Chapter 3: The Cellular Environment: Fluids and Electrolytes, Acids and Bases

MULTIPLE CHOICE

1. Infants are most susceptible to significant losses in total body water because of an infant's:
   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. The inability to communicate their thirst is a problem only when they are poorly cared for.

   PTS: 1 REF: Page 104

2. Obesity creates a greater risk for dehydration in people because:
   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 the rate of output of 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 REF: Page 104

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.

   PTS: 1 REF: Pages 129-130

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

ANS: A
The movement of water between the ICF and ECF compartments is primarily a function of osmotic forces. (Osmosis and other mechanisms of passive transport are discussed in Chapter 1.)

PTS: 1 REF: Page 105

5. In addition to osmosis, what force is involved in the movement of water between the plasma and interstitial fluid spaces?
   a. Oncotic pressure
   b. Buffering
   c. Net filtration
   d. 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 REF: Page 105

6. Venous obstruction is a cause of edema because of an increase in which pressure?
   a. Capillary hydrostatic
   b. Interstitial hydrostatic
   c. Capillary oncotic
   d. 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 REF: Page 106

7. At the arterial end of capillaries, fluid moves from the intravascular space into the interstitial space because the:
   a. Interstitial hydrostatic pressure is higher than the capillary hydrostatic pressure.
   b. 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 REF: Page 105

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
Losses or diminished production of plasma albumin is the only option that contributes to a decrease in plasma oncotic pressure.

PTS: 1 REF: Pages 106-107

9. Secretion of antidiuretic hormone (ADH) and the perception of thirst are stimulated by a(n):
   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. The other options do not accurately describe how ADH and the perception of thirst are related.

   PTS: 1 REF: Page 109

10. Thirst activates osmoreceptors by an increase in which blood plasma?
   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). The other options do not accurately identify what increases to activate osmoreceptors.

   PTS: 1 REF: Page 109

11. It is *true* that natriuretic peptides:
   a. Decrease blood pressure and increase sodium and water excretion.
   b. Increase blood pressure and decrease sodium and water excretion.
   c. Increase heart rate and decrease potassium excretion.
   d. 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.

   PTS: 1 REF: Page 109

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

   ANS: A
   Only isotonic alterations occur when proportional changes in electrolytes and water accompany changes in total body water .

PTS: 1 REF: Pages 109-110

13. Which enzyme is secreted by the juxtaglomerular cells of the kidney when circulating blood volume is reduced?
    a. Angiotensin I
    b. Angiotensin II
    c. Aldosterone
    d. 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. The other options are not released by the situation described in the question.

PTS: 1 REF: Pages 108-109

14. What mechanism can cause hypernatremia?
    a. Syndrome of inappropriate antidiuretic hormone
    b. Hypersecretion of aldosterone
    c. Brief bouts of vomiting or diarrhea
    d. 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.

PTS: 1 REF: Page 111

15. What causes the clinical manifestations of confusion, convulsions, cerebral hemorrhage, and coma in hypernatremia?
    a. High sodium in the blood vessels pulls water out of the brain cells into the blood vessels, causing brain cells to shrink.
    b. High sodium in the brain cells pulls water out of the blood vessels into the brain cells, causing them to swell.
    c. High sodium in the blood vessels pulls potassium out of the brain cells, which slows the synapses in the brain.
    d. High sodium in the blood vessels draws chloride into the brain cells followed by water, causing the brain cells to swell.

ANS: A
Hypertonic (hyperosmolar) imbalances result in an extracellular fluid concentration greater than 0.9% salt solution (e.g., water loss or solute gain); cells shrink in a hypertonic fluid (see Table 3-7). This shrinking of cells results in the symptoms described in the question. The other options do not accurately describe the cause of these symptoms as they relate to hypernatremia.

PTS: 1 REF: Page 111

16. Vomiting-induced metabolic alkalosis, resulting in the loss of chloride, causes:
    a. Retained sodium to bind with the chloride
    b. Hydrogen to move into the cell and exchange with potassium to maintain cation balance
    c. Retention of bicarbonate to maintain the anion balance
    d. 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 paradoxic 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. The other options do not accurately describe the mechanism that results from vomiting-induced metabolic alkalosis.

    PTS: 1 REF: Page 128

17. The pathophysiologic process of edema is related to which mechanism?
    a. Sodium depletion
    b. Decreased capillary hydrostatic pressure
    c. Increased plasma oncotic pressure
    d. 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 REF: Page 105

18. Insulin is used to treat hyperkalemia because it:
    a. Stimulates sodium to be removed from the cell in exchange for potassium.
    b. Binds to potassium to remove it through the kidneys.
    c. Transports potassium from the blood to the cell along with glucose.
    d. Breaks down the chemical components of potassium, causing it to be no longer effective.

    ANS: C
    Insulin contributes to the regulation of plasma potassium levels by stimulating the Na^+, potassium–adenosine triphosphatase (K^+–ATPase) pump, thereby promoting the movement of potassium simultaneously into the liver and muscle cells with glucose transport after eating. The intracellular movement of potassium prevents an acute hyperkalemia related to food intake. The other options do not accurately describe how insulin is used to treat hyperkalemia.

    PTS: 1 REF: Page 114

19. A major determinant of the resting membrane potential necessary for the transmission of nerve impulses is the ratio between:

a. Intracellular and extracellular Na^+
b. Intracellular and extracellular K^+
c. Intracellular Na^+ and extracellular K^+
d. 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 REF: Page 114

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?
a. Oxygen
b. Sodium
c. Potassium
d. 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 REF: Page 117 | Pages 126-127

21. Causes of hyperkalemia include:
a. Hyperparathyroidism and malnutrition
b. Vomiting and diarrhea
c. Renal failure and Addison disease
d. Hyperaldosteronism and Cushing disease

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. The other options are not known to be causes of hyperkalemia.

PTS: 1 REF: Page 119

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

ANS: A

If extracellular potassium concentration increases without a significant change in intracellular potassium, then the 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 [increase excitability]).

PTS: 1 REF: Pages 117-118

23. The calcium and phosphate balance is influenced by which three substances?
a. Parathyroid hormone, vasopressin, and vitamin D
b. Parathyroid hormone, calcitonin, and vitamin D
c. Thyroid hormone, vasopressin, and vitamin A

d. Thyroid hormone, calcitonin, and vitamin A

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

PTS: 1 REF: Page 119

24. It is *true* that Kussmaul respirations indicate:
a. Anxiety is a cause of respiratory acidosis.
b. A compensatory measure is needed to correct metabolic acidosis.
c. Diabetic ketoacidosis is the cause of the metabolic acidosis.
d. More oxygen is necessary to compensate for respiratory acidosis.

ANS: B
Deep, rapid respirations (Kussmaul respirations) are indicative of respiratory compensation for metabolic acidosis. The other options are not true.

PTS: 1 REF: Page 128

25. Chvostek and Trousseau signs indicate which electrolyte imbalance?
a. Hypokalemia
b. Hyperkalemia
c. Hypocalcemia
d. Hypercalcemia

ANS: C
Two clinical signs of hypocalcemia are the Chvostek sign and Trousseau sign. These clinical signs are not indicative of any of the other options.

PTS: 1 REF: Page 120

26. An excessive use of magnesium-containing antacids and aluminum-containing antacids can result in:
a. Hypomagnesemia
b. Hypophosphatemia
c. Hyponatremia
d. Hypokalemia

ANS: B
The most common causes of hypophosphatemia are intestinal malabsorption and increased renal excretion of phosphate. Inadequate absorption is associated with vitamin D deficiency, the use of magnesium and aluminum-containing antacids (which bind with phosphorus), long-term alcohol abuse, and malabsorption syndromes. The excessive use of such antacids will not result in the other options.

PTS: 1 REF: Page 121

27. The most common cause of hypermagnesemia is:
a. Hepatitis
b. Renal failure
c. 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 REF: Page 122

28. Physiologic pH is maintained at approximately 7.4 because bicarbonate (HCO_3) and carbonic acid (H_2CO_3) exist in a ratio of:

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 REF: Page 124

29. Which arterial pH will initiate the formation of ammonium (NH_4) from ammonia (NH_3), referred to as *academia*, in the tubular lumen of the kidney?

a. 7.25
b. 7.35
c. 7.55
d. 7.65

ANS: A

Pathophysiologic changes in the concentration of hydrogen ion or base in the blood lead to acid-base imbalances. Acidemia is a state in which the pH of arterial blood is less than 7.35. NH_3 is produced from glutamine in the epithelial cell and diffuses to the tubular lumen, where it combines with H^+ to form NH_4.

PTS: 1 REF: Page 126

30. Two thirds of the body's water is found in its:

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 REF: Pages 103-104

31. It is *true* that when insulin is administered:

a. The Na^+, K^+–ATPase pump is turned off.
b. Potassium is moved out of muscle cells.
c. The liver increases its potassium levels.
d. Glucose transport is impaired.

ANS: C

Insulin contributes to the regulation of plasma potassium levels by stimulating the Na^+, K^+–ATPase pump, thereby promoting the movement of potassium simultaneously into the liver and muscle cells with glucose transport after eating. The other options do not accurately describe the effect of insulin administration.

PTS: 1 REF: Page 114

32. Increased capillary hydrostatic pressure results in edema because of:
    a. Losses or diminished production of plasma albumin
    b. Inflammation resulting from an immune response
    c. Blockage within the lymphatic channel system
    d. 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 REF: Page 106

33. The existence of hyperkalemia is likely to result in which changes to a person's electrocardiogram (ECG)?
    a. Flattened U waves
    b. Peaked T waves
    c. Depressed ST segments
    d. Peaked P waves

ANS: B
Observed ECG changes include peaked T waves, prolonged PR interval, and absent P wave with a widened QRS complex. The other options are not related to hyperkalemia.

PTS: 1 REF: Page 118

MULTIPLE RESPONSE

34. Which groups are at risk for fluid imbalance? *(Select all that apply.)*
    a. Women
    b. Infants
    c. Men
    d. Obese persons
    e. 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 REF: Pages 104-105

35. Dehydration can cause which result? *(Select all that apply.)*
    a. Moist mucous membranes
    b. Weak pulses
    c. Tachycardia
    d. Polyuria
    e. Weight loss

ANS: B, C, E

Significant water deficit is demonstrated by symptoms of dehydration that include headache, thirst, dry skin and mucous membranes, elevated temperature, weight loss, and decreased or concentrated urine (with the exception of diabetes insipidus). Skin turgor may be normal or decreased. Symptoms of hypovolemia include tachycardia, weak pulses, and postural hypotension.

PTS: 1 REF: Page 112

36. Causes of hypocalcemia include: *(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 REF: Page 120

37. The electrolyte imbalance called *hyponatremia* exhibits which clinical manifestations? *(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 REF: Page 113

38. The electrolyte imbalance hypercalcemia exhibits which clinical manifestations? *(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 REF: Pages 120-121

39. The electrolyte imbalance hypokalemia exhibits which clinical manifestations? *(Select all that apply.)*
   a. Paralytic ileus
   b. Sinus bradycardia
   c. Atrioventricular block
   d. Dry mucous membranes
   e. Tetany

   ANS: A, B, C
   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 REF: Pages 116-117

40. A third of the body's fluid is contained in the extracellular interstitial fluid spaces that include: (*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 intracelluarl 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 REF: Pages 103-104

41. An imbalance of potassium can produce which dysfunctions? *(Select all that apply.)*
   a. Weakness 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.

   PTS: 1 REF: Pages 116-118

42. 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 REF: Pages 104-105

MATCHING

Match the electrolytes with the corresponding descriptions. Terms may be used more than once.

_______ A. Sodium
_______ B. Chloride
_______ C. Potassium
_______ D. Magnesium
_______ E. Phosphate

43. Regulates osmolality in the extracellular fluid (ECF) space.
44. Is inversely related to HCO_3 concentration.
45. Is a major determinant of resting membrane potential.
46. An intracellular metabolic form is adenosine triphosphate (ATP).
47. Changes in hydrogen ion concentration affect this electrolyte.

43. ANS: A PTS: 1 REF: Page 105
MSC: Sodium is the most abundant ECF ion and is responsible for the osmotic balance of the ECF space. Potassium maintains the osmotic balance of the ICF space.
44. ANS: B PTS: 1 REF: Page 109
MSC: Chloride levels are inversely related to HCO3 concentration.
45. ANS: C PTS: 1 REF: Page 114
MSC: 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 skeletal and smooth muscle contraction. (Membrane transport and membrane potentials are discussed in Chapter 1.)
46. ANS: E PTS: 1 REF: Page 119
MSC: Phosphate acts as an intracellular and extracellular anion buffer in the regulation of acid-base balance; it provides energy for muscle contraction in the form of ATP.
47. ANS: C PTS: 1 REF: Page 117
MSC: In states of acidosis, hydrogen ions shift into the cells in exchange for ICF potassium; hyperkalemia and acidosis therefore often occur together.