kidneys receive?
- 10% to 20%
 - 15% to 20%
 - 20% to 25%
 - 30% to 35%

ANS: C

The kidneys are highly vascular organs and usually receive 1000 to 1200 mL of blood per minute, or approximately 20% to 25% of the cardiac output.

PTS: 1 DIF: Cognitive Level: Remembering

10. What are blood vessels of the kidneys innervated by?
- Vagus nerve
 - Sympathetic nervous system
 - Somatic nervous system
 - Parasympathetic nervous system

ANS: B

The blood vessels of the kidney are innervated by the sympathetic noradrenergic fibers that cause arteriolar vasoconstriction and reduce renal blood flow. These vessels are not innervated by the vagus nerve, somatic nervous system, or parasympathetic nervous system.

PTS: 1 DIF: Cognitive Level: Remembering

11. When renin is released, it is capable of which action?
- Inactivation of autoregulation
 - Direct activation of angiotensin II
 - Direct release of antidiuretic hormone (ADH)
 - Formation of angiotensin I

ANS: D

When renin is released, it cleaves an α -globulin (angiotensinogen produced by liver hepatocytes) in the plasma to form angiotensin I.

PTS: 1

DIF: Cognitive Level: Remembering

12. A student asks the professor to explain what effect natriuretic peptides have during heart failure when the heart dilates. Which response by the professor is *best*?
- Stimulates antidiuretic hormones
 - Inhibits antidiuretic hormones
 - Stimulates renin and aldosterone
 - Inhibits renin and aldosterone

ANS: D

Natriuretic peptides inhibit renin and aldosterone during heart failure when the heart dilates. These make up a group of peptide hormones, including atrial natriuretic peptide (ANP), secreted from myocardial cells in the atria and brain natriuretic peptide (BNP) secreted from myocardial cells in the cardiac ventricles. When the heart dilates during volume expansion or heart failure, ANP and BNP inhibit sodium and water absorption by kidney tubules, inhibit the secretion of renin and aldosterone, vasodilate the afferent arterioles, and constrict the efferent arterioles. The result is increased urine formation, leading to decreased blood volume and blood pressure.

PTS: 1

DIF: Cognitive Level: Understanding

13. What is the direct action of atrial natriuretic hormone?
- Sodium retention
 - Sodium excretion
 - Water retention
 - Water excretion

ANS: B

Atrial natriuretic peptide (ANP) and brain natriuretic peptide (BNP) inhibit the secretion of renin, inhibit angiotensin-induced secretion of aldosterone, vasodilate the afferent and constrict the efferent glomerular arterioles, and inhibit sodium and water absorption by kidney tubules. The excretion of sodium (natriuresis) causes water excretion.

PTS: 1

DIF: Cognitive Level: Remembering

14. What term is used to identify the movement of fluids and solutes from the tubular lumen to the peritubular capillary plasma?
- Tubular secretion
 - Ultrafiltration
 - Tubular reabsorption
 - Tubular excretion

ANS: C

Tubular reabsorption is the movement of fluids and solutes from the tubular lumen to the peritubular capillary plasma. Tubular secretion is the transfer of substances from the plasma of the peritubular capillary to the tubular lumen. Ultrafiltration causes small molecules to move from the blood across the Bowman capsule into the renal tubule. Excretion is the elimination of a substance in the final urine.

PTS: 1 DIF: Cognitive Level: Remembering

15. A patient's urinalysis came back positive for glucose. What does the healthcare professional expect the patient's blood glucose to be at a minimum?
- a. 126 mg/dL
 - b. 150 mg/dL
 - c. 180 mg/dL
 - d. 200 mg/dL

ANS: C

When the plasma glucose reaches 180 mg/dL the threshold for glucose is achieved and glucose will begin appearing (spilling) into the urine.

PTS: 1 DIF: Cognitive Level: Remembering

16. Which hormone is required for water to be reabsorbed in the distal tubule and collecting duct?
- a. Antidiuretic hormone
 - b. Aldosterone
 - c. Cortisol
 - d. Adrenocorticotrophic hormone

ANS: A

Antidiuretic hormone is required for water to be reabsorbed in the distal tubule and collecting duct. Aldosterone causes sodium and water reabsorption and helps regulate electrolytes. Cortisol is a stress hormone. Adrenocorticotrophic hormone causes the adrenal glands to release cortisol.

PTS: 1 DIF: Cognitive Level: Remembering

17. Which glycoprotein protects against urolithiasis?
- a. Uromodulin
 - b. Nephtrin
 - c. Urodilatin
 - d. Cystatin

ANS: A

Tamm-Horsfall glycoprotein, also known as uromodulin, is the most abundant urinary protein, protects against bacterial adhesion and urolithiasis, and is a ligand for lymphokines. Urodilatin is a natriuretic hormone. Nephtrin is a protein needed for a stable renal filtration barrier. Cystatin C is a stable protein in serum filtered at the glomerulus and metabolized in the tubules. Serum levels of cystatin C also are a marker for estimating GFR, particularly for mild to moderate impaired renal function.

PTS: 1 DIF: Cognitive Level: Remembering

18. What is the end product of protein metabolism that is excreted in urine?
- Glucose
 - Ketones
 - Bile
 - Urea

ANS: D

Urea is an end product of protein metabolism and is the major constituent of urine along with water.

PTS: 1

DIF: Cognitive Level: Remembering

19. What is the action of urodilatin?
- Urodilatin causes vasoconstriction of afferent arterioles.
 - It causes vasodilation of the efferent arterioles.
 - Urodilatin inhibits antidiuretic hormone secretion.
 - It inhibits salt and water reabsorption.

ANS: D

Urodilatin (a natriuretic peptide) inhibits sodium and water reabsorption from the medullary part of collecting duct, thereby producing diuresis. It is not involved in the actions described by the other options.

PTS: 1

DIF: Cognitive Level: Remembering

20. The concentration of the final urine is determined by antidiuretic hormone (ADH), which is secreted by which gland?
- Posterior pituitary
 - Thyroid
 - Parathyroid
 - Anterior pituitary

ANS: A

ADH, which is secreted from the posterior pituitary gland, controls the concentration of the final urine. ADH is not secreted by the thyroid, parathyroid, or anterior pituitary glands.

PTS: 1

DIF: Cognitive Level: Remembering

21. What does the healthcare professional understand about urodilatin?
- Urodilatin inhibits sodium chloride and water reabsorption in the medullary part of the collecting duct.
 - It inhibits antidiuretic hormone (ADH) to prevent water reabsorption in the medullary part of the collecting duct.
 - Urodilatin is stimulated by a rise in blood pressure and an increase in extracellular volume.
 - It is stimulated by a fall in blood pressure and a decrease in extracellular volume.

ANS: C

When the circulating volume and increased blood pressure are increased, the distal tubule and collecting duct produces urodilatin (a natriuretic peptide). Urodilatin inhibits sodium and water reabsorption from the medullary part of collecting duct, thereby producing diuresis. It does not inhibit sodium chloride and water reabsorption in the medullary part of the collecting duct or inhibit ADH to prevent water reabsorption in the medullary part of the collecting duct.

PTS: 1 DIF: Cognitive Level: Remembering

22. What substance stimulates renal hydroxylation in the process of producing vitamin D?
- Erythropoietin
 - Thyroid hormone
 - Calcitonin
 - Parathyroid hormone

ANS: D

Parathyroid hormone stimulates renal hydroxylation in the process of producing vitamin D. Erythropoietin is necessary for the formation of red blood cells. Thyroid hormone helps control basal metabolic rate. Calcitonin opposes the actions of parathyroid hormone helping to regulate calcium and phosphorus levels in the body.

PTS: 1 DIF: Cognitive Level: Remembering

23. Which hormone is synthesized and secreted by the kidneys?
- Antidiuretic hormone
 - Aldosterone
 - Erythropoietin
 - Angiotensinogen

ANS: C

Erythropoietin is produced by the fetal liver and in the adult kidney and is essential for normal erythropoiesis. Antidiuretic hormone is stored in the posterior pituitary gland. Aldosterone is secreted by the adrenal cortex. Angiotensinogen is produced in the liver.

PTS: 1 DIF: Cognitive Level: Remembering

24. The student wants information about a patient's renal function. What test does the healthcare professional tell the student to evaluate?
- Glomerular filtration rate
 - Hourly urine output
 - Serum blood urea nitrogen and creatinine
 - The specific gravity of the solute concentration of the urine

ANS: A

The glomerular filtration rate provides the best estimate of the level of functioning of renal tissue. The professional would instruct the student to view these results. Urine output is a measure of renal function but is affected by many factors other than renal function. Blood urea nitrogen and creatinine are also affected by other factors. Specific gravity details the concentration of urine and also can be affected by extra-renal function.

PTS: 1 DIF: Cognitive Level: Understanding

25. Which renal change is found in older adults?
- Sharp decline in glomerular filtration rate
 - Sharp decline in renal blood flow
 - Decrease in the number of nephrons
 - Decrease in urine output

ANS: C

With aging, the number of nephrons decreases, possibly due to oxidative stress, inflammation, or other medical conditions. There is a linear decrease in glomerular filtration rate and renal blood flow, but it occurs more gradually. Urine output is not affected specifically by aging.

PTS: 1 DIF: Cognitive Level: Remembering

26. A healthcare professional is caring for an older adult. Understanding age-related renal changes, what urinalysis finding would the professional view as normal for an older patient?
- pH 5.2
 - Moderate protein
 - Specific gravity 1.003
 - Positive for white cell casts

ANS: C

The specific gravity of the urine in older individuals tends to be on the low side of normal. Normal specific gravity ranges from 1.001 to 1.035, so a reading of 1.003 is at the low end of normal and would be considered normal for an older patient. The pH ranges from 4.5–8 but is usually acidic and does not vary due to aging. Protein should only be found in trace amounts at any age. White cell casts indicate inflammation and are not normal at any age.

PTS: 1 DIF: Cognitive Level: Remembering

27. What process allows the kidney to respond to an increase in workload?
- Glomerular filtration
 - Secretion of 1,25-dihydroxyvitamin D₃
 - Increased heart rate
 - Compensatory hypertrophy

ANS: D

Compensatory hypertrophy allows the kidney to respond to an increase in workload throughout life. Glomerular filtration rate, secretion of vitamins, and increased heart rate are not relevant to the kidney accommodating for an increased workload.

PTS: 1 DIF: Cognitive Level: Remembering

28. Which process makes it possible for ureters to be transplanted successfully?
- Compensatory hypertrophy
 - Erythropoietin secretion
 - Peristalsis
 - Collateral circulation

ANS: C

Peristalsis is the process which makes it possible for ureters to be transplanted successfully. This process is maintained even when the ureter is denervated. Hypertrophy, erythropoietin secretion, and collateral circulation are not relevant to transplant success.

PTS: 1

DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. Which structures are parts of the nephron? (*Select all that apply.*)

- a. Loop of Henle
- b. Renal corpuscle
- c. Proximal convoluted tubule
- d. Calyx
- e. Collecting duct

ANS: A, B, C, E

The nephron is a tubular structure with subunits that include the renal corpuscle, proximal convoluted tubule, loop of Henle, distal convoluted tubule, and collecting duct, all of which contribute to the formation of final urine. The minor calyces receive urine from the collecting ducts through the renal papilla. The major calyces join to form the renal pelvis, which connects with the proximal end of the ureter.

PTS: 1

DIF: Cognitive Level: Remembering

2. Which forces create passive transport of water in the proximal tubule? (*Select all that apply.*)

- a. Peritubular capillary hydrostatic pressure
- b. Peritubular capillary oncotic pressure
- c. Interstitial hydrostatic pressure
- d. Interstitial osmotic pressure
- e. Peritubular capillary osmotic pressure

ANS: B, E

The osmotic force generated by active sodium transport promotes the passive diffusion of water out of the tubular lumen and into the peritubular capillaries. The elevated oncotic pressure of the blood in the peritubular capillaries further enhances the passive transport of water. Peritubular pressures are not forces that create passive transport of water in the proximal tubule.

PTS: 1

DIF: Cognitive Level: Remembering

3. Which hormones are produced by the kidney? (*Select all that apply.*)

- a. Renin
- b. Erythropoietin
- c. 1,25-Dihydroxyvitamin D₃
- d. Calcitonin
- e. Aldosterone

ANS: A, B, C

The kidney also has an endocrine function, secreting the hormones renin, erythropoietin, and 1,25-dihydroxyvitamin D₃ for the regulation of blood pressure, erythrocyte production, and calcium metabolism, respectively. Calcitonin is primarily produced in the thyroid. Aldosterone is produced in the adrenal gland.

PTS: 1 DIF: Cognitive Level: Remembering

4. What information does the pathophysiology student learn about renal circulation? (*Select all that apply.*)
- a. The interlobar arteries travel down into the renal columns.
 - b. The arcuate arteries branch to form the interlobar arteries.
 - c. The arcuate arteries arch over the base of the pyramids.
 - d. The interlobar arteries run parallel to the surface of the kidneys.
 - e. The interlobar arteries run between the pyramids.

ANS: A, B, E

The interlobar arteries are further subdivisions that travel down the renal columns and between the pyramids. At the cortical medullary junction, interlobar arteries branch into the arcuate arteries that arch over the base of the pyramids and run parallel to the surface of the kidney.

PTS: 1 DIF: Cognitive Level: Remembering

Chapter 39: Alterations of Renal and Urinary Tract Function

MULTIPLE CHOICE

1. How does progressive nephron injury affect angiotensin II activity?
 - a. Angiotensin II activity is decreased.
 - b. Angiotensin II activity is elevated.
 - c. Angiotensin II activity is totally suppressed.
 - d. Angiotensin II activity is not affected.

ANS: B

Angiotensin II activity is elevated with progressive nephron injury. Angiotensin II promotes glomerular hypertension and hyperfiltration caused by efferent arteriolar vasoconstriction and also promotes systemic hypertension. The chronically high intraglomerular pressure increases glomerular capillary permeability, contributing to proteinuria. Angiotensin II also may promote the activity of inflammatory cells and growth factors that participate in tubulointerstitial fibrosis and scarring.

PTS: 1

DIF: Cognitive Level: Remembering

2. A patient has been diagnosed with a renal stone. Based on knowledge of common stone types, what self-care measure does the healthcare professional plan to teach the patient when stone analysis has returned?
 - a. Increase water intake.
 - b. Decrease soda intake.
 - c. Restrict animal protein in the diet.
 - d. Ingest 1000 mg of calcium a day.

ANS: D

Calcium stones (calcium phosphate or calcium oxalate) account for 70% to 80% of all stones requiring treatment. While all choices are appropriate for self-care in the patient with kidney stones, maintaining a calcium intake of 1000 to 1200 mg/day is a specific preventative measure for calcium stones.

PTS: 1

DIF: Cognitive Level: Applying

3. The student asks the professor to explain the role of pyrophosphate, potassium citrate, and magnesium in the formation of kidney stones. What response by the professor is *best*?
 - a. They inhibit crystal growth.
 - b. They stimulate the supersaturation of salt.
 - c. They facilitate the precipitation of salts.
 - d. They enhance crystallization of salt crystals.

ANS: A

Stone or crystal growth inhibiting substances, including potassium citrate, pyrophosphate, and magnesium, are capable of crystal growth inhibition. They do not stimulate supersaturation of salt, facilitate the precipitation of salts, or enhance crystallization of salts.

PTS: 1 DIF: Cognitive Level: Understanding

4. Hypercalciuria is primarily attributable to which alteration?
- Defective renal calcium reabsorption
 - Intestinal hyperabsorption of dietary calcium
 - Bone demineralization caused by prolonged immobilization
 - Hyperparathyroidism

ANS: B

Hypercalciuria is usually attributable to intestinal hyperabsorption of dietary calcium and less commonly to a defect in renal calcium reabsorption. Hyperparathyroidism and bone demineralization associated with prolonged immobilization are also known to cause hypercalciuria but to a much lesser degree.

PTS: 1 DIF: Cognitive Level: Remembering

5. Detrusor hyperreflexia develops from neurologic disorders that originate where?
- Spinal cord between C2 and C4
 - Spinal cord between S2 and S4
 - Above the pontine micturition center
 - Below the cauda equina

ANS: C

Neurologic disorders that develop above the pontine micturition center result in detrusor hyperreflexia, also known as an *uninhibited* or *reflex bladder*.

PTS: 1 DIF: Cognitive Level: Remembering

6. A patient has overactive bladder syndrome. Which classification of drug does the healthcare professional plan to teach the patient about?
- β -Adrenergic blocking medications
 - α -Adrenergic blocking medications
 - Parasympathomimetic medications
 - Anticholinesterase medications

ANS: B

Because the bladder neck consists of circular smooth muscle with adrenergic innervation, detrusor sphincter dyssynergia may be managed by α -adrenergic blocking (antimuscarinic) medications. The other medications would not be of benefit in this situation.

PTS: 1 DIF: Cognitive Level: Remembering

7. Bladder cancer is associated with the gene mutation of which gene?
- c-erbB2*
 - Human epidermal growth factor receptor 2 (HER2)

- c. *TP53*
- d. *myc*

ANS: C

Oncogenes of the *ras* gene family and tumor-suppressor genes including *TP53* mutations and the inactivation of the *retinoblastoma* gene (*pRb*) are implicated in bladder cancer. The *c-erbB2* gene is associated with breast cancer as is *HER2*. The *myc* gene codes for a transcription factor that plays a role in cellular life cycle events.

PTS: 1

DIF: Cognitive Level: Remembering

8. A female patient has been diagnosed with an uncomplicated urinary tract infection. What self-care measure does the healthcare provider teach the patient that is specific to this type of infection?
- a. Drink at least eight glasses of water a day.
 - b. Take medication if you have a fever.
 - c. Rest as much as you can in the next few days.
 - d. After using the bathroom, wipe from front to back.

ANS: D

The most common infecting microorganisms are *E. coli* (80% to 85%) which is transmitted from the gut where it is a normal resident. Women should be taught to wipe from front to back after using the bathroom to avoid contamination of the urinary meatus with fecal material containing *E. coli*. The other options are appropriate for any type of infection.

PTS: 1

DIF: Cognitive Level: Applying

9. A healthcare professional is assessing a patient who could have either pyelonephritis or cystitis. Which differentiating sign would assist the professional in making this diagnosis?
- a. Difficulty starting the stream of urine
 - b. Spasmodic pain that radiates to the groin
 - c. Increased glomerular filtration rate
 - d. Urinalysis confirmation of white blood cell casts

ANS: D

Clinical assessment alone is difficult to differentiate the symptoms of cystitis from those of pyelonephritis. Urine culture, urinalysis, and clinical signs and symptoms establish the specific diagnosis. When present, white blood cell casts indicate pyelonephritis. Difficulty starting the urine stream could indicate prostate enlargement. Neither disorder has spasmodic pain that radiates to the groin; this would be indicative of a kidney stone. Increased GFR would not be seen in an infectious disorder.

PTS: 1

DIF: Cognitive Level: Applying

10. An 85-year-old person has a urinary tract infection. What clinical manifestation does the healthcare professional expect to see in this person?
- a. Confusion and poorly localized abdominal discomfort
 - b. Dysuria, frequency, and suprapubic pain
 - c. Hematuria and flank pain

d. Pyuria, urgency, and frequency

ANS: A

Older adults with cystitis may demonstrate confusion or vague abdominal discomfort or otherwise be asymptomatic.

PTS: 1

DIF: Cognitive Level: Remembering

11. Pyelonephritis is usually caused by which type of organism?

- a. Bacteria
- b. Fungi
- c. Viruses
- d. Parasites

ANS: A

Pyelonephritis is usually caused by the bacteria *Escherichia coli*, *Proteus*, or *Pseudomonas*.

PTS: 1

DIF: Cognitive Level: Remembering

12. Which abnormal laboratory value is found in glomerular disorders?

- a. Elevated creatinine concentration
- b. Low blood urea nitrogen (BUN)
- c. Elevated immunoglobulin A (IgA)
- d. Low serum complement

ANS: A

Elevated creatinine concentration is an abnormal laboratory value found in glomerular disorders. Reduced glomerular filtration rate during glomerular disease is evidenced by elevated plasma urea, creatinine concentration, or reduced renal creatinine clearance. Many factors can lead to an elevation in BUN such as dehydration or poor perfusion, in addition to kidney disease. Elevated IgA levels are associated with Berger disease. Low serum complement levels would affect immune functioning.

PTS: 1

DIF: Cognitive Level: Remembering

13. Which glomerular lesion is characterized by thickening of the glomerular capillary wall with immune deposition of immunoglobulin G (IgG) and C3?

- a. Proliferative
- b. Membranous
- c. Mesangial
- d. Crescentic

ANS: B

The thickening of the glomerular capillary wall characterizes only membranous lesions.

PTS: 1

DIF: Cognitive Level: Remembering

14. Goodpasture syndrome is an example of which of these?

- a. Antiglomerular basement membrane disease

- b. Acute glomerulonephritis
- c. Chronic glomerulonephritis
- d. Immunoglobulin A (IgA) nephropathy

ANS: A

Antiglomerular basement membrane disease (Goodpasture syndrome) is associated with immunoglobulin G (IgG) antibody formation against pulmonary capillary and glomerular basement membranes. Goodpasture syndrome is not an example of any of the other options.

PTS: 1

DIF: Cognitive Level: Remembering

15. A patient exhibits symptoms including hematuria with red blood cell casts and proteinuria exceeding 3 to 5 g/day, with albumin as the major protein. What diagnostic test or treatment regime does the healthcare professional educate the patient on?
- a. Intravenous pyelogram
 - b. Oral antibiotics
 - c. Renal biopsy
 - d. Cyclophosphamide

ANS: C

The data suggest the patient has *glomerulonephritis*. Two major changes distinctive of more severe glomerulonephritis are (1) hematuria with red blood cell casts and (2) proteinuria exceeding 3 to 5 g/day with albumin as the major protein. There are several types of this disorder and treatment is specific to individual types. The patient needs a renal biopsy to determine appropriate treatment. A pyelogram would help identify kidney stones. Oral antibiotics would be used if there is an infection. Cyclophosphamide can be used in glomerulonephritis that is unresponsive to corticosteroids.

PTS: 1

DIF: Cognitive Level: Applying

16. Hypothyroidism, edema, hyperlipidemia, and lipiduria characterize which kidney disorder?
- a. Nephrotic syndrome
 - b. Acute glomerulonephritis
 - c. Chronic glomerulonephritis
 - d. Pyelonephritis

ANS: A

Symptoms of nephrotic syndrome include edema, hyperlipidemia, lipiduria, vitamin D deficiency, and hypothyroidism.

PTS: 1

DIF: Cognitive Level: Remembering

17. A patient who has a history of mildly decreased renal function is admitted to the hospital for IV antibiotics. Which antibiotics would the healthcare professional avoid in this patient?
- a. Penicillin and ampicillin
 - b. Vancomycin and bacitracin
 - c. Gentamicin and tobramycin
 - d. Cefazolin and cefepime

ANS: C

Although numerous antibiotics can produce nephrotoxic ATN, the aminoglycosides (gentamicin, tobramycin) are the major culprits. The healthcare professional would avoid their use in this patient if at all possible.

PTS: 1

DIF: Cognitive Level: Remembering

18. Which urine characteristics are indicative of acute tubular necrosis (ATN) caused by intrinsic (intrarenal) failure?
- Urine sodium >30 mEq/L
 - Urine osmolality >500 mOsm
 - Fractional excretion of sodium (FE_{Na}) $<1\%$
 - Urine sediment has no cells, some hyaline casts

ANS: A

Urine sodium >30 mEq/L is the only option indicative of ATN. The other findings are associated with prerenal kidney injury.

PTS: 1

DIF: Cognitive Level: Remembering

19. How are glucose and insulin used to treat hyperkalemia associated with acute renal failure?
- Glucose has an osmotic effect, which attracts water and sodium, resulting in more dilute blood and a lower potassium concentration.
 - When insulin transports glucose into the cell, it also carries potassium with it.
 - Potassium attaches to receptors on the cell membrane of glucose and is carried into the cell.
 - Increasing insulin causes ketoacidosis, which causes potassium to move into the cell in exchange for hydrogen.

ANS: B

In severe hyperkalemia, potassium can be driven temporarily back into the cell with insulin. Glucose will also move into the cell. The glucose metabolism helps drive the potassium movement. Glucose is also given to prevent the patient from developing hypoglycemia.

PTS: 1

DIF: Cognitive Level: Remembering

20. Creatinine is primarily excreted by glomerular filtration after being constantly released from what type of tissue?
- Nervous system
 - Kidneys
 - Muscle
 - Liver

ANS: C

Creatinine is constantly released from muscle tissue to be excreted by glomerular filtration.

PTS: 1

DIF: Cognitive Level: Remembering

21. A professor has taught a student about skeletal alterations seen in chronic kidney disease. Which statement by the student indicates the professor needs to give more information?
- Parathyroid hormone is no longer effective in maintaining serum phosphate levels.
 - The parathyroid gland is no longer able to secrete sufficient parathyroid hormone.
 - The synthesis of 1,25-vitamin D₃, which reduces intestinal absorption of calcium, is impaired.
 - The effectiveness of calcium and phosphate resorption from bone is impaired.

ANS: B

Bone and skeletal changes develop with alterations in calcium and phosphate metabolism. These changes begin when the GFR decreases to 25% or less. The combined effect of *hyperparathyroidism* and *vitamin D deficiency* can result in renal osteodystrophies (e.g., *osteomalacia*, *osteitis fibrosa* with increased risk for fractures). Other consequences of secondary hyperparathyroidism include soft tissue and vascular calcification, cardiovascular disease, and, less commonly, calcific uremic arteriolopathy. The other statements are true.

PTS: 1

DIF: Cognitive Level: Evaluating

22. A patient who has chronic kidney disease has hemoglobin of 7.2 mg/dL. What treatment does the healthcare professional prepare the patient for?
- Intrinsic factor
 - Vitamin B₁₂
 - Vitamin D
 - Erythropoietin

ANS: D

Anemia of chronic kidney disease can be successfully treated with erythropoietin. Reduced erythropoietin secretion and reduced red cell production are evident in anemia resulting from chronic kidney disease. Intrinsic factor is needed for the absorption of vitamin B₁₂. Vitamin D is important for calcium absorption.

PTS: 1

DIF: Cognitive Level: Remembering

23. When the right kidney is obstructed, how will the glomeruli and tubules in the left kidney compensate?
- Increase in number
 - Increase in size
 - Develop collateral circulation
 - Increase speed of production

ANS: B

These processes cause the contralateral (unobstructed) kidney to increase the size of individual glomeruli and tubules. They do not increase in number, develop collateral circulation, or get produced more quickly.

PTS: 1

DIF: Cognitive Level: Remembering

24. What medical term is used to identify a functional urinary tract obstruction caused by an interruption of the nerve supply to the bladder?

- a. Neurogenic bladder
- b. Obstructed bladder
- c. Necrotic bladder
- d. Retrograde bladder

ANS: A

Neurogenic bladder is a general term for bladder dysfunction caused by neurologic disorders. The types of dysfunction are related to the sites in the nervous system that control sensory and motor bladder function. None of the other options correctly identify the described condition.

PTS: 1

DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. In glomerulonephritis, what damages the epithelial cells resulting in proteinuria? (*Select all that apply.*)
- a. Ischemia
 - b. Lysosomal enzymes
 - c. Compression from edema
 - d. Activated complement
 - e. Altered membrane permeability

ANS: D, E

Activated complement, inflammatory cytokines, oxidants, proteases, and growth factors attack epithelial cells, alter membrane permeability, and cause proteinuria. None of the other options are responsible for this process.

PTS: 1

DIF: Cognitive Level: Remembering

2. Which statements are *true* concerning struvite stones? (*Select all that apply.*)
- a. They are more common in women than in men.
 - b. Struvite stones are associated with chronic laxative use in women.
 - c. They grow large and branch into a staghorn configuration in renal pelvis and calyces.
 - d. They are closely associated with urinary tract infections caused by urease-producing bacteria
 - e. They are more common in men than in women.

ANS: A, C, D

Women are at greater risk for developing struvite stones, but the risk is greater because women have an increased incidence of urinary tract infections not because of chronic laxative use. Such stones grow large and branch into a staghorn configuration and are associated with *Pseudomonas a urease-producing bacteria*.

PTS: 1

DIF: Cognitive Level: Remembering

3. A patient has renal colic. What information about this condition does the healthcare professional give the student? (*Select all that apply.*)

- a. Renal colic results in mild-to-moderate pain.
- b. Pain originates in the flank area.
- c. Renal colic indicates the presence of renal stones.
- d. Pain radiated to the groin.
- e. Renal colic indicates obstruction of the renal pelvis or proximal ureter.

ANS: B, C, D, E

Renal colic is described as moderate-to-severe pain often originating in the flank and radiating to the groin. It usually indicates obstruction by renal stones of the renal pelvis or proximal ureter.

PTS: 1

DIF: Cognitive Level: Remembering

4. A patient has a lesion at the sacral segments below S1. Which conditions would the healthcare professional assess the patient for? (*Select all that apply.*)
- a. Frequency
 - b. Urge incontinence
 - c. Bladder distension
 - d. Urgency
 - e. Urinary retention

ANS: C, E

Lesions that involve the sacral micturition center (below S1; may also be termed *cauda equina syndrome*) or peripheral nerve lesions result in *detrusor areflexia* (acontractile detrusor), a lower motor neuron disorder. The result is an acontractile detrusor or atonic bladder with retention of urine and distention. The other options are associated with neurologic lesions that occur between C2 and S1.

PTS: 1

DIF: Cognitive Level: Remembering

5. What are considered risk factors for developing bladder and kidney cancers? (*Select all that apply.*)
- a. Cigarette smoking
 - b. Hypertension
 - c. Exposure to arsenic
 - d. Below normal body weight
 - e. Male gender

ANS: A, B, C

Risk factors for renal cancer include cigarette smoking, obesity, and hypertension. The risk of primary bladder cancer is greater among people who smoke or those who are exposed to *aromatic amines*, such as benzidine and beta-naphthylamine; arsenic in drinking water; phenacetin; cyclophosphamide; and pioglitazone. Gender is not a recognized risk factor.

PTS: 1

DIF: Cognitive Level: Remembering

6. Which renal disorders are considered causes of intrarenal kidney injury? (*Select all that apply.*)
- a. Acute glomerulonephritis
 - b. Allograft rejection
 - c. Tumors

- d. Acute tubular necrosis (ATN)
- e. Prostatic hypertrophy

ANS: A, B, C, D

Intrarenal (intrinsic) acute kidney injury (AKI) may result from ischemic ATN, nephrotoxic ATN, acute glomerulonephritis, vascular disease, allograft rejection, or interstitial disease (drug allergy, infection, tumor growth). Prostatic hypertrophy is associated with postrenal kidney.

PTS: 1 DIF: Cognitive Level: Remembering

7. Prerenal injury from poor perfusion can result from which conditions? (*Select all that apply.*)
- a. Bilateral ureteral obstruction
 - b. Renal vasoconstriction
 - c. Renal artery thrombosis
 - d. Hemorrhage
 - e. Hypotension

ANS: B, C, D, E

Poor perfusion can result from renal artery thrombosis, hypotension related to hypovolemia (dehydration, diarrhea, fluid shifts) or hemorrhage, renal vasoconstriction and alterations in renal regional blood flow, microthrombi, or kidney edema that restricts arterial blood flow. Bilateral ureteral obstruction is associated with postrenal injuries.

PTS: 1 DIF: Cognitive Level: Remembering

Chapter 40: Alterations of Renal and Urinary Tract Function in Children

MULTIPLE CHOICE

1. The functional kidney is associated with which embryonic organ?
 - a. Metanephros
 - b. Mesonephros
 - c. Pronephros
 - d. Endonephros

ANS: A

The functional kidney is associated with the metanephros. The kidney develops from three sets of structures: the pronephros (nonfunctional by the end of the embryonic period), mesonephros (nonfunctional), and metanephros (the functional kidney). Endonephros is not relevant to this process.

PTS: 1 DIF: Cognitive Level: Remembering

2. When does urine formation and excretion begin?
 - a. At birth
 - b. By 3 months' gestation
 - c. By 6 months' gestation
 - d. By 8 months' gestation

ANS: B

Urine formation and excretion begin by the third month of gestation.

PTS: 1 DIF: Cognitive Level: Remembering

3. Compared with an adult, an infant has a greater content of extracellular fluid, as well as a greater rate of fluid exchange. What effect does this have on the fluid balance of a child compared with that of an adult?
 - a. Edema development is less of a problem.
 - b. Overhydration is not difficult to manage.
 - c. Daily fluid requirements are greater.
 - d. The control of dehydration is more difficult.

ANS: D

An infant not only has a greater content of extracellular fluid but also has a greater rate of fluid exchange. The adult takes in and excretes approximately 2000 ml of water daily, representing 5% of the total body fluid and 14% of the extracellular fluid. In contrast, the infant's daily exchange of 600 to 700 ml of water represents 290% of the total body fluid or nearly 50% of the extracellular volume, making control of dehydration and overhydration more difficult.

PTS: 1 DIF: Cognitive Level: Remembering

4. What term is used to identify the condition that exists when the urethral meatus is located on the undersurface of the penis?
- Hypospadias
 - Epispadias
 - Hyperspadias
 - Chordee

ANS: A

Hypospadias is a congenital condition in which the urethral meatus is located on the ventral side or undersurface of the penis. In epispadias, the dorsal urethra is not fused and has failed to form into a tube. Epispadias can be seen in both boys and girls. In chordee a shortage of skin on the ventral surface causes the penis to bend or to “bow” ventrally. Hyperspadias is not a condition.

PTS: 1 DIF: Cognitive Level: Remembering

5. What initiates inflammation in acute poststreptococcal glomerulonephritis?
- Lysosomal enzymes
 - Endotoxins from *Streptococcus*
 - Immune complexes
 - Immunoglobulin E (IgE)–mediated response

ANS: C

The immune complexes initiate inflammation and glomerular injury in acute poststreptococcal glomerulonephritis. Antigen–antibody complexes are deposited in the glomerulus, or the antigen may be trapped within the glomerulus and immune complexes formed in situ. Lysosomal enzymes contain digestive enzymes. Endotoxins and IgE are not involved in acute poststreptococcal glomerulonephritis.

PTS: 1 DIF: Cognitive Level: Remembering

6. Acute glomerulonephritis (AGN) may be accompanied by a positive throat or skin culture for which bacteria?
- Staphylococcus aureus*
 - Streptococcus*
 - Pseudomonas aeruginosa*
 - Haemophilus*

ANS: B

AGN may be accompanied by a positive throat or skin culture for *Streptococcus*. AGN is not associated with any of the other organisms.

PTS: 1 DIF: Cognitive Level: Remembering

7. A child with acute poststreptococcal glomerulonephritis is voiding smoky, brown-colored urine and asks the healthcare professional to explain what causes it. What explanation by the professional is *best*?
- Presence of red blood cells
 - Presence of urobilinogen
 - Slough from the collecting tubules

d. Protein in the urine

ANS: A

The urine is usually smoky brown or cola-colored because of the presence of red blood cells. It is not due to urobilinogen, slough, or protein in the urine.

PTS: 1

DIF: Cognitive Level: Understanding

8. In immunoglobulin G (IgG) nephropathies such as glomerulonephritis, IgG is deposited in which location?
- a. Juxtamedullary nephrons
 - b. Glomerulus basement membranes
 - c. Mesangium of the glomerular capillaries
 - d. Parietal epithelium

ANS: B

In IgG-mediated nephropathies, lumpy deposits of IgG and C3 complement are found on the glomerulus basement membranes. They are not deposited in any of the other sites.

PTS: 1

DIF: Cognitive Level: Remembering

9. What is the pathophysiologic process responsible for the autoimmune disorder of hemolytic-uremic syndrome (HUS)?
- a. Immunoglobulin A (IgA) coats erythrocytes that are destroyed by the spleen, and remnants are excreted through the kidneys.
 - b. Verotoxin from *Escherichia coli* is absorbed from the intestines and damages erythrocytes and endothelial cells.
 - c. Endotoxins from *E. coli* block the erythropoietin produced by the kidneys, which reduces the number of erythrocytes produced by the bone marrow.
 - d. Failure of the nephron to filter urea increases the blood urea nitrogen, which binds to erythrocytes that are subsequently destroyed by the spleen.

ANS: B

In HUS, verotoxin from *E. coli* is absorbed from the intestines, the glomerular arterioles become swollen, and these narrowed vessels damage erythrocytes as they pass through. HUS is responsible for causing a cascade of effects, including lysis of glomerular capillary endothelial cells. HUS is not caused by erythrocyte destruction, reduced erythrocytes, or an increased BUN.

PTS: 1

DIF: Cognitive Level: Remembering

10. What is the first indication of nephrotic syndrome in children?
- a. Periorbital edema
 - b. Scrotal or labial edema
 - c. Frothy urine
 - d. Ascites

ANS: A

Onset of nephritic syndrome is insidious, with periorbital edema as the first sign of the disorder. Scrotal or labial edema and ascites can be seen when edema becomes pronounced. Frothy urine is another sign, but usually not the first sign seen.

PTS: 1 DIF: Cognitive Level: Remembering

11. Bacteria gain access to the female urinary tract by which means?
- Systemic blood that is filtered through the kidney
 - Bacteria traveling from the lymph adjacent to the bladder and kidneys
 - Bacteria ascending the urethra into the bladder
 - Colonization of the bladder when urine is static

ANS: C

Urinary tract infections (UTIs) in girls occur as a result of perineal bacteria, especially *Escherichia coli*, ascending the urethra. None of the other options represent the means by which bacteria gain access to the female urinary tract.

PTS: 1 DIF: Cognitive Level: Remembering

12. What causes vesicoureteral reflux to occur in children?
- Children do not ask for help in urinating in a timely manner, and urine is forced up into the ureters.
 - The submucosal segment of a child's ureter is short, making the antireflux mechanism inefficient.
 - The trigone lying between the opening to the ureters and the urethra is underdeveloped in children.
 - As the bladder fills in infants and children, it pulls the smooth lining of the transitional epithelium away from the ureters, making the reflux valves ineffective.

ANS: B

Although reflux is considered abnormal at any age, the shortness of the submucosal segment of the ureter during infancy and childhood renders the antireflux mechanism relatively inefficient and delicate. Reflux is not due to not voiding in a timely manner, an underdeveloped trigone area, or pulling on the epithelium.

PTS: 1 DIF: Cognitive Level: Remembering

13. What is the mechanism for developing Wilms tumor?
- It involves tumor-suppressor genes located on chromosome 11.
 - Development involves an autosomal dominant inheritance pattern.
 - Wilms tumor is an autoimmune disorder.
 - The development of a Wilms tumor is a congenital anomaly.

ANS: A

Wilms tumor-suppressor genes *WT1* and *WT2* are located on chromosome 11. The other options are not considered relevant to the development of a Wilms tumor.

PTS: 1 DIF: Cognitive Level: Remembering

14. Which anomaly is often associated with Wilms tumor?

- a. Renal anaplasia
- b. Aniridia
- c. Anemia
- d. Hypothyroidism

ANS: B

Aniridia (lack of an iris in the eye) is an anomaly often associated with Wilms tumor.

Approximately 10% of children who have Wilms tumor also have a loss of other important genes and therefore have a number of congenital anomalies, including hemihypertrophy (an asymmetry of the body), and genitourinary malformations (i.e., horseshoe kidneys, hypospadias, ureteral duplication, polycystic kidneys, uterine abnormalities). The other anomalies listed are not associated with a Wilms tumor.

PTS: 1

DIF: Cognitive Level: Remembering

15. A healthcare professional has taught a parent group about the causes of enuresis. What statement by a parent indicates the professional needs to give more information?

- a. A maturational lag may cause enuresis.
- b. Enuresis may be related to increased light sleep.
- c. Obstructive sleep apnea may be a symptom of enuresis.
- d. Elevated nocturnal levels of vasopressin may cause enuresis.

ANS: D

Children who do not have the normal nocturnal elevation of vasopressin produce a higher volume of urine with a lower osmolality. The other options are accurate statements regarding enuresis.

PTS: 1

DIF: Cognitive Level: Evaluating

16. When does an individual have their full complement of renal nephrons?

- a. At birth
- b. At 6 months of age
- c. At puberty
- d. Between the ages 18 and 21 years

ANS: A

All the nephrons are present at birth, and their number does not increase as the kidney grows and matures.

PTS: 1

DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. Which statements are *true* regarding the narrow chemical safety margin that infants demonstrate?

(Select all that apply.)

- a. The immaturity of tubules may diminish the response to antidiuretic hormone (ADH).

- b. An immature tubular transport capacity impairs the excretion of potassium.
- c. An immature tubular transport capacity impairs the reabsorption of bicarbonate.
- d. The immaturity of tubules may diminish the response to aldosterone.
- e. The safety margin begins to expand after 2 years of age.

ANS: A, B, C, E

Because of a high hydrogen ion concentration, a limited ability to regulate the internal environment, and a lowered osmotic pressure, the infant's renal system has a narrow chemical safety margin. The immaturity and smaller surface area of the tubules also may diminish the water reabsorption response to ADH. An immature tubular transport capacity means that the ability to excrete a potassium load, reabsorb bicarbonate, or buffer hydrogen with ammonia does not become efficient until approximately 2 years of age.

PTS: 1 DIF: Cognitive Level: Remembering

2. The excretion of urea is low in infants because of which features? (*Select all that apply.*)
- a. Medullary nephrons with comparatively short loops
 - b. Immature tubular transport capacity impairing the excretion of urea
 - c. High anabolic state
 - d. Dilute urine as a result of the immaturity of an infant's glomeruli
 - e. Available protein used for physical growth

ANS: C, E

Urea excretion is low in infants primarily because infants are in a high anabolic state and use their protein for growth. The other options are not involved in their low urea excretion.

PTS: 1 DIF: Cognitive Level: Remembering

3. Which factors are involved in the development of hypospadias? (*Select all that apply.*)
- a. Disruption in male hormones, including testosterone
 - b. Mutation of gene *HP-1* (chromosome 16)
 - c. 5α -reductase mutations
 - d. Hormones administered for in vitro fertilization
 - e. Advanced maternal age

ANS: A, C, D, E

The cause of hypospadias is multifactorial and related to disruptions in male hormones, including testosterone biosynthesis defects, 5α -reductase mutations, hormones administered for in vitro fertilization, advanced maternal age, and other environmental factors. A mutation of gene *HP-1* (heterochromatin protein 1) gene is not relevant as this gene functions to form heterochromatin.

PTS: 1 DIF: Cognitive Level: Remembering

4. Which cells of the inflammatory process are found in acute poststreptococcal glomerulonephritis? (*Select all that apply.*)
- a. Immunoglobulin G (IgG)
 - b. Immunoglobulin A (IgA)
 - c. Complement C3
 - d. Immunoglobulin E (IgE)

e. Immune complexes

ANS: A, B, C, E

Antigen–antibody complexes of IgG, IgA, and C3 complement are deposited in the glomerulus, or the antigen may be trapped within the glomerulus and immune complexes formed in situ. IgE is not relevant to this situation.

PTS: 1

DIF: Cognitive Level: Remembering

5. Which symptoms are considered part of the nephrotic syndrome in children? (*Select all that apply.*)

- a. Proteinuria
- b. Pyuria
- c. Hyperlipidemia
- d. Edema
- e. Hypoalbuminemia

ANS: A, C, D, E

Nephrotic syndrome is a term used to describe a symptom complex characterized by proteinuria, hypoalbuminemia, hyperlipidemia, and edema. Pyuria is not observed in this condition but could be seen in a bacterial UTI.

PTS: 1

DIF: Cognitive Level: Remembering

6. What information does the student learn about hemolytic uremic syndrome (HUS)? (*Select all that apply.*)

- a. Microangiopathic hemolytic anemia characterizes HUS.
- b. Thrombocytopenia is a comorbid condition.
- c. Wilms tumors are often the trigger for HUS.
- d. Most common community-acquired cause of acute renal failure in young children.
- e. HUS is chronic in nature.

ANS: A, B, D

HUS is an acute disorder characterized by microangiopathic hemolytic anemia and thrombocytopenia and is the most common community-acquired cause of acute renal failure in young children. Wilms tumors are not necessarily associated with this disorder.

PTS: 1

DIF: Cognitive Level: Remembering

7. What problems are commonly associated with the diagnosis of horseshoe kidneys? (*Select all that apply.*)

- a. Hydronephrosis
- b. Nephritis
- c. Infection
- d. Kidney stones
- e. Pyuria

ANS: A, C, D

Approximately one-third of individuals with horseshoe kidneys are asymptomatic, and the most common problems are hydronephrosis, infection, and stone formation. Nephritis and pyuria are not associated with this diagnosis.

PTS: 1 DIF: Cognitive Level: Remembering

8. Which structural anomalies are associated with urinary tract malformations? (*Select all that apply.*)
- a. Low-set ears
 - b. Prune-belly syndrome
 - c. Broad-bridged nose
 - d. Imperforate anus
 - e. Malformed lips

ANS: A, B, D

Structural anomalies that are associated with urinary tract malformations include low-set, malformed ears; absent abdominal muscles (prune-belly syndrome); and imperforate anus or genital deviation. Anomalies of the either the nose or the lips are not generally associated with urinary tract malformations.

PTS: 1 DIF: Cognitive Level: Remembering

Chapter 41: Structure and Function of the Digestive System

MULTIPLE CHOICE

1. In the mouth and stomach, salivary α -amylase initiates the digestion of which nutrients?
 - a. Proteins
 - b. Carbohydrates
 - c. Fats
 - d. Fiber

ANS: B

Salivary α -amylase is an enzyme that initiates carbohydrate digestion in the mouth and stomach. Pepsin breaks down protein-forming chains in the stomach. Thirty percent of fats are broken down by gastric lipase. Fiber is not broken down and contributes to stool volume.

PTS: 1 DIF: Cognitive Level: Remembering

2. Saliva contains which immunoglobulin (Ig)?
 - a. IgA
 - b. IgE
 - c. IgG
 - d. IgM

ANS: A

Saliva contains only IgA, which helps prevent infection.

PTS: 1 DIF: Cognitive Level: Remembering

3. What effect is a result of inhibiting the parasympathetic nervous system with a drug such as atropine?
 - a. Salivation becomes thinner.
 - b. Salivation decreases.
 - c. The pH of saliva changes.
 - d. Digestive enzymes are inhibited.

ANS: B

The sympathetic and parasympathetic divisions of the autonomic nervous system control salivation. Because cholinergic parasympathetic fibers stimulate the salivary glands, atropine (an anticholinergic agent) inhibits salivation and makes the mouth dry. Atropine (and similar drugs) does not cause saliva to become thinner, change the pH of saliva, or inhibit digestive enzymes.

PTS: 1 DIF: Cognitive Level: Remembering

4. Food enters the stomach via which orifice or sphincter?
 - a. Cardiac
 - b. Upper esophageal

- c. Gastric
- d. Fundal

ANS: A

Each end of the esophagus is opened and closed by a sphincter. The *upper esophageal sphincter* (*cricopharyngeal muscle*) prevents entry of air into the esophagus during respiration. The *lower esophageal sphincter* (*cardiac orifice*) prevents regurgitation from the stomach. The lower esophageal sphincter is located near the esophageal hiatus—the opening in the diaphragm where the esophagus ends at the stomach. The gastric sphincter controls the release of food from the stomach to the small intestine and is also known as the pyloric sphincter. The fundal sphincter is not a structure in the GI system.

PTS: 1 DIF: Cognitive Level: Remembering

5. Which gastric cells secrete hydrochloric acid and intrinsic factor?
- a. Parietal
 - b. Chief
 - c. G
 - d. D

ANS: A

The parietal cells (oxyntic cells) secrete hydrochloric acid and intrinsic factor. The chief cells secrete pepsinogen. The pyloric gland mucosa in the antrum synthesizes and releases the hormone gastrin from G cells. D cells secrete somatostatin.

PTS: 1 DIF: Cognitive Level: Remembering

6. Which cells in the stomach secrete histamine?
- a. Oxyntic
 - b. Chief
 - c. D
 - d. Enterochromaffin-like

ANS: D

Enterochromaffin-like cells secrete histamine. The parietal cells (oxyntic cells) within the glands secrete hydrochloric acid, intrinsic factor, and gastroferrin. The chief cells secrete pepsinogen. D cells secrete somatostatin.

PTS: 1 DIF: Cognitive Level: Remembering

7. Which gastric hormone inhibits acid and pepsinogen secretion, as well as decreases the release of gastrin?
- a. Motilin
 - b. Histamine
 - c. Somatostatin
 - d. Acetylcholine

ANS: C

Somatostatin inhibits the secretion of acid and pepsinogen and decreases gastrin release. The hormones gastrin and motilin stimulate gastric emptying. Histamine stimulates acid secretion by activating histamine receptors (H₂ receptors) on acid-secreting parietal cells. Acetylcholine stimulates pepsin secretion.

PTS: 1 DIF: Cognitive Level: Remembering

8. Which enzyme breaks down protein-forming polypeptides in the stomach?
- Acetylcholine
 - Pepsin
 - Gastrin
 - Secretin

ANS: B

Pepsin, a proteolytic enzyme, breaks down protein-forming polypeptides in the stomach. Acetylcholine stimulates pepsin secretion. The hormones gastrin and motilin stimulate gastric emptying. Secretin stimulates pancreas to secrete alkaline pancreatic juice and liver to secrete bile; decreases gastrointestinal motility; inhibits gastrin and gastric acid secretion.

PTS: 1 DIF: Cognitive Level: Remembering

9. Exposure to which substance protects the mucosal barrier of the stomach?
- Prostaglandins
 - Acetylcholine
 - Helicobacter pylori*
 - Regurgitated bile

ANS: A

Prostaglandins and nitric oxide protect the mucosal barrier by stimulating the secretion of mucus and bicarbonate and by inhibiting the secretion of acid. Acetylcholine stimulates pepsin secretion. *Helicobacter pylori* are bacteria found in the stomach. Bile is secreted by the liver.

PTS: 1 DIF: Cognitive Level: Remembering

10. The ileum and jejunum are suspended by folds of the peritoneum that contain an extensive vascular and nervous network. What are these folds called?
- Ligament of Treitz
 - Mesentery
 - Auerbach folds
 - Lamina propria

ANS: B

The ileum and jejunum are suspended in loose folds from the posterior abdominal wall by a peritoneal membrane called the *mesentery*. The mesentery facilitates intestinal motility and supports blood vessels, nerves, and lymphatics. The duodenum begins at the pylorus and ends where it joins the jejunum at a suspensory ligament called the *Treitz ligament*. Intrinsic reflexive activity is mediated by the myenteric plexus (Auerbach plexus) and the submucosal plexus (Meissner plexus) of the enteric nervous system. The lamina propria (a connective tissue layer of the mucous membrane) lies beneath the epithelial cells of the villi and contains lymphocytes and plasma cells, which produce immunoglobulins and macrophages.

PTS: 1 DIF: Cognitive Level: Remembering

11. Where in the small intestines are lymphocytes, plasma cells, and macrophages produced?
- Brush border
 - Microvilli
 - Lamina propria
 - Crypts of Lieberkühn

ANS: C

The lamina propria, which is a connective tissue layer of the mucous membrane, lies beneath the epithelial cells of the villi and contains lymphocytes, plasma cells, which produce immunoglobulins and macrophages. Together the microvilli create a mucosal surface known as the brush border. The villi and microvilli greatly increase the surface area available for absorption. Between the bases of the villi are the crypts of Lieberkühn (intestinal glands), which extend to the submucosal layer. Undifferentiated cells arise from stem cells at the base of the crypt and move toward the tip of the villus, maturing to become columnar epithelial secretory cells (water, electrolytes, and enzymes) and goblet cells (mucus).

PTS: 1 DIF: Cognitive Level: Remembering

12. The student asks the professor why water and electrolytes are transported in both directions through tight junctions and intercellular spaces rather than across cell membranes. What response by the professor is *best*?
- The intercellular hydrostatic pressure is inadequate to push the water and electrolytes across the cell membranes.
 - A balance of cations and ions among the electrolytes on each side of the cell membranes cannot be maintained.
 - The epithelial cell membranes are formed of lipids that are hydrophobic and therefore repel water.
 - Receptors on those cell membranes are occupied with a diffusion of amino acids and monosaccharides.

ANS: C

The epithelial cell membranes of the small intestine are formed of lipids and are hydrophobic or tend to repel water. Therefore, water and electrolytes are transported in both directions—toward the capillary blood or toward the intestinal lumen—through the tight junctions and intercellular spaces rather than across cell membranes.

PTS: 1 DIF: Cognitive Level: Remembering

13. Which statement *best describes* the gastrointestinal tract?
- The gastrointestinal tract is a muscular tube that transports food from the mouth to the stomach.
 - The gastrointestinal tract is a hollow tube that extends from the mouth to the anus.
 - The gastrointestinal tract is a baglike structure that propels partially digested food (chyme).
 - The gastrointestinal tract is 5 m long and consists of three segments.

ANS: B

The gastrointestinal tract is a hollow tube that extends from the mouth to the anus. The esophagus is a muscular tube that transports food from the mouth to the stomach. The stomach is a baglike structure that secretes digestive juices, mixes and stores food, and propels partially digested food (chyme) into the duodenum. The small intestine is 5 m long and has three segments.

PTS: 1

DIF: Cognitive Level: Remembering

14. Glucose transport enhances the absorption of which electrolyte?
- Sodium
 - Phosphate
 - Potassium
 - Chloride

ANS: A

Sodium passes through the tight junctions and is actively transported across cell membranes. Sodium and glucose share a common active transport carrier (sodium–glucose ligand transporter 1 [SGLT1]) so that sodium absorption is enhanced by glucose transport.

PTS: 1

DIF: Cognitive Level: Remembering

15. What process is capable of increasing both intrathoracic and intraabdominal pressure, thereby facilitating defecation?
- Relaxation of the internal anal sphincter
 - Intestinal peristalsis
 - Valsalva maneuver
 - Ileogastric reflex

ANS: C

The Valsalva maneuver consists of inhaling and forcing the diaphragm and chest muscles against the closed glottis and increases both intrathoracic and intraabdominal pressure. This pressure is transmitted to the rectum thereby facilitating defecation. Relaxation of the internal anal sphincter creates the urge to defecate. Peristalsis moves the products of digestion along in the gastrointestinal tract. The ileogastric reflex inhibits gastric motility when the ileum becomes distended.

PTS: 1

DIF: Cognitive Level: Remembering

16. Which pancreatic enzyme is responsible for the breakdown of carbohydrates?

- a. Trypsin
- b. Amylase
- c. Lipase
- d. Chymotrypsin

ANS: B

Salivary and pancreatic amylases breakdown starches to oligosaccharides by splitting α -1,4-glucosidic linkages of long-chain molecules. Trypsin is involved in protein hydrolysis. Gastric lipase aids in the digestion of fat. Chymotrypsin works with trypsin.

PTS: 1

DIF: Cognitive Level: Remembering

17. What is the formation of water-soluble molecules to facilitate the absorption of the byproducts of lipid hydrolysis accomplished by?
- a. Micelles
 - b. Phospholipase
 - c. Chylomicrons
 - d. Colipase

ANS: A

The products of lipid hydrolysis must be made water soluble if they are to be efficiently absorbed from the intestinal lumen. The formation of water-soluble molecules known as *micelles* accomplishes this process. Phospholipase cleaves fatty acids from phospholipids. Triglycerides are covered with phospholipids, lipoproteins, and cholesterol to become particles called chylomicrons. Colipase is a coenzyme needed for optimal functioning of lipase.

PTS: 1

DIF: Cognitive Level: Remembering

18. What is the *primary* source of physiologic iron?
- a. Transferrin from plasma
 - b. Pepsin from pepsinogen
 - c. Bile from bilirubin
 - d. Heme from animal protein

ANS: D

The primary source of iron is heme from animal protein. A small portion of iron comes from recycling of old red blood cells.

PTS: 1

DIF: Cognitive Level: Remembering

19. A professor has taught a class of students about the characteristics of vitamin B₁₂. Which statement by a student demonstrates a need for more education?
- a. Vitamin B₁₂ is absorbed in the terminal ileum.
 - b. Vitamin B₁₂ is absorbed in its free (unbound) form in small amounts.
 - c. Vitamin B₁₂ is necessary for platelet maturation.
 - d. Vitamin B₁₂ binds to intrinsic factor.

ANS: C

Most vitamin B₁₂ (cobalamin) is bound to intrinsic factor (making it resistant to digestion) and is absorbed in the terminal ileum, although a small amount of the vitamin is absorbed in its free (unbound) form. Vitamin B₁₂ is not necessary for platelet maturation. When a student makes this statement, the professor knows the student needs more education.

PTS: 1 DIF: Cognitive Level: Evaluating

20. Which water-soluble vitamin is absorbed by passive diffusion?
- a. Vitamin B₆
 - b. Vitamin B₁
 - c. Vitamin K
 - d. Folic acid

ANS: A

Of the options available, only Vitamin B₆ is the water-soluble vitamin absorbed by passive diffusion. B₁ and folic acid are absorbed by active transport. Vitamin K requires micelle formation with bile salts and lipid diffusion.

PTS: 1 DIF: Cognitive Level: Remembering

21. Which vitamin facilitates the absorption of iron by the epithelial cells of the duodenum and jejunum?
- a. B₆
 - b. C
 - c. E
 - d. B₁₂

ANS: B

Vitamin C reduces ferric iron to ferrous iron, which is the form more easily absorbed by the epithelial cells of the duodenum and jejunum. Vitamin B₆ is important to many functions including synthesis of neurotransmitters. Vitamin E is an antioxidant. Atrophic gastritis and failure to absorb vitamin B₁₂ result in pernicious anemia.

PTS: 1 DIF: Cognitive Level: Remembering

22. What is the role of the normal intestinal bacterial flora?
- a. Metabolizing bile salts, estrogens, and lipids
 - b. Breaking down proteins into amino acids
 - c. Facilitating the motility of the colon
 - d. Metabolizing aldosterone and insulin

ANS: A

The intestinal bacteria play a role in the metabolism of bile salts, contributing to the intestinal reabsorption of bile and the elimination of toxic bile metabolites. These bacteria also play a role in the metabolism of estrogens, androgens, and lipids, as well as in the conversion of unabsorbed carbohydrates to absorbable organic acids, the synthesis of vitamin K₂, and the metabolism of various nitrogenous substances and drugs. Although they serve many functions, they do not break protein down into amino acids, facilitate colonic motility, or metabolize hormones such as aldosterone and insulin.

PTS: 1 DIF: Cognitive Level: Remembering

23. How are Kupffer cells *best* described?
- Natural killer cells that produce interferon-gamma (IFN- γ)
 - Contractile and therefore capable of regulating the sinusoid blood flow
 - Bactericidal and therefore central to innate immunity
 - Able to metabolize estrogen, progesterone, and androgens

ANS: C

The sinusoids in the liver are lined with phagocytic cells, known as *Kupffer cells*, which are part of the mononuclear phagocyte system and are the largest population of tissue macrophages in the body. They are bactericidal and central to innate immunity. None of the other options accurately describe Kupffer cells.

PTS: 1 DIF: Cognitive Level: Remembering

24. Bilirubin is a byproduct of the destruction of which aged cells?
- Platelets
 - Protein
 - Leukocytes
 - Erythrocytes

ANS: D

Bilirubin is a byproduct of only the destruction of aged red blood cells or erythrocytes.

PTS: 1 DIF: Cognitive Level: Remembering

25. The process of conjugation of bilirubin in the liver is *best* described as which transformation?
- Unconjugated (fat-soluble) bilirubin into urobilinogen
 - Unconjugated (fat-soluble) bilirubin into conjugated (water-soluble) bilirubin
 - Conjugated (water-soluble) bilirubin into unconjugated (fat-soluble) bilirubin
 - Conjugated (water-soluble) bilirubin into urobilinogen

ANS: B

In the liver, unconjugated bilirubin moves from plasma in the sinusoids into the hepatocytes. Within hepatocytes it joins with glucuronic acid to form conjugated bilirubin, which is water-soluble.

PTS: 1 DIF: Cognitive Level: Remembering

26. A professor has been teaching a class on gastrointestinal function. Which statement by a student indicates the need for more education?
- Within 30 min of eating, the gallbladder forces bile into the stomach.
 - Cholinergic branches of the vagus nerve mediate gallbladder contraction.
 - Cholecystokinin provides hormonal regulation of gallbladder contraction.
 - The sphincter of Oddi controls the flow of bile from the gallbladder.

ANS: A

Within 30 min after eating, the gallbladder begins to contract and the sphincter of Oddi relaxes, forcing bile into the duodenum through the major duodenal papilla. The other statements regarding the functioning of the gallbladder are accurate.

PTS: 1 DIF: Cognitive Level: Remembering

27. Which structure synthesizes clotting factors and the vitamin K necessary for hemostasis?
- Colon
 - Spleen
 - Gallbladder
 - Liver

ANS: D

The liver performs many hemostatic functions, including synthesis of clotting factors and vitamin K. These are not synthesized in the colon, spleen, or gallbladder.

PTS: 1 DIF: Cognitive Level: Remembering

28. How many days does it take for the entire epithelial population of the small intestines to be replaced?
- 30 to 45
 - 15 to 25
 - 7 to 15
 - 4 to 7

ANS: D

The entire epithelial population is replaced approximately every 4 to 7 days.

PTS: 1 DIF: Cognitive Level: Remembering

29. Which statement, made by a student, is *correct* regarding the state of the intestinal tract at birth?
- The intestinal tract is colonized by *Escherichia coli*.
 - The intestinal tract is sterile.
 - Clostridium welchii* is present in but in very small numbers.
 - Streptococcus colonization in the intestinal tract has begun.

ANS: B

The intestinal tract is sterile at birth but becomes colonized with *Escherichia coli*, *Clostridium welchii*, and *Streptococcus* within a few hours.

PTS: 1 DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. Gastric emptying is delayed by the presence of which substances? (*Select all that apply.*)
- Solids
 - Carbohydrates
 - Nonisotonic solutions
 - Bacteria

e. Fats

ANS: A, C, E

Solids, fats, and nonisotonic solutions delay gastric emptying.

PTS: 1

DIF: Cognitive Level: Remembering

2. Which hormones are involved in the relaxation of the stomach's fundus during swallowing? (*Select all that apply.*)

- a. Progesterone
- b. Glucagon
- c. Motilin
- d. Gastrin
- e. Cholecystokinin

ANS: D, E

Swallowing causes the fundus to relax (receptive relaxation) to receive a bolus of food from the esophagus. Relaxation is coordinated by efferent, nonadrenergic, noncholinergic vagal fibers and is facilitated by gastrin and cholecystokinin, two polypeptide hormones secreted by the gastrointestinal mucosa. Progesterone is a sex hormone not involved in gastrointestinal function. Glucagon is released by the pancreas when blood sugar gets too low. Motilin stimulates gastric emptying.

PTS: 1

DIF: Cognitive Level: Remembering

3. Which hormones are involved in regulating gastric motility by lowering the threshold potential of muscle fibers? (*Select all that apply.*)

- a. Estrogen
- b. Secretin
- c. Somatostatin
- d. Gastrin
- e. Motilin

ANS: D, E

Gastrin and motilin (small intestine hormones) and the vagus nerve increase contraction by lowering the threshold potential of muscle fibers. Sympathetic activity and secretin (another small intestine hormone) are inhibitory and raise the threshold potential. The rate of peristalsis is mediated by pacemaker cells that initiate a wave of depolarization (basic electrical rhythm), which moves from the upper part of the stomach to the pylorus. Neither estrogen nor somatostatin inhibits gastric motility as described in the question.

PTS: 1

DIF: Cognitive Level: Remembering

4. What requirements are necessary for calcium to be absorbed through the ileum at concentrations of less than 5 mmol/L? (*Select all that apply.*)

- a. Receptor site on the ileum
- b. Vitamin D3
- c. Vitamin K
- d. Carboxypeptidase

- e. A carrier protein

ANS: B, E

At concentrations less than 5 mmol/L, calcium is transported actively across cell membranes, bound to a carrier protein. The carrier formation requires the presence of the active form of vitamin D3 (1,25-dihydroxyvitamin D). Receptors on the ileum, vitamin K, and carboxypeptidase are not involved in calcium absorption.

PTS: 1

DIF: Cognitive Level: Remembering

5. Which water-soluble vitamins are dependent on sodium for absorption? (*Select all that apply.*)
- Pantothenic acid
 - Vitamin B1
 - Niacin
 - Vitamin B12
 - Folic acid

ANS: B, E

Vitamins B₁ and folic acid depend on sodium facilitated active transport. Pantothenic acid and niacin rely on passive diffusion. Vitamin B₁₂ relies on intrinsic factor for absorption.

PTS: 1

DIF: Cognitive Level: Remembering

6. What information does the student learn regarding the functions of the pancreas? (*Select all that apply.*)
- Cholecystokinin stimulates the release of pancreatic enzymes.
 - Bilirubin and S cells inhibit the secretion of pancreatic enzymes.
 - Pancreatic polypeptide is released after eating.
 - Acetylcholine (ACh) is liberated from the pancreatic branches of the vagus nerve.
 - ACh stimulates the release of pancreatic enzymes.

ANS: A, C, D

The release of secretin and cholecystokinin stimulate pancreatic secretions and inhibit gastric secretions. Pancreatic polypeptide is released after eating and inhibits postprandial pancreatic exocrine secretion. Acid secretion is stimulated by the vagus nerve, which releases acetylcholine. As chyme enters the duodenum, its acidity (pH of 4.5 or less) stimulates the S cells of the duodenum to release secretin. Bilirubin is the product of the destruction of senescent red blood cells. ACh stimulates pepsin release.

PTS: 1

DIF: Cognitive Level: Remembering

7. Which elements in saliva protect against tooth decay? (*Select all that apply.*)
- Salivary α -amylase
 - Ptyalin
 - Mucin
 - Exogenous fluoride
 - A pH of 7.4

ANS: D, E

The bicarbonate concentration of saliva sustains a pH of approximately 7.4, which neutralizes bacterial acids and prevents tooth decay. Exogenous fluoride (e.g., fluoride in drinking water) is absorbed and then secreted in the saliva, providing additional protection against tooth decay. Salivary α -amylase, also known as ptyalin, initiates carbohydrate digestion in the mouth and stomach. Mucin provides lubrication in the saliva.

PTS: 1

DIF: Cognitive Level: Remembering

Chapter 42: Alterations of Digestive Function

MULTIPLE CHOICE

1. Where in the brain is the vomiting center located?
 - a. Hypothalamus
 - b. Medulla oblongata
 - c. Pons
 - d. Midbrain

ANS: B

The vomiting center of the brain lies in the medulla oblongata and includes the reticular formation, tractus solitarius nucleus, and the parabrachial nucleus. The other locations listed are not related to vomiting.

PTS: 1 DIF: Cognitive Level: Remembering

2. Antiemetic agents, such as domperidone and metoclopramide, are antagonists for which receptors?
 - a. 5-Hydroxytryptamine (5-HT) serotonin
 - b. Histamine-2
 - c. Acetylcholine
 - d. Dopamine

ANS: D

Metoclopramide and domperidone are dopamine antagonists, making them effective antiemetic agents.

PTS: 1 DIF: Cognitive Level: Remembering

3. A patient in the clinic reports projectile vomiting without nausea or other gastrointestinal symptoms. What action by the healthcare professional is *most* appropriate?
 - a. Provide antiemetic medications.
 - b. Arrange a brain scan.
 - c. Administer intravenous hydration.
 - d. Schedule a GI consultation.

ANS: B

Projectile vomiting is caused by the direct stimulation of the vomiting center by neurologic lesions such as increased intracranial pressure, tumors, or aneurysms of the brainstem. The professional should arrange a CT scan or MRI of the brain. It can also be caused by gastric outlet obstruction, but the patient does not report pain which is a common finding in that condition, so a GI consultation is not warranted at this time. Antiemetics might be helpful but are not the priority. There is no indication that the patient is dehydrated, but if that were the case, hydration would be important.

PTS: 1 DIF: Cognitive Level: Applying

4. A patient reports feeling constipated. When assessing this patient, how often should the patient report bowel movements to be considered within the normal range?
- a. Once a day
 - b. Once every 2 days
 - c. Once a week
 - d. Once every 2 weeks

ANS: C

Normal bowel habits range from two or three evacuations per day to one per week.

PTS: 1 DIF: Cognitive Level: Remembering

5. How many stools per day are considered the upper limits of normal?
- a. Two
 - b. Three
 - c. Five
 - d. Seven

ANS: B

More than three stools per day are considered abnormal.

PTS: 1 DIF: Cognitive Level: Remembering

6. The adult intestine processes approximately how many liters of luminal content per day?
- a. 3
 - b. 6
 - c. 9
 - d. 12

ANS: C

The adult intestine processes approximately 9 L of luminal content per day. Of this amount, 2 L is ingested and the remaining 7 L consists of intestinal secretions.

PTS: 1 DIF: Cognitive Level: Remembering

7. A person who has cholera (*Vibrio cholerae*) would be expected to have which type of diarrhea?
- a. Osmotic
 - b. Secretory
 - c. Small volume
 - d. Motility

ANS: B

Primary causes of secretory diarrhea are bacterial enterotoxins, particularly those released by cholera or strains of *Escherichia coli*, and neoplasms, such as gastrinoma or thyroid carcinoma. In osmotic diarrhea, a nonabsorbable substance in the intestine draws water into the lumen by osmosis and increases stool weight and volume, producing large-volume diarrhea. Small-volume diarrhea usually is caused by an inflammatory disorder of the intestine, such as ulcerative colitis, Crohn disease, or microscopic colitis. Excessive motility decreases transit time, mucosal surface contact, and opportunities for fluid absorption, resulting in diarrhea.

PTS: 1 DIF: Cognitive Level: Remembering

8. What type of diarrhea is a result of lactase deficiency?
- Motility
 - Osmotic
 - Secretory
 - Small-volume

ANS: B

Malabsorption related to lactase deficiency, pancreatic enzyme or bile salt deficiency, small intestine bacterial overgrowth, and celiac disease cause osmotic diarrhea. Excessive motility decreases transit time, mucosal surface contact, and opportunities for fluid absorption, resulting in diarrhea. Primary causes of secretory diarrhea are bacterial enterotoxins, particularly those released by cholera or strains of *Escherichia coli*, and neoplasms, such as gastrinoma or thyroid carcinoma. Small-volume diarrhea usually is caused by an inflammatory disorder of the intestine, such as ulcerative colitis, Crohn disease, or microscopic colitis.

PTS: 1 DIF: Cognitive Level: Remembering

9. A professor has taught the students about the pathogenesis of abdominal pain. Which statement by a student indicates the professor needs to review the material?
- Chemical mediators, such as histamine, bradykinin, and serotonin, produce abdominal pain.
 - Edema and vascular congestion produce abdominal pain by stretching.
 - Ischemia, caused by distention of bowel obstruction or mesenteric vessel thrombosis, produces abdominal pain.
 - Low concentrations of anaerobes, such as *Streptococci*, *Lactobacilli*, *Staphylococci*, *Enterobacteria*, and *Bacteroides*, produce abdominal pain.

ANS: D

Low concentrations of anaerobes are not typically a cause of abdominal pain. The professor would need to review this content if a student made that statement. The other statements are correct.

PTS: 1 DIF: Cognitive Level: Evaluating

10. How can abdominal pain that is visceral in nature *best* be described?
- Diffuse, vague, poorly localized, and dull
 - It travels from a specific organ to the spinal cord.
 - The pain lateralizes from only one side of the nervous system.

- d. Associated with the peristalsis of the gastrointestinal tract

ANS: A

Visceral pain arises from a stimulus (distention, inflammation, ischemia) acting on mechanical and chemical nociceptors of abdominal organs. Pain is usually felt near the midline in the epigastrium (upper midabdomen), midabdomen, or lower abdomen. The pain is poorly localized, is dull rather than sharp, and is difficult to describe.

PTS: 1 DIF: Cognitive Level: Remembering

11. A patient asks the healthcare professional to describe the cause of gastroesophageal reflux disease (GERD). What response by the professional is *best*?
- Excessive production of hydrochloric acid
 - Zone of low pressure of the lower esophageal sphincter
 - Presence of *Helicobacter pylori* in the esophagus
 - Reverse muscular peristalsis of the esophagus

ANS: B

Normally, the resting tone of the lower esophageal sphincter maintains a zone of high pressure that prevents gastroesophageal reflux. In individuals who develop reflux esophagitis, this pressure tends to be lower than normal from either transient relaxation or a weakness of the sphincter. Excessive hydrochloric acid and *H. pylori* can lead to gastritis. Reverse peristalsis is associated with vomiting.

PTS: 1 DIF: Cognitive Level: Understanding

12. A patient has frank bleeding of the rectum. How does the healthcare professional document this finding?
- Melena
 - Hematochezia
 - Occult bleeding
 - Hematemesis

ANS: B

Hematochezia is term for frank bright red or burgundy blood from the rectum. Melena describes dark, tarry stools. Occult bleeding cannot be visualized with the naked eye. Hematemesis is vomiting blood.

PTS: 1 DIF: Cognitive Level: Remembering

13. What is the cause of functional dysphagia?
- Intrinsic mechanical obstruction
 - Extrinsic mechanical obstruction
 - Tumor
 - Neural or muscular disorders

ANS: D

Neural or muscular disorders that interfere with voluntary swallowing or peristalsis cause functional dysphagia. It is not related to intrinsic or extrinsic mechanical obstruction or tumors.

PTS: 1 DIF: Cognitive Level: Remembering

14. A patient has been diagnosed with reflux esophagitis (GERD). What instruction by the healthcare professional is *most* appropriate?
- Exercise soon after eating to increase gastric emptying.
 - Try these proton-pump inhibitors for 2 weeks.
 - You need to schedule an upper GI endoscopy soon.
 - Over-the-counter antiemetics work well for this condition.

ANS: B

Abnormalities in lower esophageal sphincter function, esophageal motility, and gastric motility or emptying can cause GERD. Delayed gastric emptying contributes to reflux esophagitis by (1) lengthening the period during which reflux is possible and (2) increasing the acid content of chyme. A treatment of choice for this condition is proton-pump inhibitors, so the healthcare professional would educate the patient on taking these medications. Increasing gastric motility may help GERD, but exercising soon after eating may promote vomiting and other GI distress. If GERD cannot be controlled, an endoscopy may be needed to refine the diagnosis and assess for cancerous changes. Antiemetics will not help in this condition.

PTS: 1 DIF: Cognitive Level: Understanding

15. By what mechanism does intussusception cause an intestinal obstruction?
- Telescoping of part of the intestine into another section of intestine
 - Twisting the intestine on its mesenteric pedicle
 - Loss of peristaltic motor activity in the intestine
 - Fibrin and scar tissue that attaches to the intestinal omentum

ANS: A

Intussusception is the telescoping of part of the intestine into another section of intestine, usually causing strangulation of the blood supply. Torsion is twisting of the intestine on its mesenteric pedicle. A paralytic ileus is caused by loss of peristaltic motor activity. Adhesions are caused by fibrin scar tissue.

PTS: 1 DIF: Cognitive Level: Remembering

16. A patient has been admitted for a possible small intestinal obstruction. What is the first sign the healthcare professional assesses for that would indicate the presence of this condition?
- Vomiting
 - Dehydration
 - Electrolyte imbalances
 - Distention

ANS: D

Abdominal distention begins almost immediately with a small bowel obstruction, as gases and fluids accumulate proximal to the obstruction. The first sign the professional assesses for is distention. Within 24 hours, up to 8 L of fluid and electrolytes enters the lumen in the form of saliva, gastric juice, bile, pancreatic juice, and intestinal secretions. Copious vomiting or sequestration of fluids in the intestinal lumen prevents their reabsorption and produces severe fluid and electrolyte disturbances.

PTS: 1 DIF: Cognitive Level: Understanding

17. An intestinal obstruction at the pylorus or high in the small intestine causes metabolic alkalosis by causing which outcome?
- Gain of bicarbonate from pancreatic secretions that cannot be absorbed
 - Excessive loss of hydrogen ions normally absorbed from gastric juices
 - Excessive loss of potassium, promoting atony of the intestinal wall
 - Loss of bile acid secretions that cannot be absorbed

ANS: B

If the obstruction is at the pylorus or high in the small intestine, then metabolic alkalosis initially develops as a result of excessive loss of hydrogen ions that normally would be reabsorbed from the gastric juices. The alkalotic condition is not created by gain of bicarbonate, loss of potassium, or loss of bile acid secretions.

PTS: 1 DIF: Cognitive Level: Remembering

18. A patient has been admitted to the hospital with a possible bowel obstruction. Which assessment finding would alert the healthcare professional that the obstruction is in the small vs. large intestine?
- Profuse vomiting of clear gastric fluids
 - Vague dull hypogastric pain without vomiting
 - Colicky pain caused by distention, followed by vomiting
 - Excruciating pain, vomiting, and fever

ANS: C

Colicky pain, sometimes occurring in peristaltic waves, followed by distention then vomiting, characterizes an obstruction of the small intestine. Profuse vomiting of clear gastric fluids indicates an obstruction at the pylorus. Vague pain without vomiting may indicate a large intestine obstruction as vomiting is seen late in the condition. A fever in the presence of abdominal pain and vomiting probably indicates a perforation of the bowel.

PTS: 1 DIF: Cognitive Level: Remembering

19. A patient has chronic gastritis. What treatment does the healthcare professional educate the patient on?
- Antibiotic therapy
 - Corticosteroids
 - Vitamin B₁₂ injections
 - Pancreatic enzyme replacement

ANS: A

Chronic gastritis is caused by *H. pylori* bacteria or the chronic use of alcohol, tobacco, and nonsteroidal antiinflammatory drugs. The healthcare professional would educate the patient on antibiotic therapy to eradicate the bacterial infection. Steroids can increase the pain of gastritis since it is an antiinflammatory drug. Vitamin B₁₂ injections would be used for pernicious anemia. Pancreatic enzymes are not related.

PTS: 1 DIF: Cognitive Level: Applying

20. A peptic ulcer may occur in all of these areas *except* which?
- Stomach
 - Duodenum
 - Jejunum
 - Esophagus

ANS: C

A peptic ulcer is a break, or ulceration, in the protective mucosal lining of the lower esophagus, stomach, or duodenum. This type of ulcer is not associated with the jejunum.

PTS: 1 DIF: Cognitive Level: Remembering

21. A class of students has learned about contributing factors to duodenal ulcers. What statement indicates to the professor that the students need a review?
- Bleeding from duodenal ulcers causes hematemesis or melena.
 - Gastric emptying is slowed, causing greater exposure of the mucosa to acid.
 - The characteristic pain begins 30 min to 2 hours after eating
 - Duodenal ulcers occur with greater frequency than other types of peptic ulcers.

ANS: B

Duodenal ulcers can be associated with altered mucosal defenses, rapid gastric emptying, elevated serum gastrin levels, or acid production stimulated by smoking. Slowed gastric emptying contributes to reflux esophagitis. The students making this statement need a review of the information.

PTS: 1 DIF: Cognitive Level: Evaluating

22. After a partial gastrectomy or pyloroplasty, clinical manifestations that include increased pulse, hypotension, weakness, pallor, sweating, and dizziness are the results of which mechanism?
- Excessive relaxation of gastric and vascular smooth muscles
 - Postoperative hemorrhage
 - Concentrated food bolus, causing hyperglycemia
 - Rapid gastric emptying

ANS: D

Dumping syndrome occurs with varying severity in 5% to 10% of individuals who have undergone partial gastrectomy or pyloroplasty. Rapid gastric emptying and the creation of a high osmotic gradient in the small intestine cause a sudden shift of fluid from the vascular compartment to the intestinal lumen. Plasma volume decreases, causing vasomotor responses, such as increased pulse rate, hypotension, weakness, pallor, sweating, and dizziness. Rapid distention of the intestine produces a feeling of epigastric fullness, cramping, nausea, vomiting, and diarrhea. Dumping syndrome is not caused by excessive relaxation of smooth muscles, hemorrhage, or hyperglycemia.

PTS: 1 DIF: Cognitive Level: Remembering

23. A patient reports dumping syndrome after a partial gastrectomy. What does the healthcare professional teach this patient?
- Eat small, frequent high-protein meals.
 - This will need surgical correction.
 - Take antacids 30 min before meals.
 - Drink plenty of water with your meals.

ANS: A

Most individuals with the dumping syndrome respond well to dietary management. Small, frequent high protein, low carbohydrate meals are best tolerated. Fluids should be consumed between meals, not with them. Surgery is sometimes needed but only in cases that cannot otherwise be controlled. Antacids will not help this condition.

PTS: 1 DIF: Cognitive Level: Understanding

24. The most common clinical manifestation of portal hypertension is what type of bleeding?
- Rectal
 - Duodenal
 - Esophageal
 - Intestinal

ANS: C

The vomiting of blood from bleeding esophageal varices is the most common clinical manifestation of portal hypertension.

PTS: 1 DIF: Cognitive Level: Remembering

25. A patient has portal hypertension-induced splenomegaly. Which lab value would the healthcare professional associate with this condition?
- Low white blood cell count
 - Low platelet count
 - High red cell count
 - High hemoglobin and hematocrit

ANS: B

Thrombocytopenia (decreased platelet count) is the most common manifestation of congestive splenomegaly and can contribute to a tendency of increased bleeding. The other lab values would not be directly related to this condition.

PTS: 1 DIF: Cognitive Level: Understanding

26. A professor has taught the students about the sources of increased ammonia in patients with hepatic encephalopathy. What statement by a student indicates the professor should review this material?
- a. End products of intestinal protein digestion are sources of increased ammonia.
 - b. Digested blood leaking from ruptured varices is a source of increased ammonia.
 - c. Accumulation of short-chain fatty acids are a source of increased ammonia.
 - d. Ammonia-forming bacteria in the colon are sources of increased ammonia.

ANS: C

Ammonia is increased by digestion of protein or blood and by the action of ammonia-forming bacteria in the colon. Short-chain fatty acids do contribute to encephalopathy but not by increasing ammonia.

PTS: 1 DIF: Cognitive Level: Remembering

27. Hepatic fat accumulation is observed in which form of cirrhosis?
- a. Biliary
 - b. Metabolic
 - c. Postnecrotic
 - d. Alcoholic

ANS: D

Alcoholic cirrhosis is a complex process that begins with fatty infiltration (hepatic steatosis). Fat deposition (deposition of triglycerides) within the liver hepatocytes is primarily caused by increased lipogenesis and decreased fatty acid oxidation by hepatocytes. This is the only type of cirrhosis associated with hepatic fat.

PTS: 1 DIF: Cognitive Level: Remembering

28. A student asks the healthcare professional to explain the pathophysiologic process of alcoholic cirrhosis. What statement by the professional would not be consistent with complete knowledge about this process?
- a. Inflammation and damage leading to cirrhosis begin in the bile canaliculi.
 - b. Alcohol is transformed to acetaldehyde, which promotes liver fibrosis.
 - c. Mitochondrial function is impaired, decreasing oxidation of fatty acids.
 - d. Acetaldehyde inhibits export of proteins from the liver.

ANS: A

Biliary cirrhosis begins in bile canaliculi and bile ducts, rather than in the hepatocytes. This statement would show inadequate knowledge. The others are true regarding the pathophysiologic process of alcoholic cirrhosis.

PTS: 1 DIF: Cognitive Level: Evaluating

29. A student learns what information about acute pancreatitis?
- a. Autoimmune process with IgG attacking pancreatic acinar cells

- b. It is usually a severe disease with a high mortality rate.
- c. Pancreatic enzymes autodigest pancreatic cells and tissues.
- d. Oversecretion of pancreatic enzymes and malnutrition

ANS: C

Pancreatitis develops because of a blockage to the outflow of pancreatic digestive enzymes caused by bile duct or pancreatic duct obstruction (e.g., gallstones), or in some cases, it can also result from direct cellular injury from drugs or viral infection. Acute pancreatitis is usually a mild disease and spontaneously resolves; however, approximately 20% of those with the disease develop a severe acute pancreatitis that requires hospitalization. It is not due to an autoimmune process or oversecretion of enzymes leading to malnutrition.

PTS: 1

DIF: Cognitive Level: Remembering

30. The mutation of which gene is an early event associated with the pathogenetic origin of esophageal cancer?
- a. *KRAS*
 - b. *TP53*
 - c. *myc*
 - d. *HER2*

ANS: B

Mutation of the *TP53* gene is an early event associated with esophageal cancer. A Kras mutation is associated with development of colon cancer from polyps. Myc codes for a transcription factor and mutations are seen in many cancers, particularly Burkett lymphoma. A HER2 mutation is often seen in breast cancer.

PTS: 1

DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. What information does the student learn about parietal pain? (*Select all that apply.*)
- a. Parietal pain arises from the parietal peritoneum.
 - b. It is generally more localized than visceral pain.
 - c. Parietal pain is usually less intense than visceral pain.
 - d. Nerve fibers that travel to the spinal cord are involved in parietal pain.
 - e. Parietal pain corresponds to dermatomes T6 and L1.

ANS: A, B, D, E

Parietal pain arises from the parietal peritoneum and is more localized and intense than visceral pain. Nerve fibers from the parietal peritoneum travel with peripheral nerves to the spinal cord, and the sensation of pain corresponds to skin dermatomes T6 and L1. It is usually more intense than visceral pain.

PTS: 1

DIF: Cognitive Level: Remembering

2. Which information about chronic gastritis does the student learn? (*Select all that apply.*)
- a. Chronic gastritis tends to occur more in older adults.

- b. It causes thinning and degeneration of the stomach wall.
- c. Chronic gastritis results in chronic inflammation and mucosal atrophy.
- d. Mucosal atrophy is a common outcome of chronic gastritis.
- e. Epithelial metaplasia is often observed with chronic gastritis.

ANS: C, D, E

Chronic gastritis can occur at any age and causes chronic inflammation, mucosal atrophy, and epithelial metaplasia. Neither thinning nor degeneration of the stomach wall is associated with chronic gastritis. It does not cause thinning of the stomach wall.

PTS: 1

DIF: Cognitive Level: Remembering

3. Which are the early (prodromal) clinical manifestations of hepatitis? (*Select all that apply.*)
- a. Fatigue
 - b. Vomiting
 - c. Jaundice
 - d. Itching
 - e. Hyperalgia

ANS: A, B, E

The prodromal (preicteric) phase of hepatitis begins approximately 2 weeks after exposure and ends with the appearance of jaundice. Fatigue, anorexia, malaise, nausea, vomiting, headache, hyperalgia, cough, and low-grade fever are prodromal symptoms that precede the onset of jaundice. Itching and jaundice are associated with the icteric phase of hepatitis.

PTS: 1

DIF: Cognitive Level: Remembering

4. Which clinical manifestations are consistent with cancer of the cecum and ascending colon? (*Select all that apply.*)
- a. Mahogany-colored blood mixed with stool
 - b. Anemia
 - c. Pain
 - d. Constipation
 - e. Palpable mass in the lower right quadrant

ANS: A, B, C, E

Clinical manifestations consistent with cancer of the cecum and ascending colon include pain, a palpable mass in the lower right quadrant, anemia, and dark red or mahogany-colored blood mixed with the stool. Constipation is not associated with this diagnosis.

PTS: 1

DIF: Cognitive Level: Remembering

Chapter 43: Alterations of Digestive Function in Children

MULTIPLE CHOICE

1. Incomplete fusion of the nasomedial and intermaxillary process during the fourth week of embryonic development causes which condition in an infant?
 - a. Cleft palate
 - b. Sinus dysfunction
 - c. Cleft lip
 - d. Esophageal malformation

ANS: C

A cleft lip is caused by the incomplete fusion of the nasomedial and intermaxillary process during the fourth week of embryonic development.

PTS: 1 DIF: Cognitive Level: Remembering

2. Increased gastrin secretion by the mother in the last trimester of pregnancy may cause which condition in the infant?
 - a. Pyloric stenosis
 - b. Meconium ileus
 - c. Esophageal atresia
 - d. Galactosemia

ANS: A

Increased gastrin secretion by the mother in the last trimester of pregnancy increases the likelihood of pyloric stenosis in the infant. The overproduction of gastric secretions in the infant may be caused by stress-related factors in the mother. Increased gastrin secretion does not lead to meconium ileus, esophageal atresia, or galactosemia.

PTS: 1 DIF: Cognitive Level: Remembering

3. Parents report their 3-week-old infant who eats well and has gained weight began to vomit forcefully for no apparent reason. What treatment option does the healthcare professional prepare to educate the parents on?
 - a. A gastric feeding tube
 - b. Wheat-free diet
 - c. Corrective surgery
 - d. Lactose-free diet

ANS: C

This infant is displaying symptoms of pyloric stenosis is corrective surgery, usually a laparoscopic pyloromyotomy. A feeding tube is not needed. A wheat-free diet would be used in celiac disease or nonceliac gluten sensitivity. Lactose sensitivity would benefit from the elimination of lactose from the diet.

PTS: 1 DIF: Cognitive Level: Applying

4. Which term is used to identify a condition in which the developing colon remains in the upper right quadrant instead of moving to its normal location?
- a. Intestinal malrotation
 - b. Ileocecal displacement
 - c. Duodenal obstruction
 - d. Pyloric stenosis

ANS: A

Intestinal malrotation is the term used to identify a condition in which rotation does not occur and the colon remains in the upper right quadrant, where an abnormal membrane may press on and obstruct the duodenum.

PTS: 1 DIF: Cognitive Level: Remembering

5. Which term is used to identify an intestinal obstruction caused by meconium formed in utero that is abnormally sticky and adheres firmly to the mucosa of the small intestine?
- a. Meconium cecum
 - b. Meconium ileus
 - c. Meconium obstruction
 - d. Meconium vivax

ANS: B

Meconium ileus is the term used to identify an intestinal obstruction caused by meconium formed in utero that is abnormally sticky and adheres firmly to the mucosa of the small intestine, resisting passage beyond the terminal ileum. The cause is usually a lack of digestive enzymes during fetal life.

PTS: 1 DIF: Cognitive Level: Remembering

6. A newborn has meconium ileus. What diagnostic test does the healthcare professional advise the parents about?
- a. Colonoscopy
 - b. Pulmonary function studies
 - c. A sweat test
 - d. Nerve conduction studies

ANS: C

Meconium ileus is seen in 20% of children who have cystic fibrosis, so the newborn needs a sweat test and genetic screening for this disorder. There is no need for the professional to educate the parents on a colonoscopy, pulmonary function studies, or nerve conduction studies.

PTS: 1 DIF: Cognitive Level: Applying

7. Congenital aganglionic megacolon (Hirschsprung's disease) involves inadequate motility of the colon caused by neural malformation of which nervous system?
- a. Central
 - b. Parasympathetic

- c. Sympathetic
- d. Somatic

ANS: B

A malformation related to the parasympathetic nervous system causes congenital aganglionic megacolon.

PTS: 1 DIF: Cognitive Level: Remembering

8. An infant has been diagnosed with intussusception and the student asks the healthcare professional to explain the condition. What explanation by the professional is *most* accurate?
- a. Poor colonic motility due to a problem in the parasympathetic nervous system
 - b. The colon stays in the upper right quadrant instead of moving to its normal location.
 - c. One part of the intestine telescopes into another section of the intestine.
 - d. Fibrosis increases the resistance to blood flow within the portal system.

ANS: C

Intussusception is the telescoping or invagination of one portion of the intestine into another section of intestine. Usually, the ileum invaginates the cecum and part of the ascending colon by collapsing through the ileocecal valve. A problem with the parasympathetic nervous system in Hirschsprung's disease leads to poor colonic motility. Intestinal malrotation is the term used to identify a condition in which rotation does not occur and the colon remains in the upper right quadrant. Increased resistance to blood flow in the portal system leads to portal hypertension.

PTS: 1 DIF: Cognitive Level: Understanding

9. An infant suddenly develops abdominal pain, becomes irritable, and draws up the knees. Vomiting occurs soon afterward. The mother reports that the infant passed a normal stool, followed by one that looked like currant jelly. What treatment does the healthcare professional prepare the infant for?
- a. Corrective surgery
 - b. Reduction enema
 - c. Gastric decompression
 - d. Anal dilation

ANS: B

Based on these data, the nurse should suspect intussusception. A standard therapy for this disorder is a reducing enema so the professional should prepare the infant (and parents) for this procedure. Corrective surgery, gastric decompression, and anal dilation are not needed.

PTS: 1 DIF: Cognitive Level: Applying

10. Cystic fibrosis is characterized by which symptom?
- a. Excessive mucus production
 - b. Elevated blood glucose levels
 - c. Low sodium content in perspiration
 - d. Abnormally thin exocrine secretions

ANS: A

Excessive mucus production characterizes cystic fibrosis. However, the pathophysiologic triad that is the hallmark of cystic fibrosis includes (1) pancreatic enzyme deficiency, which causes maldigestion; (2) overproduction of mucus in the respiratory tract and an inability to clear secretions, which cause progressive chronic obstructive pulmonary disease; and (3) abnormally elevated sodium and chloride concentrations in sweat. Exocrine secretions tend to be abnormally thick and precipitate in the glandular ducts, obstructing flow. An elevated blood glucose level is not associated with this disorder.

PTS: 1

DIF: Cognitive Level: Remembering

11. A child has cystic fibrosis (CF). Which medication does the healthcare professional teach the parents about?
- Salt tablets
 - Pancreatic enzymes
 - Antihypertensives
 - Antibiotics

ANS: B

Pancreatic replacement enzymes are administered to people with cystic fibrosis before or with meals. Salt tablets and antihypertensives are not associated with this disorder. Antibiotics would be used for an infection; people with CF have frequent respiratory infections.

PTS: 1

DIF: Cognitive Level: Understanding

12. What causes a person with cystic fibrosis to experience an exocrine pancreatic insufficiency?
- Pancreatic ducts are obstructed with mucus.
 - Impaired blood supply to the pancreas causes ischemia.
 - A genetically impaired pancreas is unable to produce digestive enzymes.
 - The pancreas has a volvulus at the ampulla of Vater.

ANS: A

Approximately 85% of individuals with cystic fibrosis experience pancreatic insufficiency. Obstruction of the pancreatic ducts with thick mucus blocks the flow of pancreatic enzymes and causes degenerative and fibrotic changes in the pancreas. Pancreatic insufficiency is not related to ischemia, the inability to produce digestive enzymes, or the presence of a volvulus.

PTS: 1

DIF: Cognitive Level: Remembering

13. A student asks the professor to explain the characteristic appearance of stools in people with cystic fibrosis. What explanation by the professor is *best*?
- Bile ducts obstructed with mucus, leading to clay colored stools
 - Mechanical obstruction causes narrow, ribbon-like stool
 - Deficiency of pancreatic enzymes leads to steatorrhea.
 - Ischemia due to sodium blockages causes bloody stools.

ANS: C

Severe problems with maldigestion of proteins, carbohydrates, and fats occur because of the insufficient secretion of pancreatic enzymes. This leads to steatorrhea, or stools that are fatty and bulky. Biliary atresia would manifest with clay-colored stools. Thin, ribbon-like stools would be caused by a partial mechanical obstruction. Bloody stools are not seen in CF.

PTS: 1 DIF: Cognitive Level: Understanding

14. Which disorder is characterized by damage to the mucosa of the duodenum and jejunum and impaired secretion of secretin, cholecystokinin, and pancreatic enzymes?
- Wilson disease
 - Cystic fibrosis
 - Gluten-sensitive enteropathy
 - Galactosemia

ANS: C

Gluten-sensitive enteropathy is characterized by damage to the mucosa of the duodenum and jejunum and has secondary effects that exacerbate malabsorption. The secretion of intestinal hormones, such as secretin and cholecystokinin, may be diminished. Because these chemical messengers are scarce, secretion of pancreatic enzymes and expulsion of bile from the gallbladder decrease. Wilson disease (hepatolenticular degeneration) is an autosomal recessive defect of copper metabolism. Cystic fibrosis (CF) is an autosomal recessive disease of the exocrine glands. Galactosemia is disorder in which the body is unable to metabolize galactose.

PTS: 1 DIF: Cognitive Level: Remembering

15. An infant has gluten-sensitive enteropathy and the parents ask the healthcare professional to explain why the baby bruises so easily. The professional explains that the baby has which deficit?
- Vitamin K deficiency from fat malabsorption
 - Bone marrow function depression
 - Iron, folate, and B12 deficiency anemias
 - Prescribed daily warfarin

ANS: A

Deficiencies of fat-soluble vitamins (such as vitamin K) are common in children with gluten-sensitive enteropathy, also known as celiac disease or celiac sprue. Vitamin K malabsorption leads to hypoprothrombinemia, causing the child to bruise and bleed easily. Bone marrow function depression would characterize aplastic anemia. Anemias can have many different causes and children with celiac disease can become anemic. There is no indication that this infant is on warfarin; it is not a treatment for this disorder.

PTS: 1 DIF: Cognitive Level: Understanding

16. What does the student learn distinguishes kwashiorkor from marasmus?
- All nutrients, proteins, fats, and carbohydrates are reduced in kwashiorkor.
 - Physical growth of children is stunted in kwashiorkor but not in marasmus.
 - Muscle wasting, diarrhea, low hemoglobin, and infection characterize kwashiorkor.

d. Subcutaneous fat, hepatomegaly, and fatty liver are present in kwashiorkor.

ANS: D

The presence of subcutaneous fat, hepatomegaly, and fatty liver distinguishes kwashiorkor from marasmus. These manifestations are missing in marasmus because caloric intake is not sufficient to support fat synthesis and storage. None of the other options accurately describes the differences between these conditions.

PTS: 1

DIF: Cognitive Level: Remembering

17. Why is prolonged diarrhea more severe in children than it is in adults?

- a. Less water is absorbed from the colon in children.
- b. Fluid reserves are smaller in children.
- c. Children have a higher fluid volume intake.
- d. Children have diarrhea more often than adults.

ANS: B

Infants have low fluid reserves and relatively rapid peristalsis and metabolism. Therefore the danger of dehydration is greater in children than in adults.

PTS: 1

DIF: Cognitive Level: Remembering

18. A newborn baby displays jaundice 20 hours after birth. What action by the healthcare professional is *most* appropriate?

- a. Draw blood to measure total bilirubin.
- b. Teach the patient about phototherapy.
- c. Obtain consent for blood transfusions.
- d. Prepare to administer vitamin K.

ANS: A

Pathologic jaundice usually develops within 24 hours after birth. Associated lab values include total serum bilirubin level greater than 20 mg/dL or an indirect bilirubin level greater than 15 mg/dL. The healthcare professional would facilitate these labs being drawn. Phototherapy is used to treat physiologic jaundice, although pathologic jaundice can be treated with high-intensity phototherapy. Blood transfusions and vitamin K are not needed.

PTS: 1

DIF: Cognitive Level: Applying

19. What is physiologic jaundice in a newborn caused by?

- a. Reabsorption of bilirubin in the small intestine
- b. Impaired hepatic uptake and excretion of bilirubin
- c. Increased bilirubin production
- d. Mild conjugated (indirect-reacting) hyperbilirubinemia

ANS: D

Physiologic jaundice in a newborn is caused by mild unconjugated (indirect-reacting) hyperbilirubinemia.

PTS: 1

DIF: Cognitive Level: Remembering

20. A woman who is positive for hepatitis B is in labor. What action by the healthcare professional is *most* appropriate?
- Draw blood for a drug screen.
 - Encourage the mother to bottle feed.
 - Immunize the newborn within 12 hours.
 - Discuss poor infant survival.

ANS: C

To prevent perinatal transmission of HBV, immunoprophylaxis and HBV vaccination within the first 12 hours of birth are recommended with close follow-up visits. A drug screen during labor is not necessary but should have been performed as part of prenatal care. The mother can breastfeed if she is receiving antiviral therapy. Most babies have a good prognosis.

PTS: 1

DIF: Cognitive Level: Applying

21. Cirrhosis causes intrahepatic portal hypertension in children as a result of which mechanism?
- Fibrosis that increases the resistance to blood flow within the portal system
 - Increased pressure from the twisting of the common bile ducts
 - Development of collateral circulation within the portal system
 - Shunting of fluid to the spleen or abdomen

ANS: A

The two basic causes of portal hypertension in children are (1) increased resistance to blood flow within the portal system and (2) increased volume of portal blood flow. Fibrosis of the liver is a major cause of resistance to blood flow in the portal system. This condition is not caused by increased pressure from twisting common bile duct, collateral circulation, or shunting of fluid to the spleen of abdomen.

PTS: 1

DIF: Cognitive Level: Remembering

22. A child has chronic hepatitis and the healthcare professional wants to assess the child for portal hypertension. What action by the professional is *most* appropriate?
- Listen to the child's lung sounds
 - Assess for pedal edema
 - Palpate the child's abdomen
 - Inspect the skin for jaundice

ANS: C

Splenomegaly is one of the most common sign of portal hypertension in children. The healthcare professional would palpate the child's abdomen for splenomegaly. Listening to the lungs, assessing for pedal edema, and looking for jaundice are not directly related to portal hypertension.

PTS: 1

DIF: Cognitive Level: Applying

MULTIPLE RESPONSE

1. What factors can contribute to the development of a cleft lip and a cleft palate? (*Select all that apply.*)
- a. Maternal deficiency of B vitamins
 - b. Exposure to heavy metals during pregnancy
 - c. Maternal use of tobacco
 - d. Maternal diabetes mellitus
 - e. Trauma during pregnancy

ANS: A, C, D

In most cases, cleft lip and cleft palate are caused by multiple gene and environmental interactions, including maternal deficiency of B vitamins (B₆, folic acid, and B₁₂), maternal tobacco and alcohol use, maternal diabetes mellitus, and many gene mutations. Cleft lip and palate are not associated with heavy metal exposure or trauma during pregnancy.

PTS: 1 DIF: Cognitive Level: Remembering

2. Which situations are often associated with possible causes of failure to thrive (FTT) in infants? (*Select all that apply.*)
- a. Gastroesophageal reflux
 - b. Living in poverty
 - c. Feeding difficulties
 - d. Incorrect formula preparation
 - e. Child neglect

ANS: A, B, C, E

FTT can be caused by many factors including those related to illness and those not related to illness, however; a medical cause is not found in more than 80% of cases. Poverty, feeding difficulties, improper formula preparation, and child neglect are more common causes of FTT than is any specific illness such as reflux.

PTS: 1 DIF: Cognitive Level: Remembering

3. Which information does the student learn about Wilson disease in children? (*Select all that apply.*)
- a. Wilson disease is a rare autosomal recessive defect.
 - b. Wilson disease affects copper metabolism.
 - c. A lack of necessary copper is a result of Wilson disease.
 - d. The liver is often affected in Wilson disease.
 - e. Corneal damage can be a result of Wilson disease.

ANS: A, C, D, E

Wilson disease (hepatolenticular degeneration) is an autosomal recessive defect of copper metabolism that causes toxic amounts of copper to accumulate in the liver, brain, kidneys, and corneas.

PTS: 1 DIF: Cognitive Level: Remembering

4. A 3-year-old child has hepatitis A. What symptoms would the healthcare professional assess for? (*Select all that apply.*)

- a. Nausea
- b. Vomiting
- c. Diarrhea
- d. Jaundice
- e. Muscle pain

ANS: A, B, C

Clinical manifestations associated with hepatitis A may include nausea, vomiting, and diarrhea. Jaundice can appear in older children. Muscle pain is not associated with hepatitis A.

PTS: 1

DIF: Cognitive Level: Remembering

5. Cystic fibrosis is directly responsible for complications to which structures? (*Select all that apply.*)
- a. Muscles
 - b. Kidneys
 - c. Lymph nodes
 - d. Cervix
 - e. Liver

ANS: D, E

Of the options available, only cervical inflammation and portal hypertension (liver) are complications directly related to cystic fibrosis.

PTS: 1

DIF: Cognitive Level: Remembering

6. A child has celiac disease. Which foods does the healthcare professional teach the parents to eliminate from their child's diet? (*Select all that apply.*)
- a. Citrus fruits
 - b. Starchy vegetables
 - c. Wheat products
 - d. Barley
 - e. Fat soluble vitamins

ANS: C, D

Treatment for celiac sprue consists of the immediate and permanent institution of a diet free of cereal grains (e.g., wheat, rye, barley, oats, malt). Infants are given fat-soluble vitamins. There is no need to eliminate fruits or vegetables.

PTS: 1

DIF: Cognitive Level: Remembering

Chapter 44: Structure and Function of the Musculoskeletal System

MULTIPLE CHOICE

1. Which bone cells produce osteocalcin when stimulated by 1,25-dihydroxyvitamin D and synthesize osteoid?
 - a. Osteoclasts
 - b. Osteocytes
 - c. Fibrocytes
 - d. Osteoblasts

ANS: D

Osteoblasts are cells derived from mesenchymal stem cells and produce several substances, including osteocalcin, transforming growth factor-beta (TGF- β) (a growth inhibitor for many cells), macrophage colony-stimulating factor, receptor activator of nuclear factor kappa-B ligand, osteoprotegerin (OPG), and bone matrix when stimulated by 1,25-dihydroxyvitamin D.

Osteoclasts are bone resorbing cells. Osteocytes are the most abundant cells in bone. Fibrocytes produce connective tissue proteins.

PTS: 1

DIF: Cognitive Level: Remembering

2. What happens to the original bone during the second phase of bone remodeling?
 - a. The original bone is replaced.
 - b. It hardens.
 - c. The original bone is resorbed.
 - d. It is synthesized.

ANS: C

In the second phase of remodeling (resorption), the osteoclasts form a *cutting cone* that gradually resorbs bone, leaving behind an elongated cavity termed a *resorption cavity*. The original bone is replaced during phase 3. The bone hardens in a process called calcification where minerals are deposited and crystalize. Osteoblasts initiate the formation of new bone by their synthesis of osteoid (nonmineralized bone matrix).

PTS: 1

DIF: Cognitive Level: Remembering

3. Which cells function to maintain bone matrix?
 - a. Osteoclasts
 - b. Osteocytes
 - c. Osteoblasts
 - d. Osteophytes

ANS: B

Osteocytes help synthesize and replace needed elements of the matrix by signaling osteoclasts and osteoblasts to resorb and form new bone. Osteoclasts are bone resorbing cells. Osteoblasts are bone forming cells. Osteophytes are bony outgrowths, also known as bone spurs.

PTS: 1 DIF: Cognitive Level: Remembering

4. Which bone cells are large and multinucleated and contain lysosomes filled with hydrolytic enzymes?
- Osteoblasts
 - Osteoclasts
 - Osteocytes
 - Fibrocytes

ANS: B

Osteoclasts are the major resorptive cells of bone. They are large multinucleated cells with a short life span and contain lysosomes (digestive vacuoles) filled with hydrolytic enzymes. Osteoblasts are bone forming cells. Osteoclasts are bone resorbing cells. Fibrocytes produce connective tissue proteins.

PTS: 1 DIF: Cognitive Level: Remembering

5. Which bone cell secretes hydrochloric acid to help dissolve bone minerals and collagenase, thus aiding in the digestion of collagen?
- Osteocytes
 - Osteoblasts
 - Osteoclasts
 - Osteophytes

ANS: C

Osteoclasts bind to the bone surface of cell attachment proteins called *integrins*. They bring about resorption of bone by secreting hydrochloric acid and cathepsin K (a protease enzyme) that help dissolve bone minerals and collagenase, which aids in digesting collagen, along with the action of cytokines. Osteocytes are the most abundant cells in bone. Osteoblasts are bone forming cells. Osteophytes are bony outgrowths, otherwise known as bone spurs.

PTS: 1 DIF: Cognitive Level: Remembering

6. Which glucoprotein is believed to inhibit calcium phosphate precipitation and play a part in bone resorption by recruiting osteoclasts?
- Osteocalcin
 - Osteonectin
 - Laminin
 - Osteopontin

ANS: A

The roles of osteocalcin may be to inhibit calcium phosphate precipitation and play a part in bone resorption by recruiting osteoclasts. Osteonectin is a bone-specific protein that binds selectively to both hydroxyapatite and collagen in the bone matrix. Laminin is an abundant bone matrix protein in humans that stabilizes basement membranes in bones and is important in neurite and axon growth. Osteopontin is a noncollagenous bone matrix protein.

PTS: 1 DIF: Cognitive Level: Remembering

7. Which glucoprotein is thought to transport essential elements such as hormones, ions, and other metabolites to and from the bone cells?
- Osteocalcin
 - Osteonectin
 - Laminin
 - Bone albumin

ANS: D

Researchers believe bone albumin transports essential elements such as hormones, ions, and other metabolites to and from the bone cells and maintain the osmotic pressure of bone fluid (fluid surrounding mineral crystals and osteoblasts). Osteocalcin inhibits calcium phosphate precipitation and recruits osteoclasts for bone resorption. Osteonectin is a bone-specific protein that binds selectively to both hydroxyapatite and collagen in the bone matrix. Laminin is an abundant bone matrix protein in humans that stabilizes basement membranes in bones and is important in neurite and axon growth.

PTS: 1

DIF: Cognitive Level: Remembering

8. How is the work function of a muscle usually calculated?
- Muscle type
 - Calculating force \times distance
 - Foot pounds
 - Kilograms

ANS: B

The ultimate function of muscle is to accomplish work. *Work* refers to the amount of energy liberated or the amount of force exerted over a distance (work = force \times distance). Muscle type is not relevant. Work is sometimes expressed in measures such as foot-pounds or kilogram-meters.

PTS: 1

DIF: Cognitive Level: Remembering

9. What is the basic structural unit in compact bone?
- Small channels called *canaliculi*
 - Osteocytes within the lacunae
 - Tiny spaces within the lacunae
 - Haversian system

ANS: D

The basic structural unit in compact bone is the haversian system. Osteocytes are interconnected by a network of dendritic cytoplasmic processes through tunnels known as canaliculi. These canaliculi radiate from each lacuna and contain cell processes from the resident osteocyte, thereby enabling it to form gap junctions with adjacent osteocytes. Lacunae each contain one osteocyte.

PTS: 1

DIF: Cognitive Level: Remembering

10. Which part of an injured joint becomes insensitive to pain and regenerates slowly and minimally?

- a. Synovium
- b. Articular cartilage
- c. Bursa
- d. Tendon

ANS: B

Articular cartilage has no blood vessels, lymph vessels, or nerves. Therefore, it is insensitive to pain and regenerates slowly and minimally after injury. This is not true of the synovium, bursa, or tendons.

PTS: 1

DIF: Cognitive Level: Remembering

11. The outer layer of the periosteum contains blood vessels and nerves that penetrate the inner structures of the bone by way of which structure?
- a. Volkmann canals
 - b. Canaliculi
 - c. Sharpey canals
 - d. Trabeculae

ANS: A

All bones are covered with a double-layered connective tissue called the *periosteum*. The outer layer of the periosteum contains blood vessels and nerves, some of which penetrate to the inner structures of the bone only through channels called *Volkmann canals*. Osteocytes are interconnected by a network of dendritic cytoplasmic processes through tunnels known as canaliculi. The inner layer of the periosteum is anchored to the bone by collagenous fibers (Sharpey fibers) that penetrate the bone. Sharpey fibers also help hold or attach tendons and ligaments to the periosteum of bones. In spongy bone, the lamellae are not arranged in concentric layers but in plates or bars termed trabeculae that branch and unite with one another to form an irregular meshwork.

PTS: 1

DIF: Cognitive Level: Remembering

12. What is the function of Sharpey fibers?
- a. To anchor the outer layer of the periosteum to the inner layer
 - b. To contain blood vessels and nerves on the outer layer of the periosteum
 - c. To help attach tendons and ligaments to the periosteum
 - d. To attach muscles to the periosteum

ANS: C

Collagenous fibers (Sharpey fibers) that penetrate the bone anchor the inner layer of the periosteum to the bone. They do not anchor the outer layer of periosteum to the inner layer, contain blood vessels and nerves on the outer layer of periosteum, or attach muscles to the periosteum.

PTS: 1

DIF: Cognitive Level: Remembering

13. The student learns that after puberty, the epiphyseal plate calcifies and the epiphysis merges with which structure?
- a. Epiphyseal line

- b. Epiphyseal plate
- c. Metaphysis
- d. Articular cartilage

ANS: C

After puberty, the epiphyseal plate calcifies and the epiphysis merges with the metaphysis.

PTS: 1 DIF: Cognitive Level: Remembering

14. The stage of healing in the bone that involves procallus formation entails which process?
- a. Formation of a hematoma that allows the development of a fibrin network
 - b. Production of granulation tissue by fibroblasts, capillary buds, and osteoblasts
 - c. Development of a primitive bone matrix termed *woven bone*
 - d. Remodeling of the periosteal and endosteal bone surfaces

ANS: B

Fibroblasts, capillary buds, and osteoblasts move into the wound to produce granulation tissue called a *procallus*. This process does not include hematoma formation, primitive bone matrix, or remodeling of bone surfaces.

PTS: 1 DIF: Cognitive Level: Remembering

15. The professor asks a student to describe the movement of a diarthrosis joint. What answer by the student is *best*?
- a. Immovable joint
 - b. Slightly moveable
 - c. Variable movement
 - d. Freely moveable

ANS: D

Based on movement, a joint is classified as a synarthrosis (immovable joint), an amphiarthrosis (slightly movable joint), or a diarthrosis (freely movable joint). There is no specific term for a joint with variable movement.

PTS: 1 DIF: Cognitive Level: Remembering

16. Which type of joint holds teeth in the maxilla or mandible?
- a. Amphiarthrosis
 - b. Diarthrosis
 - c. Synarthrosis
 - d. Gomphosis

ANS: D

A gomphosis is a special type of fibrous joint in which a conical projection fits into a complementary socket and is held in place by a ligament. Amphiarthrosis describes a slightly moveable joint. Diarthrosis is a freely moveable joint. Synarthrosis is an immovable joint.

PTS: 1 DIF: Cognitive Level: Remembering

17. The hyaline cartilage joints between the ribs and sternum are examples of which type of joint?
- Synchondrosis
 - Symphysis
 - Gomphosis
 - Syndesmosis

ANS: A

A synchondrosis is the only type of joint in which hyaline cartilage, rather than fibrocartilage, connects the two bones. The joints between the ribs and the sternum are synchondroses. A symphysis is a cartilaginous joint in which bones are united by a pad or disk of fibrocartilage. The symphysis pubis is an example. A gomphosis is a special type of fibrous joint in which a conical projection fits into a complementary socket and is held in place by a ligament. An example of a gomphosis is the joint holding the teeth in place. A syndesmosis is a joint in which the two bony surfaces are united by a ligament or membrane. The fibers of ligaments are flexible and stretch, permitting a limited amount of movement. The paired bones of the lower arm (radius and ulna) and the lower leg (tibia and fibula) and their ligaments are syndesmotomic joints.

PTS: 1

DIF: Cognitive Level: Remembering

18. The joint that contains a synovial membrane that lines the inner joint capsule is an example of which type of joint?
- Amphiarthrosis
 - Diarthrosis
 - Synarthrosis
 - Biarthrosis

ANS: B

The joint that contains a synovial membrane that lines the inner joint capsule is a diarthrosis. A synovial joint consists of these parts: (1) fibrous joint capsule (articular capsule), (2) synovial membrane that lines the inner surface of the joint capsule, (3) joint cavity (synovial cavity or space formed by the capsule), (4) synovial fluid, which fills the joint cavity and lubricates the joint surface, and (5) articular cartilage, which covers and pads the articulating bony surfaces. An amphiarthrosis is a partially moveable joint. A synarthrosis is an immovable joint. Biarthrosis is not a term used to describe joints.

PTS: 1

DIF: Cognitive Level: Remembering

19. What is the function of the synovial membrane's type A cells within the intima?
- To release mast cells, initiating the inflammatory process after joint injury
 - To ingest and remove bacteria and debris by phagocytosis in the joint cavity
 - To secrete hyaluronate, a binding agent that gives synovial fluid its viscous quality
 - To store fat cells and glycogen, providing adenosine triphosphate for joint activity

ANS: B

The intima contains two types of synovial cells: A and B. Type A synovial cells ingest and remove bacteria and particles of debris by phagocytosis in the joint cavity. The vascular subintima contains mast cells. Type B cells secrete hyaluronate. Glycogen is present in muscle cells to provide an energy source.

PTS: 1 DIF: Cognitive Level: Remembering

20. The professor is quizzing student on synovial fluid. Which statement shows the students need further instruction?
- It contains protein polysaccharides to repair the synovial membrane after injury.
 - It lubricates the joint surfaces, allowing ease of movement.
 - It nourishes the pad of the articular cartilage.
 - It contains leukocytes to phagocytize joint debris and microorganisms.

ANS: A

Synovial fluid lubricates the joint surfaces, nourishes the pad of the articular cartilage that covers the ends of the bones, and contains free-floating synovial cells and various leukocytes that phagocytose joint debris and microorganisms. It does not contain polysaccharides for synovial membrane repair.

PTS: 1 DIF: Cognitive Level: Remembering

21. What anchors articular cartilage to the underlying bone?
- Sharpey fibers
 - Collagen fibers
 - Glycoproteins
 - Elastin fibers

ANS: B

Collagen fibers are important components of the cartilage matrix because they anchor the cartilage securely to underlying bone. Sharpey fibers help attach tendons and ligaments to the periosteum. Glycoproteins are carbohydrate-protein complexes of bone. Elastin fibers comprise part of the vascular subintima.

PTS: 1 DIF: Cognitive Level: Remembering

22. What controls the movement of synovial fluid through cartilage?
- Cartiloregulins
 - Hyaluronate
 - Proteoglycans
 - Chondroitin

ANS: C

Proteoglycans give articular cartilage its stiff quality and regulate the movement of synovial fluid through the cartilage. Hyaluronate is a binding agent that gives synovial fluid its viscous quality. Chondroitin is a substance that helps make up glycosaminoglycans. Cartiloregulin is not a term used in the text.

PTS: 1 DIF: Cognitive Level: Remembering

23. Which statement indicates that a student needs more information about muscles?
- Muscle comprises 50% of an adult's body weight and 40% of a child's body weight.
 - Muscle is 75% water, 20% protein, and 5% organic and inorganic compounds.

- c. Muscle contains 32% of all protein stores for energy and metabolism.
- d. Muscles are encased in fascia.

ANS: A

Muscle constitutes 50% of an adult's body weight and 40% of a child's body weight. The other options are true statements regarding muscles.

PTS: 1 DIF: Cognitive Level: Remembering

24. Which characteristic of type II (white fast-motor) muscle fibers does the student learn?
- a. Slow contraction speed
 - b. Fast conduction velocities
 - c. Profuse capillary supply
 - d. Oxidative metabolism

ANS: B

Type II fibers, also called *white fast-motor fibers*, are innervated by relatively large type II alpha motor neurons with fast conduction velocities. Slow contraction speed, profuse capillary supply, and oxidative metabolism apply to type I muscle fibers.

PTS: 1 DIF: Cognitive Level: Remembering

25. As the innervation ratio of a particular organ increases, what other property also increases?
- a. Control
 - b. Movement
 - c. Coordination
 - d. Endurance

ANS: D

The greater the innervation ratio (the number of motor units per muscle) of a particular organ, the greater is its endurance. Low-innervation ratios promote control and coordination, whereas high ratios promote strength and endurance. An increase in the innervations ratio does not result in an increase in movement.

PTS: 1 DIF: Cognitive Level: Remembering

26. Which statement describes a neuroregulin?
- a. Chemical mediator that initiates signals from the anterior horn cell of the spinal cord to the axon of motor nerve branches of groups of muscle fibers
 - b. Neurotransmitter that provides a means of reporting changes in length, tension, velocity, and tone in muscles
 - c. Proteoglycan secreted by neurons, which increases acetylcholine receptors
 - d. Mechanoreceptor that lies parallel to muscle fibers and responds to muscle stretching

ANS: C

Motor and sensory neurons secrete a proteoglycan called *neuroregulin* that increases acetylcholine receptors and helps in the formation of muscle spindle fibers. From the anterior horn cell of the spinal cord, the axons of motor nerves branch out to innervate a specific group of muscle fibers. Muscle spindles, Golgi tendon organs, and free nerve endings provide a means of reporting changes in length, tension, velocity, and tone in the muscle. Spindles are mechanoreceptors that lie parallel to muscle fibers and respond to muscle stretching.

PTS: 1 DIF: Cognitive Level: Remembering

27. Which four-step process correctly describes muscle contraction?
- Coupling, contraction, relaxation, excitation
 - Contraction, relaxation, excitation, coupling
 - Relaxation, excitation, coupling, contraction
 - Excitation, coupling, contraction, relaxation

ANS: D

Muscle contraction is a four-step process: excitation, coupling, contraction, and relaxation.

PTS: 1 DIF: Cognitive Level: Remembering

28. Which type of ion directly controls the contraction of muscles?
- Sodium
 - Potassium
 - Calcium
 - Magnesium

ANS: C

Contraction begins as the calcium ions combine with troponin, a reaction that overcomes the inhibitory function of the troponin-tropomyosin system. Sodium and potassium are maintained in balance by the sodium-potassium pump. This balance is needed to maintain the resting potential of cells. Magnesium is important for bone and muscle function.

PTS: 1 DIF: Cognitive Level: Remembering

29. In which type of contraction does the muscle maintain a constant tension as it moves?
- Isotonic
 - Isometric
 - Hypertonic
 - Hypotonic

ANS: A

An isotonic contraction describes when the muscle maintains a constant tension as it moves. In an isometric contraction, the muscle maintains a constant length when tension increases. Hyper- and hypotonic are not used to describe skeletal muscle activity.

PTS: 1 DIF: Cognitive Level: Remembering

30. Which term is used to identify a functional muscle contraction in which the muscle contracts but the limb does not move?

- a. Isotonic
- b. Isometric
- c. Eccentric
- d. Concentric

ANS: B

During an isometric contraction (static or holding contraction) the muscle maintains a constant length as tension is increased. Isometric contraction occurs, for example, when the arm or leg is pushed against an immovable object. The muscle contracts, but the limb does not move. An isotonic contraction describes when the muscle maintains a constant tension as it moves. Eccentric and concentric do not describe muscle contractions.

PTS: 1 DIF: Cognitive Level: Remembering

31. A student has learned about aging and the musculoskeletal system. What statement by the student indicates a need for more study on the topic?
- a. Haversian system erodes, the canals nearest the marrow cavity widen, and the endosteal cortex converts to spongy bone.
 - b. The remodeling cycle increases because of a decreased ability of the basic multicellular units to resorb and deposit bone.
 - c. Cartilaginous rigidity increases because of decreasing water content and decreasing concentrations of glycosaminoglycans.
 - d. Muscle ribonucleic acid (RNA) synthesis declines, although the regenerative function of muscle tissue is reportedly normal in older adults.

ANS: A

Aging does not typically have an effect on the haversian system as described. The remaining options are accurate statements regarding the effects of aging.

PTS: 1 DIF: Cognitive Level: Remembering

32. Which component is found in synovial fluid?
- a. Protein polysaccharides
 - b. Water
 - c. Leukocytes
 - d. Chondrocytes

ANS: C

Synovial fluid lubricates the joint surfaces, nourishes the pad of the articular cartilage that covers the ends of the bones, and contains only free-floating synovial cells and various leukocytes that phagocytose joint debris and microorganisms. Protein polysaccharides, water, and chondrocytes are not found in synovial fluid.

PTS: 1 DIF: Cognitive Level: Remembering

33. What term is used to identify an interlacing bundle of dense, white fibrous tissue that is richly supplied with nerves, blood vessels, and lymphatic vessels?
- a. Procallus
 - b. Joint capsule

- c. Hematoma
- d. Elastin fibers

ANS: B

The joint capsule is made up of parallel, interlacing bundles of dense, white fibrous tissue. It is richly supplied with nerves, blood vessels, and lymphatic vessels. Early in wound healing, fibroblasts, capillary buds, and osteoblasts move into the wound to produce granulation tissue called procallus. A hematoma is a mass of clotted blood found inside the tissue. Elastin fibers are a component of the vascular subintima.

PTS: 1

DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. In adults, hematopoiesis typically takes place in which bone marrow cavities? (*Select all that apply.*)
- a. Skull
 - b. Shoulders
 - c. Sternum
 - d. Long bones
 - e. Pelvis

ANS: A, B, C, E

The marrow cavities within certain bones serve as sites of blood cell formation. In adults, blood cells exclusively originate in the marrow cavities of the skull, vertebrae, ribs, sternum, shoulders, and pelvis. The yellow bone marrow found in long bones only assists the red marrow with hematopoiesis during times of intense stress.

PTS: 1

DIF: Cognitive Level: Remembering

2. What information does the student learn about osteocytes? (*Select all that apply.*)
- a. An osteocyte is a transformed osteoblast.
 - b. An osteocyte obtains nutrients from capillaries in the canaliculi.
 - c. Osteocytes are the prime target of thyroid hormone action.
 - d. Osteocytes signal osteoclasts and osteoblasts to form new bone.
 - e. An osteocyte helps maintain levels of calcium and phosphorus in blood plasma.

ANS: A, B, D, E

An osteocyte is a transformed osteoblast. Osteocytes communicate with each other and help concentrate nutrients in the matrix. They obtain nutrients from capillaries in the canaliculi, which contain nutrient-rich fluids and also help synthesize and replace needed elements of the matrix by signaling osteoclasts and osteoblasts to resorb and form new bone. Through exchanges among these cells, hormone catalysts, minerals, and optimal levels of calcium, phosphorus, and other minerals are maintained in blood plasma. Osteocytes are the prime target of parathyroid hormone activity.

PTS: 1

DIF: Cognitive Level: Remembering

3. Which minerals are stored in bones? (*Select all that apply.*)
- a. Carbonate
 - b. Phosphate
 - c. Selenium
 - d. Magnesium
 - e. Calcium

ANS: A, B, D, E

Bones have a crucial role in mineral homeostasis and in storing and releasing minerals (e.g., calcium, phosphate, carbonate, magnesium) that are essential for the proper working of many delicate cellular mechanisms. Selenium is not stored in the bones.

PTS: 1

DIF: Cognitive Level: Remembering

4. Which factors influence the rate of protein synthesis of skeletal muscles? (*Select all that apply.*)
- a. Insulin
 - b. Cortisol
 - c. Parathyroid hormone
 - d. Growth hormone
 - e. Amino acid substrates

ANS: A, E

The rate of protein synthesis is related to insulin levels, amino acid substrates and to overall nutritional status. Unrelated are cortisol, parathyroid hormone, and growth hormone.

PTS: 1

DIF: Cognitive Level: Remembering

Chapter 45: Alterations of Musculoskeletal Function

MULTIPLE CHOICE

1. The health care professional is caring for a person who has a pathologic fracture. The patient asks the professional to explain the condition. What response by the professional is *best*?
 - a. The outer surface of the bone is disrupted, but the inside is intact.
 - b. A stable fracture where the cortex of the bone bends but doesn't break.
 - c. A fracture that happens at the site of an abnormality already in that bone.
 - d. It was caused by the cumulative effects of stress on the bone over time.

ANS: C

A pathologic fracture is a break at the site of a preexisting abnormality, usually by force that would not fracture a normal bone. A greenstick fracture is one in which the outer surface is disrupted but the inside is intact. The stable fracture with a bent but not broken cortex is a torus fracture. Cumulative stress results in stress fractures.

PTS: 1

DIF: Cognitive Level: Understanding

2. A health care professional is providing education to a group of seasonal athletes. What type of fracture does the professional warn them to avoid?
 - a. Stress
 - b. Greenstick
 - c. Insufficiency
 - d. Pathologic

ANS: A

A stress fracture occurs in normal or abnormal bone that is subjected to repeated stress, such as repetitive and strenuous activities that occur during athletics. A greenstick fracture is one in which the outer surface of the bone is disrupted but the interior is intact. Insufficiency fractures are seen in osteoporosis and osteomalacia. A pathologic fracture is one that occurs from force that would not usually break a bone. There is usually an underlying lesion or abnormality at the site of the fracture.

PTS: 1

DIF: Cognitive Level: Understanding

3. A patient has a temporary displacement of two bones causing the bone surfaces to partially lose contact with each other. What treatment does the health care professional prepare the patient for?
 - a. Internal fixation
 - b. Reduction and immobilization
 - c. Calcium phosphate cement
 - d. Low-density ultrasound

ANS: B

This patient has manifestations of a subluxation. Treatment would include reduction followed by immobilization, followed by physical therapy. Internal fixation would be appropriate for some fractures. Calcium phosphate cement can be used to fill a large defect in bone such as seen in nonunion. Low-density ultrasound is another option to promote new bone growth in nonunion.

PTS: 1 DIF: Cognitive Level: Applying

4. Improper reduction or immobilization of a fractured femur can result in which outcome after cast removal?
- a. The muscles around the fracture site are weak.
 - b. The fracture requires 6 to 8 weeks of physical therapy.
 - c. The skin under the cast is dry and flaky.
 - d. The bone is not straight.

ANS: D

Improper reduction or immobilization of a fractured bone may result in nonunion, delayed union, or malunion. Malunion is the healing of a bone in a nonanatomic position that could result in the bone not being straight. The other options are normal occurrences.

PTS: 1 DIF: Cognitive Level: Remembering

5. Which structure attaches skeletal muscle to bone?
- a. Tendon
 - b. Ligament
 - c. Bursa
 - d. Mesentery

ANS: A

A tendon is fibrous connective tissue that attaches skeletal muscle to bone. A ligament attaches bones together where they meet at a joint. A bursa is a small sac lined with synovial membrane and filled with synovial fluid; bursae are located between tendons, muscles, and bony prominences. Their primary function is to separate, lubricate, and cushion these structures. The mesentery is a fold of the peritoneum that attaches internal abdominal organs to the posterior wall of the abdomen.

PTS: 1 DIF: Cognitive Level: Remembering

6. What is the tear in a ligament referred to as?
- a. Fracture
 - b. Strain
 - c. Disunion
 - d. Sprain

ANS: D

Ligament tears are commonly known as *sprains*. A fracture is a break in a bone. A strain is an injury to a tendon or muscle. Disunion is when bones do not heal together properly after a fracture.

PTS: 1 DIF: Cognitive Level: Remembering

7. A patient seen in the clinic has tissue degeneration or irritation of the extensor carpi radialis brevis tendon. What diagnosis does the health care professional document?
- Lateral epicondylopathy
 - Medial epicondylopathy
 - Bursitis
 - Lateral tendinitis

ANS: A

Lateral epicondylopathy, commonly called *tennis elbow*, is the result of tissue degeneration or irritation of the extensor carpi radialis brevis tendon at its origin. Medial tendinitis or medial epicondylitis, referred to as golfer's elbow, is a degenerative process of the pronator teres, flexor carpi radialis, and palmaris longus tendons at the medial humeral condyle. Bursitis is inflammation of the bursae. Tendinitis is a general term for inflammation of a tendon.

PTS: 1

DIF: Cognitive Level: Remembering

8. A patient in the Emergency Department has either a tendon or ligament injury. What pain description from the patient would the health care professional associate with these injuries?
- Dull and diffuse, persisting over the distribution of the tendon or ligament
 - Sharp and localized, persisting over the distribution of the tendon or ligament
 - Pins-and-needle sensations that occur distal to the injury with movement
 - Intermittent and aching, occurring over the distribution of the tendon or ligament

ANS: B

The pain resulting from tendon and ligament injuries is usually described as being sharp and localized, persisting over the distribution of the tendon or ligament. This selection is the only option that accurately describes this type of pain.

PTS: 1

DIF: Cognitive Level: Remembering

9. A student asks for an explanation of rhabdomyolysis. What response by the professor is *best*?
- Paralysis of skeletal muscles, resulting from an impaired nerve supply
 - Smooth muscle degeneration, resulting from ischemia
 - Lysis of skeletal muscle cells through the initiation of the complement cascade
 - Release of myoglobin from damaged striated muscle cells

ANS: D

Rhabdomyolysis involves the release of myoglobin when muscle cells are damaged. It is not due to muscle paralysis, muscle degeneration, or from the complement cascade.

PTS: 1

DIF: Cognitive Level: Remembering

10. Which pathophysiologic alteration precedes crush syndrome after prolonged muscle compression?
- Muscle ischemia
 - Myoglobinuria
 - Volkmann contracture
 - Neural injury

ANS: B

Myoglobinuria is an excess of myoglobin (an intracellular muscle protein) in the urine. Muscle cell damage releases the myoglobin. The most severe form is often called *crush syndrome*. Less severe and more localized forms of muscle damage are called *compartment syndromes*. This selection is the only option that accurately identifies the pathophysiologic alteration that precedes crush syndrome.

PTS: 1

DIF: Cognitive Level: Remembering

11. By the time osteoporosis is visible on an x-ray examination, up to what percent of bone has been lost?
- 30%
 - 40%
 - 50%
 - 60%

ANS: A

Generally, osteoporosis is radiographically detected as increased radiolucency of bone. By the time abnormalities are detected by x-ray examination, as much as 25% to 30% of bone tissue may have been lost.

PTS: 1

DIF: Cognitive Level: Remembering

12. A patient has a bone density T score of -2.8. What diagnosis does the health care professional educate the patient on?
- Osteoplasia
 - Osteoporosis
 - Osteopenia
 - Osteomalacia

ANS: B

Bone density is based on the number of standard deviations that differ from the mean bone mineral density of a young-adult reference population (a T-score). A normal T score is >-1.0 . A score between -1.0 and -2.5 signifies osteopenia. A score <-2.5 indicates osteoporosis.

PTS: 1

DIF: Cognitive Level: Understanding

13. Which type of osteoporosis would a person develop after having the left leg in a cast for 8 weeks to treat fracture of the tibia and fibula?
- Iatrogenic
 - Regional
 - Idiopathic
 - Osteoblastic

ANS: B

Classic regional osteoporosis is associated with disuse or immobilization of a limb because of fractures, motor paralysis, or bone or joint inflammation.

PTS: 1 DIF: Cognitive Level: Remembering

14. In osteoporosis, the receptor activator of nuclear factor κ B (RANK) activates what?
- Osteoclast apoptosis
 - Osteoblast survival
 - Osteoprotegerin
 - Osteoclast survival

ANS: D

RANKL activates the receptor RANK, which is expressed on osteoclasts and their precursors and suppresses apoptosis, which leads to activation and the prolongation of osteoclast survival. Apoptosis, osteoblast survival, and osteoprotegerin are not affected.

PTS: 1 DIF: Cognitive Level: Remembering

15. A health care professional who works with older women understands that which changes are believed to play a significant role in the development of age-related bone loss?
- Increased oxidative stress and increased intracellular reactive oxygen species
 - Hypoparathyroidism
 - Increased body weight
 - Decreased formation and short life span of osteoclasts

ANS: A

Recent studies indicate that increased oxidative stress (OS) and increased intracellular reactive oxygen species (ROS) play significant roles in the development of age-related bone loss, as well as other age-related changes in the body.

PTS: 1 DIF: Cognitive Level: Remembering

16. Which hormone exerts antiapoptotic effects on osteoblasts but proapoptotic effects on osteoclasts?
- Parathyroid hormone
 - Glucocorticoid
 - Growth hormone
 - Estrogen

ANS: D

Data reveal that sex steroids (e.g., estrogens) exert antiapoptotic effects on osteoblasts but exert proapoptotic effects on osteoclasts; in both scenarios, activating the extracellular signal-regulated kinases (ERKs) accomplishes these effects. This process is not true of any of the other options.

PTS: 1 DIF: Cognitive Level: Remembering

17. A patient is brought to the Emergency Department after being found by neighbors. The patient says she has been lying on the floor in the house for 3 days. What action by the health care professional is *best*?
- Order a serum creatine kinase (CK) level
 - Obtain an x-ray of the patient's hips
 - Arrange for the patient to have a DXA scan

d. Perform the Fracture Risk Assessment

ANS: A

This patient is at high risk of having rhabdomyolysis. The best diagnostic test for this disorder is a serum creatine kinase level. The patient may well have a hip fracture, but other bones may be broken as well and the patient may well have rhabdomyolysis. A DXA scan and Fracture Risk Assessment are useful tools for osteoporosis.

PTS: 1

DIF: Cognitive Level: Applying

18. The health care professional teaches a group of seniors that the most common clinical manifestation of osteoporosis is which of these?
- Bone deformity
 - Bone pain
 - Pathologic fracture
 - Muscle strain

ANS: A

The most common clinical manifestation of osteoporosis is bone deformity. Pain does occur, but is often associated with fractures, which can be pathological in nature (occurring under normal stress). Muscle strain is not a component of osteoporosis.

PTS: 1

DIF: Cognitive Level: Remembering

19. A patient has been diagnosed with Paget disease. What explanation of the disease does the health care professional provide the patient?
- "It is a severe infection in your bones."
 - "It is a problem with bone resorption and formation."
 - "It is a condition in which your bones become soft."
 - "It's a disorder of altered energy production in muscle."

ANS: B

Paget disease is a state of increased metabolic activity in bone characterized by abnormal and excessive bone remodeling. Osteomyelitis is a bone infection. Bones become soft in osteomalacia. Several metabolic disorders lead to altered energy production, such as McArdle disease.

PTS: 1

DIF: Cognitive Level: Understanding

20. A health care professional determines that the student needs more education when the student makes which statement about treating bone infection?
- Bone contains multiple microscopic channels that are impermeable to the cells and biochemicals of the body's natural defenses.
 - Microcirculation of bone is highly vulnerable to damage and destruction by bacterial toxins, leading to ischemic necrosis of bone.
 - Bone cells have a limited capacity to replace bone destroyed by infections.
 - Bacteria are walled off by macrophages and T lymphocytes; consequently, the antibiotics cannot penetrate the infected area.

ANS: D

Bacteria are not walled off by macrophages and T lymphocytes, thus inhibiting the effects of antibiotics. This statement would cause the professional to review the material with the student. The other options are true statements regarding factors that contribute to the difficulty in treating bone infections.

PTS: 1

DIF: Cognitive Level: Evaluating

21. Bone death as a result of osteomyelitis is due to what?
- Formation of immune complexes at the site of infection
 - Localized ischemia
 - Tumor necrosis factor-alpha (TNF- α) and interleukin 1 (IL-1)
 - Impaired nerve innervation at the site of infection

ANS: B

Vessel damage causes local thrombosis (blockage) of the small vessels, which leads to ischemic necrosis (death) of bone. Bone death is not due to the formation of immune complexes, tumor necrosis factor and interleukins, or impaired nerve innervation.

PTS: 1

DIF: Cognitive Level: Remembering

22. A student studying osteomyelitis and asks for an explanation of the term “sequestrum.” What response by the professor is *best*?
- An area of devascularized and devitalized bone
 - An enzyme that phagocytizes necrotic bone
 - A subperiosteal abscess
 - A layer of new bone surrounding the infected bone

ANS: A

Lifting of the periosteum disrupts blood vessels that enter bone through the periosteum, which deprives the underlying bone of its blood supply. This deprivation leads to necrosis and death of the area of infected bone, producing sequestrum, an area of devitalized bone. None of the other available options accurately identify the term “*sequestrum*”.

PTS: 1

DIF: Cognitive Level: Understanding

23. A patient in the clinic had a femur x-ray that was read as having a “moth-eaten” appearance. What treatment option does the health care professional discuss with the patient?
- Limb-salvaging surgery
 - Amputation
 - Oral bisphosphonates
 - Calcium and vitamin D supplements

ANS: A

A moth-eaten appearance of a bone signifies osteosarcoma, a malignant bone-forming cancer. The preferred treatments are chemotherapy and limb-salvaging surgery. Oral bisphosphonates and calcium and vitamin D supplements would be treatments for osteoporosis.

PTS: 1

DIF: Cognitive Level: Applying

24. Which statement accurately describes a characteristic of osteosarcoma?
- a. Slow-growing tumor that begins in the bone marrow and infiltrates the trabeculae
 - b. Solitary tumor that most often affects the metaphyseal region of the femur or tibia
 - c. Aggressive tumor most often found in the bone marrow of long bones
 - d. Tumor that infiltrates the trabeculae in spongy bone and implants in surrounding tissue by seeding

ANS: C

An osteosarcoma is a malignant bone-forming tumor. It is aggressive and most often found in bone marrow; it has a moth-eaten pattern of bone destruction. A fibrosarcoma begins in the bone marrow and infiltrates the trabeculae. It tends to be a solitary tumor that affects the metaphyseal region of the femur or tibia. A chondrosarcoma spreads by seeding.

PTS: 1 DIF: Cognitive Level: Remembering

25. A professor has taught the class about giant cell bone tumors. Which statement by a student would require the professor to review the material?
- a. Giant cell tumors are an overexpression of genes including osteoprotegerin ligand (OPGL).
 - b. The tumors are malignant, solitary, and irregularly shaped.
 - c. Giant cell tumors are typically located in the epiphysis in the femur, tibia, radius, and humerus.
 - d. They are slow-growing tumors that extend over the articular cartilage.

ANS: B

The giant cell tumor is generally a benign, solitary, circumscribed tumor that causes extensive bone resorption because of its osteoclastic origin. This statement would cause the professor to review the material. The other options are true statements concerning giant cell tumors.

PTS: 1 DIF: Cognitive Level: Remembering

26. Which patient finding would lead the health care professional to assess the patient for inflammatory joint disease?
- a. Unilateral joint involvement
 - b. Normal joint synovial fluid
 - c. Absence of synovial membrane inflammation
 - d. Systemic symptoms of inflammation

ANS: D

Inflammatory joint disease is characterized by systemic signs of inflammation (fever, leukocytosis, malaise, anorexia, hyperfibrinogenemia) and inflammatory damage or destruction in the synovial membrane or articular cartilage. Joint swelling tends to be symmetric. Joint synovial fluid will demonstrate hemorrhage, coagulation, and fibrin deposition. The synovial membranes are inflamed.

PTS: 1 DIF: Cognitive Level: Understanding

27. What is a primary defect in osteoarthritis?

- a. Stromelysin and acid metalloproteinase breakdown articular cartilage.
- b. Immunoglobulin G (IgG) destroys the synovial membrane.
- c. Synovial membranes become inflamed.
- d. Cartilage-coated osteophytes create bone spurs.

ANS: A

The primary defect in osteoarthritis is the loss of articular cartilage. IgG-mediated synovial membrane destruction is seen in rheumatoid arthritis as are inflamed synovial membranes. Osteophytes are seen in osteoarthritis.

PTS: 1

DIF: Cognitive Level: Remembering

28. A patient reports joint stiffness with movement and joint pain in weightbearing joints that is usually relieved by rest. What treatment option does the health care professional discuss with the patient?
- a. Ways to decrease serum uric acid
 - b. Administration of oral methotrexate
 - c. Exercise and weight reduction
 - d. Rapid intravenous hydration

ANS: C

Pain and stiffness in one or more joints, usually weightbearing or load-bearing joints, are the first symptoms of osteoarthritis. The joint pain is usually relieved by rest. The standard treatment approach begins with weight reduction and an exercise regime. Decreasing serum uric acid would be beneficial in gout. Oral methotrexate is one drug used in rheumatoid arthritis. Rapid intravenous hydrations would be appropriate for rhabdomyolysis.

PTS: 1

DIF: Cognitive Level: Applying

29. A patient has ankylosing spondylitis. Which description of this condition by the health care professional is *most* accurate?
- a. Chronic inflammatory disease with stiffening and fusion of the spine and sacroiliac joints
 - b. Chronic systemic inflammatory disease that affects many tissues and organs
 - c. State of abnormal and excessive bone resorption and formation
 - d. Wide-spread and deep chronic muscle pain, fatigue, and tender points

ANS: A

Ankylosing spondylitis (spondyloarthritis) is a chronic, inflammatory joint disease characterized by stiffening and fusion (ankylosis) of the spine and sacroiliac joints. Rheumatoid arthritis is a chronic systemic inflammatory disease that affects multiple tissues and organs. Paget disease is characterized by abnormal and excessive bone resorption and formation. Fibromyalgia manifests with wide-spread, deep chronic muscle pain, fatigue, and tender points.

PTS: 1

DIF: Cognitive Level: Understanding

30. What is the primary pathologic alteration resulting from ankylosing spondylitis (AS)?
- a. Inflammation of the bursa
 - b. Inflammation of the long bones

- c. Inflammation of fibrocartilaginous joints of the vertebrae
- d. Inflammation of the small hand and feet bones

ANS: C

AS involves inflammation of fibrocartilage in cartilaginous joints, primarily in the spine and sacroiliac joints. AS does not include inflammation of bursa, long bones, of small bones in the hands and feet.

PTS: 1 DIF: Cognitive Level: Remembering

31. A person in the health care clinic has gout. In order to prevent a common complication, what self-care measure does the health care professional teach the person about?
- a. Drinking plenty of water
 - b. Splinting affected joints
 - c. Eating more protein
 - d. Avoiding hot weather

ANS: A

Renal stones are 1000 times more prevalent in individuals with primary gout than they are in the general population. One self-care measure to prevent stones and to prevent uric acid remaining in the kidney is a large fluid intake. Splinting joints would be difficult in gout; 50% of the time the affected joint is in the big toe. The other 50% involve the heel, ankle, and instep of the foot; knee; wrist; or elbow. More protein is not related to preventing complications. Avoiding hot weather is also not a preventative measure for complications of gout.

PTS: 1 DIF: Cognitive Level: Remembering

32. What causes the crystallization within the synovial fluid of the joint affected by gouty arthritis?
- a. Reduced excretion of purines
 - b. Overproduction of uric acid
 - c. Increase in the glycosaminoglycan levels
 - d. Overproduction of proteoglycans

ANS: B

When the uric acid reaches a certain concentration in fluids, it crystallizes, forming insoluble precipitates that are deposited in connective tissues throughout the body. Crystallization in synovial fluid causes acute, painful inflammation of the joint, a condition known as *gouty arthritis*. This selection is the only option that accurately identifies the cause of crystallization in synovial fluid associated with gouty arthritis.

PTS: 1 DIF: Cognitive Level: Remembering

33. The pathophysiologic presentation of gout is closely linked to the metabolism of which chemical?
- a. Purine
 - b. Pyrimidine
 - c. Vitamin E
 - d. Amino acid

ANS: A

The pathophysiologic presentation of gout is closely linked only to purine metabolism (or cellular metabolism of purines) and kidney function.

PTS: 1

DIF: Cognitive Level: Remembering

34. A patient in the clinic is worried about having fibromyalgia. For which symptoms should the health care professional assess the patient for?
- Hot, tender, and edematous muscle groups bilaterally
 - Fasciculations of the upper and lower extremity muscles
 - Exercise intolerance and painful muscle cramps
 - Sensitivity at tender points and profound fatigue

ANS: D

Widespread joint and muscle pain, fatigue, and tender points are characteristics of fibromyalgia, a chronic musculoskeletal syndrome. Increased sensitivity to touch (i.e., tender points), the absence of systemic or localized inflammation, and fatigue and sleep disturbances are common. Fatigue is profound. Hot, tender and edematous muscle groups; muscle fasciculations; and exercise intolerance are not generally associated with fibromyalgia.

PTS: 1

DIF: Cognitive Level: Remembering

35. A health care professional is teaching a group of college women about increasing calcium in the diet to prevent osteoporosis. A participant asks at what age is peak bone mass is reached in women. What response is *best*?
- 15 years
 - 20 years
 - 30 years
 - 35 years

ANS: C

Bone formation continues at a pace faster than resorption until peak bone mass—or maximum bone density and strength—is reached at approximately 30 years of age, after which bone resorption slowly exceeds bone formation.

PTS: 1

DIF: Cognitive Level: Understanding

36. What event is associated with the beginning of bone loss in women?
- Puberty
 - Sexual activity
 - Childbirth
 - Menopause

ANS: D

Bone loss in women is associated with menopause. Bone loss is most rapid in the first years after menopause but persists throughout the postmenopausal years. The other options are not relevant as triggers for bone loss.

PTS: 1

DIF: Cognitive Level: Remembering

37. A patient in the clinic has calcium crystals that are associated with chronic gout. How does the professional document this finding?
- Stones
 - Spurs
 - Tophi
 - Nodes

ANS: C

With time, crystal deposition in subcutaneous tissues causes the formation of small white nodules, or tophi, that are visible through the skin. Crystal aggregates deposited in the kidneys can form urate renal stones and lead to renal failure. Stones are precipitates that accumulate in liquid, such as kidney stones. Spurs are outgrowths of bone. Nodes are a central connecting point for some bodily structures.

PTS: 1

DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. What are the *primary* sources of bacterial infections that lead to hematogenous bone infection? (*Select all that apply.*)
- Sinus
 - Ear
 - Dental
 - Cutaneous
 - Throat

ANS: A, B, C, D

Cutaneous, sinus, ear, and dental infections are all primary sources of bacteria in hematogenous bone infections. Throat infections are not generally associated with bone infections.

PTS: 1

DIF: Cognitive Level: Remembering

2. Which structures are *most* often affected by Paget disease? (*Select all that apply.*)
- Vertebrae
 - Skull
 - Sternum
 - Metacarpals
 - Pelvis

ANS: A, B, C, E

Paget disease most often affects the axial skeleton, especially the vertebrae, skull, sacrum, sternum, and pelvis. The metacarpals are not associated with the axial skeleton or Paget disease.

PTS: 1

DIF: Cognitive Level: Remembering

3. Which clinical manifestations are characteristic of rheumatoid arthritis? (*Select all that apply.*)
- Subcutaneous tissue crystals

- b. Anorexia
- c. Painful, stiffening of joints
- d. Edema of the wrists
- e. Fever

ANS: B, C, E

Rheumatoid arthritis begins with general systemic manifestations of inflammation, including fever, fatigue, weakness, anorexia, weight loss, and generalized aching and stiffness. Local manifestations also gradually appear over weeks or months. Typically, the joints become painful, tender, and stiff. Neither tissue crystals nor edema is associated with rheumatoid arthritis.

PTS: 1

DIF: Cognitive Level: Remembering

Chapter 46: Alterations of Musculoskeletal Function in Children

MULTIPLE CHOICE

1. Until the skeleton matures and adult stature is reached, where does growth in the length of bone occur?
 - a. Epiphyseal line
 - b. Physeal plate
 - c. Epiphyseal cartilage
 - d. Metaphyseal plate

ANS: B

Until the skeleton matures and adult stature is reached, growth in the length of bone occurs only at the physeal plate through endochondral ossification.

PTS: 1 DIF: Cognitive Level: Remembering

2. A healthcare professional is educating an expectant parent class. Which skeletal deformity does the professional tell them is normal at birth but generally disappears by $2\frac{1}{2}$ years of age?
 - a. Genu varum (bowleg)
 - b. Genu valgum (knock knee)
 - c. Equinovarus (clubfoot)
 - d. Pes planus (flat feet)

ANS: A

Genu varum (bowleg) generally resolves itself by $2\frac{1}{2}$ years of age, whereas genu valgum (knock knee) maximizes by 5 to 6 years of age. This statement is not true of either equinovarus or pes planus.

PTS: 1 DIF: Cognitive Level: Remembering

3. A healthcare professional wants to estimate the total mass of muscle in a patient's body. What serum laboratory test should the professional evaluate?
 - a. Albumin
 - b. Blood urea nitrogen
 - c. Creatinine
 - d. Creatine

ANS: C

The total mass of muscle in the body can be estimated from the amount of creatinine excreted in the urine, because the conversion of creatine to creatinine only takes place in muscle.

PTS: 1 DIF: Cognitive Level: Remembering

4. A healthcare professional working with children learns that which is the *most* common congenital skeletal defect of the upper extremity?

- a. Vestigial tabs
- b. Paget disease
- c. Rickets
- d. Syndactyly

ANS: D

The most common congenital skeletal defect of the upper extremity is syndactyly, or webbing of the fingers.

PTS: 1

DIF: Cognitive Level: Remembering

5. What diagnosis is given to parents when their infant's hip maintains contact with the acetabulum but is not well seated within the hip joint?
- a. Dislocatable hip
 - b. Subluxated hip
 - c. Dislocated hip
 - d. Subluxable hip

ANS: B

Subluxated hip is the only option used to identify the condition when the hip maintains contact with the acetabulum but is not well seated within the hip joint. The dislocatable hip is sometimes located properly but can dislocate easily. A dislocated hip is out of its socket. "Subluxable" is often used interchangeably with subluxated.

PTS: 1

DIF: Cognitive Level: Understanding

6. Which sign or symptom is a very late indication of developmental dysplasia of the hip?
- a. Asymmetry of the gluteal or thigh folds
 - b. Leg-length discrepancy
 - c. Waddling gait
 - d. Pain

ANS: D

Pain is a very late sign of developmental dysplasia of the hip. Earlier signs include asymmetry of gluteal or thigh folds, leg-length discrepancy, and waddling gait.

PTS: 1

DIF: Cognitive Level: Remembering

7. To assess for osteogenesis imperfecta, which laboratory result would the healthcare professional expect to find?
- a. Increased phosphorus
 - b. Decreased calcium
 - c. Increased alkaline phosphatase
 - d. Decreased total protein

ANS: C

Serum alkaline phosphatase is elevated in all forms of osteogenesis imperfecta.

PTS: 1

DIF: Cognitive Level: Remembering

8. A child has a disorder that resulted in the failure of bones to ossify, resulting in soft bones and skeletal deformity. What treatment plan does the healthcare professional discuss with the parents?
- Extremely careful handling
 - Increasing vitamin D intake
 - Revascularization
 - Containment and motion therapy

ANS: B

This description characterizes rickets. Growing bone fails to mineralize because of a problem with vitamin D intake, absorption, or excretion. Treatment includes supplemental vitamin D. Extremely careful handling would be appropriate for osteogenesis imperfecta. Revascularization procedures would benefit a child with osteochondrosis. Containment and motion are the principles of treating Legg-Calvé-Perthes disease.

PTS: 1

DIF: Cognitive Level: Applying

9. An insufficient dietary intake of which vitamin can lead to rickets in children?
- C
 - B₁₂
 - B₆
 - D

ANS: D

Rickets results from either insufficient vitamin D, insensitivity to vitamin D, wasting of vitamin D by the kidney, or inability to absorb vitamin D and calcium in the gut. Vitamin D is the only vitamin associated with rickets.

PTS: 1

DIF: Cognitive Level: Remembering

10. A child has scoliosis with a 40-degree curvature of the spine, and the parent is worried about pulmonary involvement. What statement by the healthcare professional is *most* appropriate?
- "Scoliosis is a bone disorder and does not affect the lungs."
 - "Yes, we should obtain pulmonary function studies soon."
 - "Scoliosis severe enough to involve the lungs would be fatal."
 - "The lungs aren't affected until the curvature is over 80 degrees."

ANS: D

The professional should inform the parent that in scoliosis, curves in the thoracic spine greater than 80 degrees result in decreased pulmonary function. The other statements are inaccurate and should not be used to educate the parent.

PTS: 1

DIF: Cognitive Level: Understanding

11. In osteomyelitis, bacteria gain access to the subperiosteal space in the metaphysis. What factor makes this route the easiest for bacteria to gain access to this area?
- Cortex of the bone in this area is porous or mazelike.
 - Blood supply to the metaphysis is easily compromised.

- c. Macrophages and lymphocytes have limited access to the subperiosteal space.
- d. Bacteria usually spread down the medullary cavity of the bone.

ANS: A

The subperiosteal space in the metaphysis is the path of least resistance for bacterial invasion because the cortex of the bone in this area is porous or mazelike, and the inflammatory response blocks spread within the bone. Bacterial access to the subperiosteal space is not related to compromised blood supply, actions of macrophages and lymphocytes, or spread down the medullary cavity.

PTS: 1

DIF: Cognitive Level: Remembering

12. The student wants to know how the clinical manifestations and onset of juvenile idiopathic arthritis (JIA) differ from those of rheumatoid arthritis (RA) in adults. What answer by the healthcare professional is *best*?
- a. JIA begins insidiously with systemic signs of inflammation.
 - b. JIA predominantly affects large joints.
 - c. JIA has more severe joint pain than adult RA.
 - d. JIA has a rapid onset of generalized aches as the first symptom.

ANS: B

The onset of JIA is less gradual than it is in adult RA. JIA also differs from the adult form in that predominantly the large joints are affected in JIA. Pain is not as severe as in the adult type which often is first noticed as generalized aches.

PTS: 1

DIF: Cognitive Level: Understanding

13. An adolescent has been diagnosed with osteochondrosis. How does the healthcare professional describe the pathophysiology to the teen?
- a. Imbalance between calcitonin and parathyroid hormone
 - b. Nutritional deficiency of calcium and phosphorus
 - c. Bacterial infection of the bone
 - d. Vascular impairment and trauma to bone

ANS: D

Vascular impairment and trauma to bone, coupled with an underlying developmental or genetic predisposition, have been identified as probable causes of osteochondrosis. Often this is due to trauma and/or overuse. It does not involve hormonal imbalances, deficiency of minerals, or a bacterial infection.

PTS: 1

DIF: Cognitive Level: Understanding

14. Which bones are affected in Legg-Calvé-Perthes disease?
- a. Heads of the femur
 - b. Distal femurs
 - c. Heads of the humerus
 - d. Distal tibias

ANS: A

A recurrent interruption of the blood supply to the femoral heads presumably produces Legg-Calvé-Perthes disease, which is a self-limited disease of the hip.

PTS: 1 DIF: Cognitive Level: Remembering

15. What *does the student learn about* the pain experienced with Legg-Calvé-Perthes disease?
- Elbow and upper and lower arm pain is aggravated by activity and relieved by rest.
 - Knee, inner thigh, and groin pain is described as a continuous ache and relieved by antiinflammatory drugs.
 - Knee, inner thigh, and groin pain is aggravated by activity and relieved by rest.
 - Elbow and upper and lower arm pain is described as a continuous ache and relieved by antiinflammatory drugs.

ANS: C

The child with Legg-Calvé-Perthes disease often complains of a limp or pain for several months. The pain is usually referred to the knee, inner thigh, and groin and aggravated by activity and relieved by rest. This selection is the only option that accurately describes the pain associated with Legg-Calvé-Perthes disease.

PTS: 1 DIF: Cognitive Level: Remembering

16. The healthcare professional directs a student to assess a teen who has Osgood-Schlatter disease. What assessment finding does the student anticipate for this disorder?
- Lateral epicondylitis of the elbow
 - Inflammation of the anterior cruciate ligament
 - Bursitis of the subscapular bursa in the glenohumeral joint
 - Tendinitis of the anterior patellar tendon

ANS: D

Tendinitis of the anterior patellar tendon, within which the patella (kneecap) is embedded, and associated osteochondrosis of the tubercle of the tibia are characteristics of Osgood-Schlatter disease. The upper extremities are not involved.

PTS: 1 DIF: Cognitive Level: Remembering

17. At birth, the diagnosis of cerebral palsy (CP) may be made based on what factor?
- Brain trauma
 - Prematurity
 - Major brain malformation
 - Genetic defect

ANS: C

The diagnosis of CP is often made when gross motor milestones are not met by predicted ages. In some infants, diagnosis is made at birth because the child has an underlying diagnosis, such as a major brain malformation that is known to be associated with CP. None of the other options are known triggers for CP.

PTS: 1 DIF: Cognitive Level: Remembering

18. A child has Duchenne muscular dystrophy and the parents want to know how this occurred. Which statement by the healthcare professional is *most* accurate?
- X-linked recessive inheritance
 - Common *SMN1* gene abnormality
 - Autosomal dominant inheritance
 - Inheritance is not well defined

ANS: A

A deletion of a segment of DNA or a single-gene defect on the short arm of the X chromosome is believed to be the cause of the X-linked inherited type of Duchenne muscular dystrophy. Spinal muscular atrophy is a common recessive genetic disorder due to an abnormality in the *SMN1* gene. Facioscapulohumeral muscular dystrophy is a mild progressive type of muscular dystrophy that is inherited in an autosomal dominant pattern. Limb girdle muscular dystrophy may be a recessive disorder but is not well defined.

PTS: 1

DIF: Cognitive Level: Understanding

19. Which protein, absent in muscle cells of Duchenne muscular dystrophy, mediates the anchoring of skeletal muscle fibers to the basement membrane?
- Syntrophin
 - Laminin
 - Dystrophin
 - Troponin

ANS: C

Dystrophin is present in normal muscle cells and absent in Duchenne muscular dystrophy. Dystrophin mediates anchorage of the actin cytoskeleton of skeletal muscle fibers to the basement membrane through a membrane glycoprotein complex. Syntrophin is a family of dystrophin-associated proteins. Laminin is an abundant glycoprotein. Troponin is a marker of muscle injury or death, particularly in the heart.

PTS: 1

DIF: Cognitive Level: Remembering

20. A child has Duchenne muscular dystrophy. What complication does the healthcare professional teach the parents is *most* important to control?
- Respiratory infection
 - Joint contractures
 - Urinary tract infection
 - Fractures from falling

ANS: A

Although the life expectancy of boys with Duchenne continues to rise, death usually occurs from respiratory infection and a compromised respiratory system. The healthcare professional would educate the parents about the importance of maintaining good pulmonary hygiene and functioning. While other complications may occur, respiratory infections are the most worrisome.

PTS: 1

DIF: Cognitive Level: Applying

21. Generally, what is the first symptom of facioscapulohumeral muscular dystrophy?
- Inability to open the eyes completely
 - Difficulty standing
 - Drooping shoulders
 - Facial pain

ANS: C

As the name implies, clinical manifestations begin with weakness and atrophy of facial and shoulder girdle (scapulohumeral) muscles. The first symptoms usually include drooping of the shoulders with difficulty in raising the arms above the head. The inability to close the eyes completely may be noted in early childhood. The onset of weakness in the lower limbs is often delayed for 20 to 30 years. Facial pain is not normally associated with this disorder.

PTS: 1 DIF: Cognitive Level: Remembering

22. What is the most common malignant bone tumor diagnosed during childhood?
- Chondrosarcoma
 - Fibrosarcoma
 - Ewing Sarcoma
 - Osteosarcoma

ANS: D

Osteosarcoma is the most common bone tumor that occurs during childhood.

PTS: 1 DIF: Cognitive Level: Remembering

23. Molecular analysis has demonstrated that osteosarcoma is associated with which gene?
- TP53*
 - src*
 - myc*
 - TSC2*

ANS: B

Of the options available, only the oncogene *src* has been associated with osteosarcoma. The *TP53* gene has been associated with rhabdomyosarcoma. The *myc* gene codes for a transcription factor and a mutated version is seen in many cancers. The *TSC2* gene is mutated in tuberous sclerosis complex.

PTS: 1 DIF: Cognitive Level: Remembering

24. A child has osteosarcoma and the healthcare team is assessing for metastases. What diagnostic study would be the *priority*?
- Pancreatic enzyme analysis
 - Liver biopsy
 - Chest x-ray or CT scan
 - Brain MRI

ANS: C

Osteosarcoma disseminates through the bloodstream, usually to the lung. As many as 25% of children diagnosed with osteosarcoma exhibit lung metastases at diagnosis. The healthcare team would choose the chest x-ray or CT scan as the priority.

PTS: 1 DIF: Cognitive Level: Applying

25. What does a Ewing sarcoma arise from?
- Bone marrow
 - Bone-producing mesenchymal cells
 - Metadiaphysis of long bones
 - Embryonal osteocytes

ANS: A

Arising from bone marrow, Ewing sarcoma can break through the cortex of the bone to form a soft tissue mass.

PTS: 1 DIF: Cognitive Level: Remembering

26. Rhabdomyosarcoma can develop in which type of muscle?
- Cardiac
 - Smooth
 - Involuntary
 - Striated

ANS: D

Rhabdomyosarcoma can develop anywhere striated muscle is located. It does not arise in cardiac, smooth, or involuntary muscles.

PTS: 1 DIF: Cognitive Level: Remembering

27. A newborn is diagnosed with osteomyelitis. What organism does the healthcare professional prepare to treat?
- Staphylococcus aureus*
 - Escherichia coli*
 - Group B streptococcus
 - Bacillus anthracis*

ANS: A

S. aureus is the primary cause of osteomyelitis in a newborn. Group B streptococcus and *E. coli* infections are responsible for some cases, especially those of multiple bone involvement and in high-risk infants. *S. aureus* is the responsible microorganism in 80% to 90% of osteomyelitis cases in older children. *Bacillus anthracis* (anthrax) is not associated with osteomyelitis.

PTS: 1 DIF: Cognitive Level: Remembering

28. A student asks what the cause of structural scoliosis is. What explanation by the professor is accurate?
- Poor posture
 - Vertebral rotation

- c. Poor calcium absorption
- d. Intrauterine trauma

ANS: B

Structural scoliosis is the curvature of the spine associated with vertebral rotation. Nonstructural scoliosis can be caused by poor posture. Calcium absorption and intrauterine trauma are not related to structural scoliosis.

PTS: 1

DIF: Cognitive Level: Understanding

MULTIPLE RESPONSE

1. What does the student learn about bone growth before adulthood? (*Select all that apply.*)
 - a. Growth in the length of bone occurs at the physeal plate.
 - b. Growth occurs through endochondral ossification.
 - c. Bone growth takes place under hormonal control.
 - d. Cartilage cells at the epiphyseal side of the physeal plate multiply and enlarge.
 - e. Cartilage cells at the metaphyseal side of the plate are replaced by bone.

ANS: A, B, D, E

Until adult stature is reached, growth in the length of bone occurs at the physeal plate through endochondral ossification. Cartilage cells at the epiphyseal side of the physeal plate multiply and enlarge. As rapidly as new cartilage cells form, cartilage cells at the metaphyseal side of the plate are destroyed and replaced by bone. Bone growth is not hormonally controlled.

PTS: 1

DIF: Cognitive Level: Remembering

2. The anatomic makeup of which bone structures make them susceptible locations for osteomyelitis in children? (*Select all that apply.*)
 - a. Hip joint
 - b. Distal femur
 - c. Proximal humerus
 - d. Distal radius
 - e. Lateral ankle

ANS: A, B, C, E

Spread of infection to contiguous joints is related to the child's age. Metaphyseal infection may spread to contiguous joints if the fibrous joint capsule includes the metaphysis and epiphysis. This special situation exists at the hip joint, distal femur, proximal humerus and radius, and lateral ankle.

PTS: 1

DIF: Cognitive Level: Remembering

Chapter 47: Structure, Function, and Disorders of the Integument

MULTIPLE CHOICE

1. Which component of the epidermis initiates immune responses and provides a defense against environmental antigens?
 - a. Langerhans cells
 - b. Merkel cells
 - c. Keratinocytes
 - d. Melanocytes

ANS: A

Langerhans cells (a type of dendritic cell) and dermal dendritic cells initiate an immune response by presenting processed antigen to T cells, thus providing a defense against environmental antigens. This function is not carried out by Merkel cells, keratinocytes, or melanocytes.

PTS: 1 DIF: Cognitive Level: Remembering

2. Which cells of the dermis release histamine and play a role in the hypersensitivity reactions of the skin?
 - a. Histiocytes
 - b. Fibroblasts
 - c. Mast cells
 - d. Macrophages

ANS: C

Only mast cells release histamine and play a role in hypersensitivity reactions in the skin. Histiocytes are macrophages that reside in loose connective tissue and phagocytize pigments and the debris of inflammation. Fibroblast cells secrete collagen and connective tissue matrix. Macrophages are phagocytic.

PTS: 1 DIF: Cognitive Level: Remembering

3. Which cells of the dermis secrete connective tissue matrix?
 - a. Macrophages
 - b. Mast cells
 - c. Fibroblasts
 - d. Histiocytes

ANS: C

Only fibroblasts secrete the connective tissue matrix and collagen. Macrophages are phagocytic cells. Mast cells release histamine and play a role in hypersensitivity reactions in the skin. Histiocytes are a type of macrophage found in loose connective tissue.

PTS: 1 DIF: Cognitive Level: Remembering

4. Which gland releases secretions that are important in thermoregulation and cooling of the body through evaporation?
- Sebacous
 - Apocrine
 - Eccrine
 - Exocrine

ANS: C

The eccrine sweat glands are distributed over the body, with the greatest numbers in the palms of the hands, soles of the feet, and forehead. These secretions are important in thermoregulation and cooling of the body through evaporation. Sebaceous glands secrete sebum which is a lipid substance that protects from drying. Apocrine glands are found in the axillae, scalp, face, abdomen, and genital area and have very limited proven function. Exocrine glands secrete substances onto the epithelial surface; an example is a sweat gland.

PTS: 1

DIF: Cognitive Level: Remembering

5. Which receptors of the sympathetic nervous system regulate heat loss through the skin?
- Cholinergic
 - β -Adrenergic
 - α -Adrenergic
 - Anticholinergic

ANS: C

Heat loss can be regulated by varying blood flow through the skin by opening and closing the arteriovenous anastomoses in conjunction with evaporative heat loss of sweat. The sympathetic nervous system regulates vasoconstriction and vasodilation through α -adrenergic receptors only.

PTS: 1

DIF: Cognitive Level: Remembering

6. The healthcare professional is assessing four patients for pressure ulcer formation. What is the first change in the skin that the professional would note if a patient were developing a pressure ulcer?
- Blanchable erythema of intact skin
 - Nonblanchable erythema of intact skin
 - Blister at the site of pressure
 - Reddish-purple discoloration

ANS: B

Nonblanchable erythema of intact skin, usually over bony prominences, characterizes stage 1 pressure ulcers. A blister would indicate a deep tissue pressure injury as would a reddish-purple discoloration. Blanchable erythema of intact skin would not indicate any pressure damage.

PTS: 1

DIF: Cognitive Level: Remembering

7. Which type of dressings should the healthcare professional apply to pressure ulcers?
- Flat and dry
 - Flat, moisture-retaining

- c. Bulky and dry
- d. Bulky, moisture-retaining

ANS: B

Superficial pressure ulcers should be covered with flat, nonbulky dressings that cannot wrinkle or cause increased pressure or friction. The dressing should be moisture-retaining such as Hydrogel.

PTS: 1 DIF: Cognitive Level: Remembering

8. What term is used to identify skin lesions that are elevated, rounded, and firm with irregular clawlike margins that extend beyond the original site of injury?
- a. Psoriasis
 - b. Dermatitis
 - c. Acne
 - d. Keloid

ANS: D

Keloids typically send out clawlike projections from the margins.

PTS: 1 DIF: Cognitive Level: Remembering

9. Keloids are caused by excessive amounts of which substance in the corneum during connective tissue repair?
- a. Elastin
 - b. Collagen
 - c. Stroma
 - d. Reticular fibers

ANS: B

Abnormal wound healing with excessive fibroblast activity and collagen formation during dermal connective tissue repair cause keloids. The other substances are not associated with keloid formation.

PTS: 1 DIF: Cognitive Level: Remembering

10. In allergic contact dermatitis, which cells possess the antigens and present them to T cells?
- a. Langerhans cells
 - b. Merkel cells
 - c. Keratinocytes
 - d. Macrophages

ANS: A

In allergic contact dermatitis, Langerhans cells process the antigen and carry it to T cells that then become sensitized to the antigen-releasing cytokines and chemokines, leading to leukocyte infiltration and inflammation. Merkel cells are associated with touch receptors and function as slowly adapting mechanoreceptors when stimulated by deformation of the epidermis.

Keratinocytes produce keratin, a scleroprotein that provides protection from mechanical stress. Keratin is the main constituent of skin, hair, and nail cells.

PTS: 1 DIF: Cognitive Level: Remembering

11. In latex allergies, which immunoglobulin (Ig) is associated with an immediate reaction?
- IgA
 - IgE
 - IgG
 - IgM

ANS: B

Latex allergy can be either a type IV hypersensitivity to chemicals used in latex rubber processing or a type I immediate hypersensitivity, with IgE antibodies formed in response to latex rubber protein.

PTS: 1 DIF: Cognitive Level: Remembering

12. A patient in the clinic is diagnosed with dermatitis. The patient states that a previous healthcare professional diagnosed eczema. What response by the healthcare professional is *best*?
- "Both are general terms for a specific inflammatory response in the skin."
 - "Eczema is an older, outdated term. The preferred term is dermatitis."
 - "No, it's not eczema. Eczema has yellowish scaly plaques."
 - "If it were eczema, it would have blisters that go away on their own."

ANS: A

The most common inflammatory disorder of the skin is eczema, or dermatitis. Eczema and dermatitis are general terms that describe a particular type of inflammatory response in the skin—these terms can be used interchangeably. Yellowish scaly plaques are seen in seborrheic dermatitis. Self-limiting blisters can be seen in bullous pemphigoid.

PTS: 1 DIF: Cognitive Level: Understanding

13. What clinical manifestations do allergic contact and stasis dermatitis have in common?
- Petechiae and hyperpigmentation
 - Edema and vesicular lesions
 - Scaling and crusting of lesions
 - Erythema and pruritus

ANS: D

Only erythema and pruritus are exhibited with both conditions.

PTS: 1 DIF: Cognitive Level: Remembering

14. Lesions on the elbows and knees that are well demarcated, thick, silvery, scaly, and erythematous characterize which type of psoriasis?
- Plaque
 - Inverse
 - Guttate
 - Erythrodermic

ANS: A

The description provided is characteristic of only lesions observed in plaque psoriasis. These lesions are well-demarcated, thick, silvery, scaly, erythematous plaque surrounded by normal skin. Inverse psoriasis is rare and is seen in skinfolds. Guttate psoriasis small papules appear after a streptococcal infection. Erythrodermic psoriasis covers a large portion of the body with red, scaling lesions.

PTS: 1

DIF: Cognitive Level: Remembering

15. A healthcare professional assesses a patient who presents with a single lesion on the trunk that is circular, demarcated, and salmon pink. The lesion measures approximately 3 to 4 cm in diameter. What treatment option does the professional educate the patient about?
- Narrow-band ultraviolet light therapy
 - Oral erythromycin regime
 - Keratolytic agent application
 - Consistent photoprotection

ANS: B

This patient has a herald patch, seen in pityriasis rosea. Treatments include medication for itching and erythromycin and acyclovir. UV light therapy is a treatment for lichen planus. Keratolytic agents are used in psoriasis. Photoprotection is vital in acne rosacea.

PTS: 1

DIF: Cognitive Level: Applying

16. A patient shows the healthcare professional a collection of infected hair follicles on the back of the neck is red, painful, and draining. What condition does the professional educate the patient on?
- Erysipelas
 - Furuncles
 - Carbuncles
 - Boils

ANS: C

The term *carbuncle* is used to identify a collection of infected hair follicles occurring most often on the back of the neck, the upper back, and the lateral thighs. The lesion begins in the subcutaneous tissue and lower dermis as a firm mass that evolves into an erythematous, painful, and swollen mass and drains through many openings. Erysipelas is a bacterial infection with firm red spots that coalesce together. A furuncle, or boil, is a deep, firm, red, painful nodule that changes into a fluctuant cyst.

PTS: 1

DIF: Cognitive Level: Remembering

17. The healthcare professional educates a community group that chickenpox (varicella) may be followed years later by which disorder?
- Erysipelas
 - Cytomegalovirus
 - Warts
 - Herpes zoster

ANS: D

The same herpesvirus—*varicella-zoster virus* (VZV)—causes both herpes zoster (shingles) and varicella (chickenpox). Varicella is the primary infection, followed years later by herpes zoster, particularly among those who are immunosuppressed. Varicella-zoster virus does not produce erysipelas, cytomegalovirus, or warts.

PTS: 1

DIF: Cognitive Level: Remembering

18. A child has been diagnosed with ringworm and the parent asks how to get rid of this parasite. What response by the healthcare professional is *most* appropriate?
- “We have several antibiotics that can be used.”
 - “Ringworm is actually a fungal infection of the skin.”
 - “Actually, ringworm is an old name for pemphigus.”
 - “Inexpensive topical antifungals often work well.”

ANS: B

Tinea corporis (ringworm) is a fungal infection of the skin and is not actually an infestation of worms. The healthcare professional should educate the parent to this fact.

PTS: 1

DIF: Cognitive Level: Remembering

19. Cutaneous vasculitis develops from the deposit of which substance?
- Immune complexes
 - Immunoglobulin E (IgE)
 - Complement proteins
 - T lymphocytes

ANS: A

Cutaneous vasculitis involves the deposit of immune complexes, initiating an uncontrolled inflammatory response and causing the lesions that are often polymorphic.

PTS: 1

DIF: Cognitive Level: Remembering

20. The student learns that which skin lesion is mediated by the immunoglobulin E (IgE)-stimulated release of histamine, bradykinin, or kallikrein from mast cells?
- Dermatitis
 - Scleroderma
 - Urticaria
 - Cutaneous vasculitis

ANS: C

Only urticaria is mediated by the IgE-stimulated release of histamine, bradykinin, or kallikrein from mast cells or basophils, or both, which causes the endothelial cells of skin blood vessels to contract. Dermatitis is a general term for a particular type of skin inflammation. Scleroderma can be local or systemic and involves connective tissue. Cutaneous vasculitis involves the deposit of immune complexes.

PTS: 1

DIF: Cognitive Level: Remembering

21. A patient with scleroderma asks the healthcare professional how this condition was acquired. What response is *best*?
- X-linked recessive gene
 - X-linked dominant gene
 - Virus
 - Autoantibodies

ANS: D

Scleroderma means *sclerosis of the skin* and is associated with immune dysregulation and several autoantibodies.

PTS: 1 DIF: Cognitive Level: Remembering

22. A healthcare professional assesses a patient who has elevated lesions on the face that are waxy and yellowish. What condition does the professional discuss with the patient?
- Basal keratosis
 - Seborrheic keratosis
 - Keratoacanthoma
 - Actinic keratosis

ANS: B

Seborrheic keratosis is a benign proliferation of cutaneous basal cells that produces smooth or warty elevated lesions. The pathogenetic origin is unknown. Seborrheic keratosis usually occurs in older people as multiple lesions on the chest, back, and face. The color varies from tan to waxy, yellow, flesh-colored, or dark brown to black. Keratoacanthoma usually arise from hair follicles. Actinic keratosis is a common premalignant condition with lesions that are rough, poorly defined, and pink or reddish.

PTS: 1 DIF: Cognitive Level: Remembering

23. Lesions that usually have depressed centers with rolled borders and are frequently located on the face and neck characterize which malignancy?
- Squamous cell carcinoma
 - Kaposi sarcoma
 - Malignant melanoma
 - Basal cell carcinoma

ANS: D

Basal cell carcinoma lesions have depressed centers with rolled borders. Lesions are most often observed on people who live in regions with intense sunlight and on those areas of the skin most exposed—namely, the face and neck. Squamous cell lesions are firm with a granular surface that bleeds easily. Kaposi sarcoma lesions are purplish brown macules and develop into plaques and nodules and are seen most often in people with AIDS. The ABCDE rule is used as a guide for assessing malignant melanoma: Asymmetry, Border irregularity, Color variation, Diameter larger than 6 mm, and Elevation which includes raised appearance or rapid enlargement.

PTS: 1 DIF: Cognitive Level: Remembering

24. The student learns that alteration of which gene is associated with basal cell carcinoma?

- a. *myc*
- b. *TP53*
- c. *src*
- d. *Ras*

ANS: B

Basal cell carcinoma arises as a consequence of ultraviolet-associated mutation in only the *TP53* tumor-suppressor gene leading to the loss of keratinocyte repair functions and apoptosis resistance of DNA-damaged cells. The *Ras* gene is involved in melanoma. The *myc* gene codes for a transcription factor and is involved in several cancers. The *src* gene is a proto-oncogene.

PTS: 1 DIF: Cognitive Level: Remembering

25. Bowen disease is a form of which type of cancer?
- a. Kaposi sarcoma
 - b. Malignant melanoma
 - c. Basal cell carcinoma
 - d. Squamous cell carcinoma

ANS: D

Squamous cell carcinoma (SCC) is a tumor of the epidermis and the second most common human cancer. Two types are characterized: (1) in situ (Bowen disease) and (2) invasive. Bowen disease is not a form of any of the other cancers.

PTS: 1 DIF: Cognitive Level: Remembering

26. A patient has an intradermal nevus. What assessment does the healthcare professional know is consistent with this lesion?
- a. Flat, dark, may be up to 2 cm in size
 - b. Elevated and smooth surface
 - c. Regular edges with bristle-like hairs
 - d. Heaped-up, keratinized cells

ANS: C

Only intradermal nevus is characterized by a small (less than 1 cm) lesion with regular edges and bristlelike hairs with a color change that can range from skin tones to light brown. A junctional nevus is flat, dark, and up to 2 cm in size. A compound nevus is elevated and smooth. Heaped up keratinized cells describe a scale.

PTS: 1 DIF: Cognitive Level: Remembering

27. Which cell is thought to be the progenitor cell of Kaposi sarcoma?
- a. Endothelial
 - b. Keratinocyte
 - c. Melanocyte
 - d. Exothelial

ANS: A

Only the endothelial cell is thought to be the progenitor of Kaposi sarcoma, but the specific origin is elusive.

PTS: 1 DIF: Cognitive Level: Remembering

28. A patient is brought to the Emergency Department with cold, white, waxy fingers and toes. The patient denies pain. Which intervention does the healthcare professional provide as the *priority*?
- Applying local, dry heat
 - Rubbing or massaging the area
 - Immersing in warm water
 - Leaving the area uncovered

ANS: C

This patient has signs of frostbite. Immersion in a warm-water bath (40°C to 42°C [104°F to 107.6°F]) until frozen tissue is thawed is the best treatment for frostbite. Rubbing or massaging the area would damage the traumatized cells. Dry heat is not used. Leaving the area uncovered would occur in order to immerse it.

PTS: 1 DIF: Cognitive Level: Applying

29. A patient was hospitalized with frostbite and is receiving ibuprofen. The patient asks the healthcare professional to explain the rationale for the drug. What is the *best* response?
- Treating fever
 - Preventing plate aggregation
 - Reducing pain
 - Inhibiting prostaglandins

ANS: D

Ibuprofen is used to inhibit prostaglandins. Although ibuprofen may be administered for the other reasons stated, those applications are not related to the treatment of frostbite.

PTS: 1 DIF: Cognitive Level: Understanding

30. A patient has an onychomycosis. Where would the healthcare professional assess this disorder?
- Scalp
 - Fingernail
 - Lower legs
 - Mucus membranes

ANS: B

Onychomycosis is the term used to identify a fungal or dermatophyte infection of the nail plate. The professional would assess the patient's fingernails (or toenails).

PTS: 1 DIF: Cognitive Level: Applying

31. A patient has a furuncle. Where would the healthcare professional assess the patient for this condition?
- Feet
 - Palms

- c. Hair follicles
- d. Fingernails

ANS: C

A *furuncle*, or “boil,” is used to identify an inflammation of the hair follicles (root) that may develop from a preceding folliculitis and spread through the follicular wall into the surrounding dermis.

PTS: 1

DIF: Cognitive Level: Applying

MULTIPLE RESPONSE

1. What effects does normal aging have on the wound healing process? (*Select all that apply.*)
 - a. Decreased cell proliferation
 - b. Decreased blood supply
 - c. Depressed immune responses
 - d. Depressed appetite
 - e. Decreased cognitive function

ANS: A, B, C

Decreased cell proliferation, decreased blood supply, and depressed immune responses delay wound healing in aging skin. Decreased nutrition can affect the healing process, but that is not a normal age-related change. Decreased cognitive function is not related to wound healing.

PTS: 1

DIF: Cognitive Level: Remembering

2. Which information does the student learn about a nevus? (*Select all that apply.*)
 - a. A nevus is an aggregation of melanocytes.
 - b. Nevi begin to form at the ages of 3 to 5 years.
 - c. Nevi are characterized by irregular borders.
 - d. Nevi share a relationship with melanoma.
 - e. Nevi always warrant being removed.

ANS: A, B, D

A nevus, or mole, is a benign pigmented or nonpigmented lesion that forms from melanocytes beginning at ages 3 to 5 years. Over time the cells move down into the dermis and the nevi become nodular and symmetrical without irregular borders. Nevi may undergo transition to malignant melanomas. Nevi repeatedly traumatized, irritated by clothing, or large lesions can be excised.

PTS: 1

DIF: Cognitive Level: Remembering

3. What information does the student learn about Kaposi sarcoma? (*Select all that apply.*)
 - a. South America has been the site of the endemic form of Kaposi sarcoma.
 - b. Kaposi sarcoma is a vascular malignancy.
 - c. It is associated with drug-induced immunosuppression.
 - d. Kaposi sarcoma is associated with acquired immunodeficiency syndrome (AIDS).
 - e. The classic form of Kaposi sarcoma is observed on the lower legs of older men.

ANS: B, C, D, E

Kaposi sarcoma is a vascular malignancy with four different presentations: (1) it is associated with drug-induced immunosuppression; (2) its endemic form has been found in equatorial Africa, (3) the classic form appears on the lower legs of older men, and (4) it is associated with AIDS. There is no specific geographic location for endemic Kaposi sarcoma.

PTS: 1 DIF: Cognitive Level: Remembering

4. A patient has psoriasis. Which drug classifications does the healthcare professional advise the patient to avoid if possible? (*Select all that apply.*)
- a. Antibiotics
 - b. Calcium channel blockers
 - c. Nonsteroidal antiinflammatory drugs (NSAIDs)
 - d. Beta-blockers
 - e. Lithium

ANS: D, E

Triggers for psoriasis include physical injury, infection, and some medications such as beta-blockers and lithium.

PTS: 1 DIF: Cognitive Level: Understanding

5. Which inflammatory mediators are active in frostbite? (*Select all that apply.*)
- a. Leukotrienes
 - b. Histamine
 - c. Prostaglandins
 - d. Bradykinin
 - e. Thromboxanes

ANS: B, C, D, E

The inflammatory mediators of frostbite are similar to burns and include prostaglandins, thromboxanes, bradykinin, and histamine. Leukotrienes are not associated with frostbite.

PTS: 1 DIF: Cognitive Level: Remembering

6. A woman has developed hirsutism. What conditions should the healthcare professional assess her for? (*Select all that apply.*)
- a. Adrenal hyperplasia
 - b. Cushing disease
 - c. Polycystic ovaries
 - d. Addison disease
 - e. Adrenal tumor

ANS: A, C, E

Women who develop hirsutism may be secreting hormones associated with ovarian or adrenal disease. Such women should be evaluated for polycystic ovaries, adrenal hyperplasia, or adrenal tumors. Neither Cushing nor Addison diseases are associated with hirsutism.

PTS: 1 DIF: Cognitive Level: Remembering

Chapter 48: Alterations of the Integument in Children

MULTIPLE CHOICE

1. Which immunoglobulin (Ig) is elevated in atopic dermatitis?

- a. IgA
- b. IgM
- c. IgE
- d. IgG

ANS: C

In the acute phase of atopic dermatitis, inflammation is associated with the activation of T helper 1 (Th-1) cells with an overexpression of cytokines (interleukin [IL]-4, IL-5, and IL-13) and chemokine ligand 1 (CCL1) and 18 (CCL18) with increases in IgE, eosinophils, and macrophages. IgA, IgM, and IgG are not involved in atopic dermatitis.

PTS: 1 DIF: Cognitive Level: Remembering

2. Which leukocytes are elevated in atopic dermatitis?

- a. Eosinophils
- b. Neutrophils
- c. Basophils
- d. Monocytes

ANS: A

In the acute phase of atopic dermatitis, inflammation is associated with the activation of T helper 1 (Th-1) cells with an overexpression of cytokines (interleukin [IL]-4, IL-5, and IL-13) and chemokine ligand 1 (CCL1) and 18 (CCL18) with increases in IgE, eosinophils, and macrophages. Neutrophil refers to white blood cells and eosinophils are one component. Basophils and monocytes are not elevated in atopic dermatitis.

PTS: 1 DIF: Cognitive Level: Remembering

3. A child has atopic dermatitis. What assessment finding does the healthcare professional associate with this condition?

- a. Papular rash
- b. High fever
- c. Vesicles that burst and form crusts
- d. Itching

ANS: D

Itching is considered a hallmark of atopic dermatitis, and rubbing and scratching to relieve the itch are responsible for many of the clinical changes of atopic dermatitis. Atopic dermatitis is not characterized by high fever, vesicles, or papular rash.

PTS: 1 DIF: Cognitive Level: Remembering

4. A baby has diaper dermatitis. What secondary infection does the healthcare professional assess for?
- Escherichia coli*
 - Candida albicans*
 - Proteus spp.*
 - Staphylococcus aureus*

ANS: B

Frequently the infant with diaper dermatitis has a secondary infection with *C. albicans*.

PTS: 1

DIF: Cognitive Level: Remembering

5. The disruption in cellular adhesion observed in bullous impetigo is caused by an exfoliative toxin related to which organism?
- Staphylococcus aureus*
 - Streptococcus pyogenes*
 - Escherichia coli*
 - Candida albicans*

ANS: A

Bullous impetigo is a rare variant of impetigo caused by *S. aureus*. The staphylococci produce a bacterial toxin called *exfoliative toxin* (ET), which causes a disruption in desmosomal adhesion molecules with blister formation characteristic of bullous impetigo. The other organisms are not involved in this disorder.

PTS: 1

DIF: Cognitive Level: Remembering

6. A parent of a child in a crowded daycare is worried about the staff passing on a bacterial infection to the child. Which infection would be *most* likely?
- Atopic dermatitis
 - Staphylococcal scalded-skin syndrome
 - Impetigo
 - Tinea capitis

ANS: C

Impetigo is a common bacterial skin infection in infants and children and is particularly infectious among people living in crowded conditions with poor sanitary facilities or in settings such as daycare facilities. The other options are not as infectious as impetigo.

PTS: 1

DIF: Cognitive Level: Remembering

7. A parent reports a child has skin lesions that rupture, creating a thin, flat, honey-colored crust. What treatment does the healthcare professional educate the parent about?
- Supportive care only
 - Oral griseofulvin
 - Topical corticosteroids
 - Topical mupirocin

ANS: D

This child has bullous impetigo, which is treated with topical mupirocin. Supportive care is used in rubella, which has a faint-pink to red, coalescing maculopapular rash develops on the face, with spread to the trunk and extremities. Oral griseofulvin would be appropriate for tinea capitis, which is found on the scalp. Corticosteroids would be useful for itchy rashes such as atopic dermatitis.

PTS: 1

DIF: Cognitive Level: Applying

8. A child has been diagnosed with tinea corporis. Which lesion would the healthcare professional assess for in this condition?
- Pink-to-red coalescing maculopapular rash on the face or trunk
 - Vesicles that rupture, creating a thin, flat, honey-colored crust
 - Circular (round or oval) lesions with erythema and scaling patches
 - Red papules, vesicles, and pustules in clusters

ANS: C

Lesions caused by tinea corporis are often erythematous, round, or oval-scaling patches that peripherally spread with clearing in the center, creating the ring appearance, which is why this disease is commonly referred to as *ringworm*. A pink-to-red rash is characteristic of rubella. The honey-colored crusts cover the lesions of bullous impetigo. Clusters of papules, vesicles, and pustules characterize varicella.

PTS: 1

DIF: Cognitive Level: Remembering

9. Parents do not want the child to contract tinea corporis. Which animal would they limit the child's exposure to?
- Mites
 - Kittens
 - Ponies
 - Ticks

ANS: B

Contact with kittens and puppies is considered a common source of tinea corporis.

PTS: 1

DIF: Cognitive Level: Remembering

10. The student learns that the cause of molluscum contagiosum is which of these?
- Bacteria
 - Virus
 - Fungi
 - Rickettsia*

ANS: B

The poxvirus is the only organism that induces epidermal cell proliferation and blocks immune responses that would control the virus as noted with molluscum contagiosum.

PTS: 1

DIF: Cognitive Level: Remembering

11. The healthcare professional teaches a parent group that which organism causes thrush?
- Staphylococcus*
 - Streptococcus*
 - Herpesvirus
 - Candida albicans*

ANS: D

C. albicans infection is a superficial fungal infection that commonly occurs in children. *C. albicans* is part of the normal skin flora in certain individuals and invades susceptible tissue sites if the predisposing factors are not eliminated.

PTS: 1 DIF: Cognitive Level: Remembering

12. A child has white plaque in the mouth with a few shallow ulcers. What treatment does the healthcare professional educate the parent about?
- Nystatin oral suspension
 - Warm saline rinses
 - Topical antivirals
 - No specific treatment

ANS: A

This infant has thrush, caused by *Candida albicans*. The treatment is an antifungal mouth rinse such as nystatin. Warm saline rinses and antiviral medications will not treat this fungal infection.

PTS: 1 DIF: Cognitive Level: Applying

13. The healthcare professional is teaching a group of new parents about childhood diseases. What does the professional tell them the incubation period for rubella is?
- 3 to 5 days
 - 14 to 21 days
 - 7 to 10 days
 - 5 to 15 days

ANS: B

Rubella has an incubation period that ranges from 14 to 21 days.

PTS: 1 DIF: Cognitive Level: Remembering

14. Rubella (German or 3-day measles) is caused by what type of organism?
- Virus
 - Bacterium
 - Fungus
 - Yeast

ANS: A

Rubella is a common communicable disease in children and young adults and is caused only by a ribonucleic acid (RNA) virus that enters the bloodstream through the respiratory route.

PTS: 1 DIF: Cognitive Level: Remembering

15. Rubeola is a highly contagious acute disease in children caused by which type of infection?
- Bacterial
 - Fungal
 - Yeast
 - Viral

ANS: D

Rubeola, a highly contagious acute disease in children, is a result of only a viral infection.

PTS: 1

DIF: Cognitive Level: Remembering

16. A student cannot remember the differences between rubeola and rubella. Which clinical manifestation does the healthcare professional tell the student is present in rubeola but not in rubella?
- Conjunctivitis
 - Enlarged lymph nodes
 - Presence of a cough
 - Runny nose

ANS: A

Conjunctivitis is present in rubeola, but not in rubella.

PTS: 1

DIF: Cognitive Level: Remembering

17. Parents want their child vaccinated against chickenpox. The healthcare professional prepares to administer the vaccine against which organism?
- Poxvirus
 - Varicella-zoster virus
 - Adenovirus
 - Human papillomavirus

ANS: B

Only a varicella-zoster viral infection produces chickenpox (varicella) and herpes zoster (shingles).

PTS: 1

DIF: Cognitive Level: Remembering

18. A preschool teacher notices a child who has burrows on the hands that are several millimeters to 1 cm long, papules, and vesicular lesions. What other assessment finding would help the teacher determine the type of infestation the child has?
- Ask the child if he or she has been around puppies or kittens.
 - Check the child's hair for the presence of small mites.
 - Ask the child if itching occurs especially at night.
 - Assess the child's trunk and abdomen for petechiae.

ANS: C

Scabies symptoms include burrows that are seen on the hands and are up to 1 cm long. Scabies also causes itching which is worse at night. The teacher would ask the child about itching. The other assessments would not be related to scabies.

PTS: 1 DIF: Cognitive Level: Applying

19. Which contagious disease creates a primary skin lesion that is a pinpointed macule, papule, or wheal with hemorrhagic puncture site?
- Pediculosis
 - Tinea capitis
 - Scabies
 - Rubeola

ANS: A

Of the options available, only the primary lesion of the body louse (pediculosis) exhibits a pinpoint red macule, papule, or wheal with a hemorrhagic puncture site.

PTS: 1 DIF: Cognitive Level: Remembering

20. Which contagious disease is caused by the itch mite?
- Miliaria
 - Tinea corporis
 - Pediculosis
 - Scabies

ANS: D

Scabies is the only contagious disease caused by the itch mite, *Sarcoptes scabiei*.

PTS: 1 DIF: Cognitive Level: Remembering

21. A person has a vascular anomaly associated with a congenital malformation of dermal capillaries and has been told this lesion does not fade with age. What treatment options can the healthcare professional discuss with this person?
- Surgical excision
 - Pulsed dye laser
 - Cool temperatures
 - Cosmetic tattooing

ANS: B

This person has a port-wine stain. The pulsed dye laser is the treatment of choice to fade the color and flatten its contour. Surgical excision is not required. Cool temperatures will not help. This lesion may be very large and is on the face so tattooing would not be a viable option for most people.

PTS: 1 DIF: Cognitive Level: Applying

22. An infant has a skin disorder that is characterized by a vesicular eruption after prolonged exposure to perspiration, with subsequent obstruction of the eccrine ducts. What care measures does the healthcare provider educate the parents about?

- a. Topical antifungals
- b. Corticosteroids
- c. Oral ivermectin
- d. Keeping skin cool and dry

ANS: D

This infant has miliaria which is characterized by a vesicular eruption after prolonged exposure to perspiration, with subsequent obstruction of the eccrine ducts. The key to management is avoidance of excessive heat and humidity, which cause sweating. Light clothing, cool baths, and air conditioning assist in keeping the skin surface dry and cool. The infant does not need antifungals, corticosteroids, or ivermectin.

PTS: 1 DIF: Cognitive Level: Applying

23. What is the treatment plan the healthcare professional discusses with a patient for a strawberry hemangioma?
- a. Cosmetic surgical removal
 - b. Topical steroid therapy
 - c. Oral antibiotics
 - d. Support of its involution

ANS: D

Approximately 90% of strawberry hemangiomas involute by 5 to 6 years of age, usually without scarring; therefore, self-resolution is the usual treatment plan.

PTS: 1 DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. What information does the student learn about scalded skin syndrome? (*Select all that apply.*)
- a. Virulent group II staphylococci cause the scalded skin syndrome.
 - b. A trauma burn triggers the syndrome.
 - c. The syndrome results in a separation involving the epidermis.
 - d. Toxins resulting from scalded skin syndrome are circulated through the blood.
 - e. The lesions of scalded skin syndrome are sites of the infective organism.

ANS: A, C, D

Virulent group II staphylococci, which produce an exfoliative toxin that attacks desmoglein and adhesion molecules and that causes a separation of the skin just below the granular layer of the epidermis, cause the scalded-skin syndrome. The toxins are usually produced at body sites other than the skin and arrive at the epidermis through the circulatory system. Staphylococci are not typically found in the skin lesions themselves.

PTS: 1 DIF: Cognitive Level: Remembering

2. Which acne lesions are classified as inflammatory? (*Select all that apply.*)
- a. Closed comedones
 - b. Opened comedones

- c. Nodules
- d. Papules
- e. Pustules

ANS: C, D, E

Acne lesions may be divided into inflammatory lesions (pustules, papules, nodules) and noninflammatory lesions (closed and open comedones).

PTS: 1 DIF: Cognitive Level: Remembering

3. The healthcare professional is educating a parenting class on Koplik spots? What information is *most* appropriate to include? (*Select all that apply.*)
- a. Koplik spots are associated with rubeola.
 - b. They appear as white spots.
 - c. The lesions are surrounded by a red ring.
 - d. The lesions of Koplik spots are large in size.
 - e. Koplik spots are primarily found on buccal mucosa.

ANS: A, B, C, E

Rubeola infection begins with characteristic pinpoint white spots surrounded by an erythematous ring that develops over the buccal mucosa and are known as *Koplik spots*.

PTS: 1 DIF: Cognitive Level: Understanding

Chapter 49: Shock, Multiple Organ Dysfunction Syndrome, and Burns in Adults

MULTIPLE CHOICE

1. What is the final outcome of impaired cellular metabolism?
 - a. Cellular alterations in the heart and brain
 - b. Buildup of cellular waste products
 - c. Cellular alterations in the vasculature structures and kidneys
 - d. Impairment of urine excretion

ANS: B

The common pathway in all types of shock is impairment of cellular metabolism as a result of decreased delivery of oxygen and nutrients, which are frequently coupled with an increased demand, the consumption of oxygen and nutrients, and a decreased removal of cellular waste products. Eventually organ dysfunction and failure do occur. Urine excretion diminishes as the kidneys fail from lack of perfusion or due to hypovolemic shock and volume loss.

PTS: 1 DIF: Cognitive Level: Remembering

2. Which clinical manifestation of septic shock confirms an elevation in immune system response?
 - a. Tachycardia
 - b. Increased white blood cell count
 - c. Low respiratory rate
 - d. Hypothermia

ANS: B

The increased WBCs indicate the immune response. Tachycardia occurs as a compensatory mechanism. The respiratory rate will be increased. Temperature will most likely be increased in most patients.

PTS: 1 DIF: Cognitive Level: Remembering

3. The release of catecholamine by the adrenal glands provides which compensatory mechanism in hypovolemic shock?
 - a. Interstitial fluid moves out of the vascular compartment.
 - b. Systemic vascular resistance is decreased.
 - c. Heart rate is increased.
 - d. Water excretion is increased.

ANS: C

The heart rate will increase in shock due to the effects of circulating catecholamines. Fluid moving out of the vascular compartment is deleterious, leading to a relative hypovolemia. Systemic vascular resistance is increased to improve blood pressure. Water excretion is not increased as a result of catecholamine release.

PTS: 1 DIF: Cognitive Level: Remembering

4. Hypovolemic shock begins to develop when intravascular volume has decreased by what percentage?
- 5
 - 10
 - 15
 - 20

ANS: C

Hypovolemic shock begins to develop when intravascular volume has decreased by approximately 15%.

PTS: 1 DIF: Cognitive Level: Remembering

5. A student asks the professor to explain the basics of vasogenic shock. What statement by the professor is *best*?
- The outcome of widespread hypersensitivity to an allergen
 - Bacteremia combined with systemic inflammatory response
 - Inability to get adequate blood to tissues and end organs
 - Vasodilation from an imbalance between the two nervous systems

ANS: D

Vasogenic shock refers to a widespread and massive vasodilation resulting from an imbalance between parasympathetic and sympathetic stimulation of vascular smooth muscle. Widespread hypersensitivity is characteristic of anaphylactic shock. Bacteremia and systemic inflammation are seen in septic shock. The inability to pump adequate blood to tissues and end organs describes cardiogenic shock.

PTS: 1 DIF: Cognitive Level: Understanding

6. What is the clinical hallmark of neurogenic shock as a result of the overstimulation of the parasympathetic nervous system?
- Vasoconstriction
 - Vasodilation
 - Increased metabolism
 - Respiratory distress

ANS: B

Neurogenic shock refers to a widespread and massive vasodilation that results from an imbalance between parasympathetic and sympathetic stimulation of vascular smooth muscle. Increased metabolism is seen in all forms of shock. Respiratory distress may occur in any form of shock.

PTS: 1 DIF: Cognitive Level: Remembering

7. Four patients are in the intensive care unit with different types of shock. Which patient would the healthcare professional assess as the *priority*?
- Septic
 - Hypovolemic

- c. Anaphylactic
- d. Neurogenic

ANS: C

Anaphylactic shock is characterized by massive vasodilation and widespread inflammation that can lead to death in minutes if treatment is not instituted immediately. If all else is equal, the healthcare professional should assess the patient with anaphylactic shock first.

PTS: 1 DIF: Cognitive Level: Applying

8. A patient is diagnosed with septic shock. What action by the healthcare professional will address the main underlying pathophysiologic mechanism of this disorder?
- a. Administer antibiotics as soon as possible.
 - b. Provide high volumes of isotonic fluid.
 - c. Place patient on an intra-aortic balloon pump.
 - d. Give the patient antihistamines and steroids.

ANS: A

Septic shock begins when bacteria enter the bloodstream, so the effective treatment for this specific problem is antibiotics. High volumes of fluid may be needed in all types of shock other than cardiogenic. A balloon pump would be beneficial in cardiogenic shock. Antihistamines and steroids would be used in anaphylactic shock.

PTS: 1 DIF: Cognitive Level: Applying

9. For which type of shock would antihistamines and corticosteroids be prescribed?
- a. Septic
 - b. Anaphylactic
 - c. Hypovolemic
 - d. Cardiogenic

ANS: B

Only anaphylactic shock responds to the administration of epinephrine to decrease mast cell and basophil degranulation. Antihistamines and steroids are administered to stop the inflammatory reaction. Septic shock specifically requires antibiotics. Hypovolemic shock is treated with large amounts of fluid. Cardiogenic shock requires the use of drugs or devices to improve the pumping ability of the heart.

PTS: 1 DIF: Cognitive Level: Remembering

10. Which condition is best defined as a clinical syndrome involving a systemic response to infection, which is manifested by two or more of the systemic inflammatory response syndrome criteria?
- a. Bacteremia
 - b. Sepsis
 - c. Septicemia
 - d. Septic shock

ANS: B

Of the options available, only sepsis is best defined as a systemic response to infection that is manifested by two or more criteria of the systemic inflammatory response syndrome.

PTS: 1 DIF: Cognitive Level: Remembering

11. The student learns that which mechanism causes organ injury in primary multiple organ dysfunction syndrome (MODS)?
- Impaired immune response
 - Impaired glucose use
 - Impaired perfusion
 - Impaired ventilation

ANS: C

In primary MODS, the organ injury is directly associated with a specific insult, most often ischemia or impaired perfusion from an episode of shock or trauma, thermal injury, soft tissue necrosis, or invasive infection. Although MODS can be associated with impaired immune response, glucose use, and ventilation, the commonality in all cases of primary MODS is impaired perfusion.

PTS: 1 DIF: Cognitive Level: Remembering

12. A student has studied secondary multiple organ dysfunction syndrome (MODS). What substance does the student learn is least likely to stimulate the normal endothelial cells to change to a proinflammatory state?
- Interleukin (IL)-1
 - IL-4
 - IL 6
 - Tumor necrosis factor

ANS: B

Normal endothelial cells have little interaction with leukocytes except when stimulated by TNF, IL-1, and IL-6. The student would recognize that IL4 is not involved in this process.

PTS: 1 DIF: Cognitive Level: Remembering

13. What stimulates the *respiratory burst* and production of highly toxic free radicals in the multiple organ dysfunction syndrome (MODS)?
- Neutrophils adhering to the endothelium
 - Activation of the complement cascade
 - Release of prostaglandins, thromboxanes, and leukotrienes
 - Activation of the fibrinolytic system

ANS: A

The accumulation of activated neutrophils in organs is thought to play a key role in the pathogenetic development of MODS. When neutrophils adhere to the endothelium, they undergo a respiratory burst (oxidative burst) and release oxygen radicals. The respiratory burst occurs as the activated neutrophil experiences a sudden increase in oxidative metabolism, producing large quantities of highly toxic oxygen free radicals. Activation of the complement cascade; release of prostaglandins, thromboxanes, and leukotrienes; and activation of the fibrinolytic system do not provide this stimulus.

PTS: 1 DIF: Cognitive Level: Remembering

14. A student is perplexed that in a patient with multiple organ dysfunction syndrome (MODS), no infectious source has been found. What statement by the healthcare professional *best* describes this phenomenon?
- Death of organs
 - Translocation of bacteria
 - Maldistribution of blood flow
 - Massive inflammatory response

ANS: B

The loss of intestinal barrier function leads to the systemic spread of bacteria and/or endotoxin from the gut (systemic endotoxemia). This phenomenon is called *translocation of bacteria*. This “gut hypothesis” provides a possible explanation for the fact that an infectious focus is not always found in individuals with MODS. The gut hypothesis is not related to death of organs, maldistribution of blood flow, or massive inflammation.

PTS: 1 DIF: Cognitive Level: Understanding

15. Blistering of the skin within minutes occurs in which type of burn injury?
- First degree
 - Superficial partial thickness
 - Deep partial thickness
 - Full thickness

ANS: B

The hallmark of superficial partial-thickness injury is the appearance of thin-walled, fluid-filled blisters that develop within only a few minutes after injury. First degree burns only involve the epidermis and can be compared to a sunburn. A deep partial thickness burn looks waxy white and may initially be indistinguishable from a full thickness burn until new skin buds and hair appear within 7 to 10 days.

PTS: 1 DIF: Cognitive Level: Remembering

16. A patient has an acute burn injury. What type of treatment for shock will the healthcare professional anticipate for this patient?
- Intravenous fluids
 - Antibiotics
 - Intra-aortic balloon pump
 - Antihistamines and steroids

ANS: A

Acute burn injuries can lead to hypovolemic shock from massive fluid losses from the circulating blood volume. The professional anticipates treating hypovolemic shock with fluid resuscitation. Antibiotics would be used in septic shock. A balloon pump would be used in cardiogenic shock. Antihistamines and steroids are used in anaphylactic shock.

PTS: 1

DIF: Cognitive Level: Applying

17. What assessment finding would indicate to the healthcare professional that the patient is no longer in burn shock?
- Blood pressure 100/58 mmHg
 - Pulse rate 98 beats/min
 - Respiratory rate 24 breaths/min
 - Urine output 35 mL/hour for 4 hours

ANS: D

The most reliable criterion for adequate resuscitation of burn shock is urine output. Normal urine output is minimally 30 mL/hour. The patient having a normal urine output for 4 hours has shown recovery from burn shock. None of the remaining options are considered as reliable as urine output.

PTS: 1

DIF: Cognitive Level: Analyzing

18. Which condition does a burn injury create for an extended period?
- Hypervolemia
 - Hypermetabolism
 - Hyponatremia
 - Hypotension

ANS: B

A burn injury induces a hypermetabolic state that persists until wound closure. Fluid and electrolyte imbalances and hypotension can be resolved with rapid treatment, but the hypermetabolic state lasts for an extended period of time.

PTS: 1

DIF: Cognitive Level: Remembering

19. A student learns that a fatal burn injury has what effect on interleukins (ILs)?
- Decreases levels of IL-2
 - Decreases levels of IL-4 lymphocytes
 - Increases levels of IL-6
 - Increases levels of IL-12

ANS: A

A fatal burn injury has often shown decreased levels of IL-2, which may result in decreased Th1 lymphocytes. This results in a major disruption in cellular immunity and IgG production.

PTS: 1

DIF: Cognitive Level: Remembering

20. Daily evaporative water loss after a burn injury is approximately how many times the normal?

- a. 5
- b. 10
- c. 15
- d. 20

ANS: D

Moncrief and Mason determined that daily evaporative water loss after burn injury was in the range of 20 times normal in the early phase, with gradual decreases as wound closure is achieved.

PTS: 1

DIF: Cognitive Level: Remembering

21. What is the significance of a high level of interleukin 1 (IL-1) in a patient who has experienced severe burns?
- a. Prognosis is poor.
 - b. Antibiotic therapy is required.
 - c. Urinary function is improved.
 - d. They are less at risk for death.

ANS: D

The level of IL-1 inversely correlates with burn survival; low levels may be associated with a higher mortality. This selection is the only option that accurately identifies the significance of a high level of IL-1.

PTS: 1

DIF: Cognitive Level: Remembering

MULTIPLE RESPONSE

1. A healthcare professional is determining the disposition of four burn patients in the Emergency department. Which patients will the professional refer to the burn center? (*Select all that apply.*)
- a. Partial thickness burn 20% TBSA
 - b. Burn of the genitals
 - c. Lightning injury
 - d. Both arms burned
 - e. Concomitant trauma

ANS: A, B, C, E

There are specific criteria for transferring a patient to a burn center. Burn injuries that should be referred to a burn center include the following: partial-thickness burns on more than 10% TBSA, burns that involve the face, hands, feet, genitalia, perineum, or major joints, and electrical burns, including lightning injury. If the patient has suffered both trauma and burns, the patient would be transferred if the burn poses the greater immediate risk. Burns to both arms would not need referred unless joints were involved.

PTS: 1

DIF: Cognitive Level: Applying

2. In septic shock, which mediators are antiinflammatory? (*Select all that apply.*)
- a. Interleukin (IL)-4 (IL-4)

- b. IL-10
- c. IL-13
- d. Tumor necrosis factor- α (TNF- α)
- e. Prostaglandin

ANS: A, B, C

In septic shock, the only antiinflammatory mediators released include lipopolysaccharide-binding protein; IL-1 receptor antagonist; soluble cluster of differentiation 14 (CD-14); type 2 IL-1 receptor; leukotriene β 4-receptor antagonist; IL-4, IL-10, and IL-13; and soluble TNF.

PTS: 1

DIF: Cognitive Level: Remembering

Chapter 50: Shock, Multiple Organ Dysfunction Syndrome, and Burns in Children

MULTIPLE CHOICE

1. What is the *most* common type of shock in children?
 - a. Hypovolemic
 - b. Cardiogenic
 - c. Neurogenic
 - d. Septic

ANS: A

Hypovolemic shock, the most common type of shock in children, is associated with a reduction in the intravascular volume relative to the vascular space. It is most frequently caused by dehydration and trauma.

PTS: 1 DIF: Cognitive Level: Remembering

2. Hypotension is likely to occur when an infant or child is greater than _____ % dehydrated.
 - a. 2
 - b. 5
 - c. 7
 - d. 10

ANS: D

Hypotension typically develops when dehydration is greater than 10% in the infant or child or greater than 6% in the adolescent.

PTS: 1 DIF: Cognitive Level: Remembering

3. A healthcare professional assesses that a child's capillary refill time is 4 sec. What does the healthcare professional evaluate that finding to mean?
 - a. The child is in shock.
 - b. The child must have septic shock.
 - c. The child has compensated shock.
 - d. This finding is normal.

ANS: A

Normal capillary refill time is <2 sec (brisk). A refill time of 4 sec is prolonged and indicates a perfusion deficit possibly from shock. In septic shock, the capillary refill time may be normal or faster than normal due to vasodilation.

PTS: 1 DIF: Cognitive Level: Applying

4. A 2-year-old is in shock. The healthcare professional assesses the child's heart rate as 52 beats/min. What action by the healthcare professional is *most* appropriate?

- a. Get an ECG.
- b. Increase the intravenous rate.
- c. Sedate the child.
- d. Begin CPR.

ANS: D

Bradycardia often indicates impending cardiovascular collapse or cardiac arrest and is the most common terminal cardiac rhythm observed in children. The normal resting heart rate in a toddler is 80 to 120 beats/min, so a heart rate of 52 beats/min is too slow. The provider would assess perfusion and if the heart rate does not rise, begin CPR. The provider would not take the time to order an ECG. There is no reason to increase the fluid rate, or sedate the child at this moment.

PTS: 1

DIF: Cognitive Level: Applying

5. A child has a burn injury. What does the healthcare provider assess for when determining the child's chance of surviving?
- a. Immunosuppression
 - b. Hypermetabolism
 - c. Inhalation injury
 - d. Hypertrophic scarring

ANS: C

The leading cause of death in children after burn injury, as in adults, is an inhalation injury. Inhalation injuries cause approximately 50% of all deaths in children with burns. Burn victims do have immune dysfunction, hypermetabolism, and scarring, but those do not contribute to the majority of pediatric burn deaths.

PTS: 1

DIF: Cognitive Level: Applying

6. A child is in cardiogenic shock and the parents ask why the child has hepatomegaly and periorbital edema. What explanation by the healthcare professional is *best*?
- a. Mass vasodilation as a result of chemical mediators released from the myocardium
 - b. Low cardiac output and systemic venous congestion
 - c. Tissue damage to the myocardium, causing increased capillary permeability
 - d. Reduced renal perfusion, stimulating the RAAS system

ANS: B

Cardiogenic shock is generally associated with low cardiac output and systemic venous congestion, leading to signs of fluid backup into organs and tissues. The professional would explain that this is the cause of the hepatomegaly and edema. It is not the result of mass vasodilation, tissue damage, or the RAAS system activation.

PTS: 1

DIF: Cognitive Level: Understanding

7. Approximately 80% of all hospital-acquired infections in children are a result of which type of organism?
- a. Bacteria
 - b. Viruses
 - c. Fungi

d. *Rickettsia*

ANS: A

In adults and children, approximately 40% of all hospital-acquired infections are linked to gram-negative infections, 40% to gram-positive infections, and 21% each to viruses and fungi.

PTS: 1

DIF: Cognitive Level: Remembering

8. A student asks the healthcare professional to explain reperfusion injuries. What explanation by the professional is *best*?
- a. Tissue damage that can occur with blood transfusions
 - b. Tissue destruction during rewarming in frostbite
 - c. Damage from restored blood flow and exposure to oxygen
 - d. Fluid overload from intravenous therapy that is too rapid

ANS: C

Reperfusion (reoxygenation) injury is associated with cell damage caused by the restoration of blood flow and physiologic concentrations of oxygen to cells that have been exposed to injurious but nonlethal hypoxic conditions. It is not related to blood transfusions, rewarming specifically, or fluid overload.

PTS: 1

DIF: Cognitive Level: Understanding

9. The healthcare professional plans care for a child in shock. What are the *primary* goals for the treatment of shock?
- a. Maximizing oxygen delivery and minimizing oxygen demand
 - b. Maintaining hydration and adequate urinary output
 - c. Supporting all facets of the cardiovascular system
 - d. Maintaining all vital signs within normal functioning ranges

ANS: A

The primary goals of the treatment of shock are maximizing oxygen delivery and minimizing oxygen demand. The other goals are desirable, but do not take priority over maximizing oxygen delivery and minimizing demand. If those goals are met, the others will be as a result.

PTS: 1

DIF: Cognitive Level: Remembering

10. To determine a child's response to fluid therapy for shock, the healthcare professional should monitor which measurements as the *priority*?
- a. Hematocrit and hemoglobin levels
 - b. Urine output and specific gravity
 - c. Blood pressure and pulse
 - d. Arterial blood gases and heart rate

ANS: B

Monitoring of the volume of urine output and specific gravity is most useful in determining the child's response to fluid therapy.

PTS: 1

DIF: Cognitive Level: Remembering

11. A 33-pound child is in shock. Which fluid bolus should the healthcare professional prepare to administer to this child?
- Hypotonic fluid, 150 mL
 - Hypotonic fluid, 300 mL
 - Isotonic fluid, 150 mL
 - Isotonic fluid, 300 mL

ANS: D

In general, isotonic crystalloids (salt-containing solutions, such as normal saline or lactated Ringer solution) or colloids (protein-containing fluids, such as albumin or blood) are administered in boluses of 20 mL/kg. This child weighs 33 pounds, or 15 kg. $15 \times 20 = 300$. Hypotonic fluids are not used.

PTS: 1

DIF: Cognitive Level: Applying

12. What causes renal failure after electrical burns in children?
- Cytokines are released after the damaged tissue.
 - Immature kidneys are unable to compensate for the electrical burn.
 - Cardiac output is reduced.
 - Myoglobin is released from damaged muscles.

ANS: D

The release of myoglobin may occlude the kidney tubules and result in renal failure. Renal failure after electrical burns is not related to cytokine release or immature kidneys. While severely decreased cardiac output as in cardiogenic shock can affect the kidneys due to poor perfusion, this is not related directly to electrical burns.

PTS: 1

DIF: Cognitive Level: Remembering

13. A 4-year-old child with a burn injury has entered the catabolic flow phase. What assessment would the healthcare provider correlate with this situation?
- Oxygen saturation normal on room air
 - 7 pound weight loss in 1 week
 - Capillary refill <2 sec
 - Blood pressure 89/56 mmHg

ANS: B

After the resolution of the shock and the restoration of circulating volume, the metabolic response shifts to a catabolic (flow) phase. A state of hypermetabolism ensues characterized by elevation of catecholamines which are insulin antagonists. Glycogen stores in the child are limited leading to a state of prolonged metabolic dysfunction, the end result of which is loss of lean body mass. The professional would assess the child as being in this phase with a documented weight loss. Oxygen saturation would not give information about oxygen consumption which is elevated in the phase. A capillary refill of <2 sec is normal as is the blood pressure for a 4-year-old.

PTS: 1

DIF: Cognitive Level: Analyzing

14. The healthcare professional explains to a student that the most serious outcome resulting from limited glycogen stores in children who have been seriously burned is which of these?
- Poor wound healing
 - Increased morbidity
 - Decreased immunity
 - Loss of adipose tissue stores

ANS: B

Glycogen stores are limited in children, making it hard for them to meet the increased energy demands of the burn. This prolonged metabolic dysfunction may lead to the loss of lean body mass. The most serious effect of weight loss is increased morbidity. Limited glycogen stores do not directly affect wound healing, immunity, or adipose tissue stores.

PTS: 1

DIF: Cognitive Level: Understanding

15. A healthcare professional gets an update on four children. Which one should the professional assess as the *priority*?
- 6-month old, respiratory rate of 42 breaths/min
 - 2-year-old, respiratory rate of 39 breaths/min
 - Preschooler, respiratory rate of 26 breaths/min
 - School-aged child, respiratory rate of 38 breaths/min

ANS: D

The normal respiratory rate for a school-aged child is 18 to 25 breaths/min, so a respiratory rate of 38 is excessive. The professional should assess this child first. The 6-month-old and the preschooler have normal respiratory rates. The 2-year-old's respiratory rate is slightly above the normal of 27-37 breaths/min, but this is not as large a deviation from normal as seen in the school-aged child.

PTS: 1

DIF: Cognitive Level: Analyzing

MULTIPLE RESPONSE

1. Which information does the student learn regarding multiple organ dysfunction syndrome (MODS)? (*Select all that apply.*)
- Diagnosis requires simultaneous failure of at least two organs.
 - Primary MODS occurs immediately after the attributing cause.
 - Secondary MODS occurs within 3 to 7 days of the initial insult.
 - Chronic illness increases a child's risk for MODS.
 - Risk factors for MODS include severe or prolonged shock, sepsis, and trauma.

ANS: A, D, E

MODS is the simultaneous failure of at least two organs resulting from a single cause and may be either primary or secondary. Primary MODS is directly attributable to the insult and typically occurs 3 to 7 days after an insult. Secondary MODS typically occurs later and may be associated with the more sequential development of organ dysfunction. Risk factors for MODS include severe or prolonged shock, sepsis, trauma, cardiopulmonary arrest, congenital heart disease, and liver and bone marrow transplantation. Children with chronic diseases have an increased risk for MODS and increased mortality.

PTS: 1 DIF: Cognitive Level: Remembering

2. A child has septic shock with significant hypovolemia. What interventions should the healthcare professional prepare to complete? (*Select all that apply.*)
- a. Aggressive fluid administration
 - b. Antibiotic therapy
 - c. Titration of inotropes
 - d. Vasopressors
 - e. Permissive hyperglycemia

ANS: A, B, C, D

The child with septic shock has significant hypovolemia that typically responds to aggressive fluid administration, antibiotic therapy, titration of inotropes, vasopressors, and vasodilators. Tight glycemic control has shown to be associated with better outcomes in shock.

PTS: 1 DIF: Cognitive Level: Applying

3. Which behaviors in newborns would support the possibility of shock? (*Select all that apply.*)
- a. Decreased heart rate variability
 - b. Temperature instability
 - c. Hyperalertness
 - d. Increased muscle tone
 - e. Hypoglycemia

ANS: A, B, E

Nonspecific signs of distress in newborns include jitteriness or lethargy with decreased muscle tone, bradycardia or decreased heart rate variability, temperature instability, and hypoglycemia.

PTS: 1 DIF: Cognitive Level: Remembering

4. Which assessment findings would be recognized as late signs of shock in a child? (*Select all that apply.*)
- a. Metabolic (lactic) acidosis
 - b. Cool skin
 - c. Bradycardia
 - d. Prolonged capillary refill
 - e. Hypotension

ANS: C, E

Although all of the options are observable, hypotension and bradycardia are recognized as late signs of shock in children.

PTS: 1

DIF: Cognitive Level: Remembering

5. Which *information does the professor teach the class* regarding how a child's body compensates for cardiogenic shock? (*Select all that apply.*)
- a. Splanchnic arteries are constricted to divert blood from the skin, kidneys, and gut to the heart and brain.
 - b. Peripheral blood vessels are constricted to raise blood pressure.
 - c. Adrenergic responses produce tachycardia to increase cardiac output.
 - d. The renin-angiotensin-aldosterone system is stimulated when renal function decreases.
 - e. Compensation prevents the child from developing hepatic or mesenteric failure.

ANS: A, B, C, D

In the early stages of cardiogenic shock, adrenergic compensatory mechanisms produce tachycardia, peripheral vasoconstriction, and constriction of the splanchnic arteries to divert blood flow from the skin, gut, and kidneys to maintain flow to the heart and brain. These compensatory mechanisms may be sufficient to maintain the child's systolic blood pressure and effective coronary artery and cerebral blood flow. However, tachycardia and systemic arterial constriction increase myocardial oxygen consumption. In addition, reduction in gut and kidney blood flow may produce hepatic, mesenteric, or renal ischemia or failure. Decreased renal perfusion stimulates the renin-angiotensin-aldosterone system, as described for hypovolemic shock.

PTS: 1

DIF: Cognitive Level: Remembering

6. A healthcare professional is assessing the severity of a burn injury. What factors does the professional include in this assessment? (*Select all that apply.*)
- a. Amount of fluid lost over a 24-hour period
 - b. Circumference of the burn injury
 - c. Depth of the burn injury
 - d. Severity of the injury caused to other body systems
 - e. Percentage of total body surface area involved

ANS: C, E

The severity of a burn injury is assessed on the basis of the percentage of the total body surface area involved. Because burn trauma represents a three-dimensional wound, the severity of injury is also assessed in relation to the depth of the injury. Although the other options are considered when planning treatment, the severity of the burn injury, itself, is not based on any of these.

PTS: 1

DIF: Cognitive Level: Remembering

7. Which cytokines are antiinflammatory mediators? (*Select all that apply.*)
- a. IL-4
 - b. IL-11
 - c. Colony-stimulating factor
 - d. Nitric oxide
 - e. Arachidonic acid metabolites

ANS: A, B, C

Antiinflammatory mediators include only IL-4, IL-10, IL-11, and IL-13; transforming growth factor-beta; colony-stimulating factors; soluble TNF receptor; IL-1 receptor antagonist; and activated protein C.

PTS: 1 DIF: Cognitive Level: Remembering

8. A healthcare professional explains that children under 2 years of age have a higher risk for dehydration because of which factors? (*Select all that apply.*)
- a. Inability to concentrate urine
 - b. Larger TBSA compared to weight than adults
 - c. Immature kidneys
 - d. Limited glycogen stores
 - e. Underdeveloped antiinflammatory mediators

ANS: A, B, C

Children younger than 2 years lack the ability to concentrate urine because of the immaturity of the renal system (including the kidneys) and are therefore at increased risk for dehydration. They also have a larger TBSA in relationship to weight than do adults. Young children do have limited glycogen stores, but this is not related to becoming dehydrated. A child's antiinflammatory mediators also do not have a direct impact of hydration status.

PTS: 1 DIF: Cognitive Level: Remembering