Chapter 14 Test Bank

Student: _____

1. Which is NOT a function of the kidneys in maintaining homeostasis?
A. regulation of extracellular fluid osmolarity
B. regulation of blood hydrogen ion concentration
C. regulation of blood glucose concentration
D. regulation of extracellular fluid volume
E. regulation of blood K^+ concentration

2.

Which of the following does NOT correctly describe kidney function?

A. They contribute significantly to long-term regulation of arterial blood pressure by maintaining the proper plasma volume.
B. They produce urine of a constant composition at all times, in order to maintain homeostasis of extracellular fluid.
C. They excrete metabolic waste products.
D. They assist in maintaining proper acid-base balance in the body.
E. They secrete hormones.

3. Which correctly describes a basic renal process?
A. Fluid is filtered from Bowman's capsule into the glomerulus.
B. Substances are secreted from the tubule into the peritubular capillaries.
C. Substances are reabsorbed from the capillaries into the tubular lumen.
D. Substances are actively secreted from glomerular capillaries into Bowman's capsule.
E. Fluid moves by bulk flow from glomerular capillaries into Bowman's space.

4. The amount of a substance that is excreted in the urine is equal to the amount that is _____ plus the amount that is _____ minus the amount that is _____.
A. filtered; reabsorbed; secreted
B. reabsorbed; filtered; secreted
C. secreted; reabsorbed; filtered
D. filtered; secreted; reabsorbed
E. reabsorbed; secreted; filtered

5. Which of the following is least likely to be filtered into Bowman's capsule in a normal, healthy person?
A. glucose
B. plasma protein
C. sodium

D. urea
E. bicarbonate ion

6.

All of the following substances are present in proximal tubular fluid in the kidney, but which one is NOT normally present in urine?

A. Ca^{2+}
B. H^{+}
C. K^{+}
D. $HPO4^{-}$
E. glucose

7.

Which one of the following substances is LEAST dependent on the kidney for regulation of its plasma concentration?

A. water
B. Na^{+}
C. K^{+}
D. HPO_4^{-}
E. glucose

8. Which is TRUE about the juxtaglomerular apparatus?
A. It is composed of parts of the ascending limb of the loop of Henle and the efferent arteriole.
B. It is composed of glomerular capillaries and the macula densa.
C. It is the site of renin secretion.
D. It is created by the the junction between the proximal tubule and the afferent arteriole.
E. It is composed of cells that secrete atrial natriuretic peptide and cells that secrete norepinephrine.

9. Which correctly describes the composition of the glomerular filtrate?
A. It is identical to urine, but has a much smaller flow rate.
B. It is identical to urine, but has a much larger flow rate.
C. It is identical to blood plasma, except it lacks red blood cells.
D. It is highly similar to plasma, except it contains plasma proteins.
E. It is highly similar to plasma, except it does not contain plasma proteins.

10. Which of the following statements concerning the process of glomerular filtration is correct?
A. The hydrostatic pressure in Bowman's space opposes filtration.
B. The glomerular filtration rate is limited by a transport maximum.
C. All of the plasma that enters the glomerular capillaries is filtered.

D. The osmotic force due to plasma proteins favors filtration.
E. The hydrostatic pressure in glomerular capillaries opposes filtration.

11. Which equation is equal to the net glomerular filtration pressure?
A. = hydrostatic pressure in glomerular capillaries - hydrostatic pressure in Bowman's capsule - osmotic pressure due to protein in Bowman's capsule
B. = osmotic pressure due to protein in plasma - hydrostatic pressure in glomerular capillaries - hydrostatic pressure in Bowman's capsule
C. = hydrostatic pressure in glomerular capillaries + hydrostatic pressure in Bowman's capsule + osmotic pressure due to protein in plasma
D. = hydrostatic pressure in glomerular capillaries + hydrostatic pressure in Bowman's capsule - osmotic pressure due to protein in plasma
E. = hydrostatic pressure in glomerular capillaries - hydrostatic pressure in Bowman's capsule - osmotic force due to proteins in plasma

12. Constriction of the _____ decreases hydrostatic pressure in _____.
A. afferent arterioles, glomerular capillaries
B. efferent arterioles, proximal convoluted tubules
C. renal vein, peritubular capillaries
D. efferent arterioles, glomerular capillaries
E. efferent arterioles, Bowman's capsule

13. Which is TRUE regarding renal tubular reabsorption?
A. Reabsorption of Na+ from the proximal tubule occurs as a result of water reabsorption.
B. Reabsorption of glucose saturates at a maximum transport rate.
C. Urea reabsorption cannot occur at any point along the nephron.
D. Toxic substances are removed from the body by reabsorption from peritubular capillaries into the proxmial tubule.
E. Reabsorption of Na^+ only occurs from nephron regions that come after the descending limb of the loop of Henle.

14. Which of the following describes tubular reabsorption in the kidney?
A. the movement of substances from the peritubular capillaries into the tubular fluid
B. the movement of substances from the proximal tubule into the loop of Henle
C. transepithelial transport from the lumen of the tubule into renal interstitial fluid
D. movement of Na^+, Cl^- and water from glomerular capillaries into Bowman's capsule
E. transport of solutes from the renal medullary interstitium into the collecting duct

15. Which is NOT a transport mechanism typically seen in renal tubular epithelial cells?
A. cotransport proteins in the luminal membrane of the proximal tubule that move Na+ and glucose from the proximal tubule into epithelial cells
B. transport proteins that move glucose by facilitated diffusion from inside of proximal tubule cells into the renal interstitial fluid
C. ion channels that allow Na+ to move by diffusion from the lumen of the proximal tubule into epithelial

cells

D. Na^+-K^+ ATPase pumps in the luminal membrane of proximal tubule epithelial cells that move Na^+ from inside the cell into the tubule and K^+ from the tubule lumen into the cell

E. countertransport proteins that move Na^+ into proximal tubule epithelial cells while moving H^+ from the cells into the lumen

16. Which of the following substances undergo renal tubular secretion?

A. Ca^{2+}

B. Na^+

C. K^+

D. H_20

17. Which is true for a man who is in balance for total body water?

A. he must ingest more water than is lost in the urine
B. he must ingest more water than is lost by all output pathways combined
C. he must ingest less water than is lost in the urine
D. the water filtered into Bowman's capsule must be 100% reabsorbed
E. the amount ingested plus that metabolically produced must equal the amount of water in the urine

18. Which of the following is TRUE about how water is handled by the nephron?

A. Water is filtered out of glomerular capillaries by bulk flow.
B. Water is actively reabsorbed from the proximal tubule, and Na+ follows down its diffusion gradient.
C. Water is actively secreted into the descending loop of Henle.
D. The permeability of the ascending limb of the loop of Henle is modified by vasopressin.
E. Vasopressin inserts pumps in the collecting duct membrane that move water against its concentration gradient.

19. Where do Na^+/K^+ ATPase pumps play an active role in reabsorbing Na^+?

A. in Bowman's capsule epithelial cells, facing the interior of Bowman's space
B. in the basolateral membrane of cells of the cortical collecting duct
C. in the apical membrane of epithelial cells of the proximal tubule
D. in the luminal membrane of epithelial cells of the distal convoluted tubule
E. in the basolateral membrane of endothelial cells of peritubular capillaries

20. Compared to the normal plasma osmolarity, the tubular fluid is _____ as it enters Bowman's space, _____ at the beginning of the loop of Henle, _____ at the tip of the loop and _____ at the beginning of the distal convoluted tubule.

A. isosmotic; hyperosmotic; hyperosmotic; isosmotic
B. isosmotic; isosmotic; hypoosmotic; hypoosmotic
C. isosmotic; isosmotic; hyperosmotic; hypoosmotic
D. isosmotic; isosmotic; hypoosmotic; hyperosmotic

E. isosmotic; isosmotic; hyperosmotic; isosmotic

21. In what segment of the nephron is the greatest fraction of filtered water reabsorbed?
A. the proximal tubule
B. the ascending limb of the loop of Henle
C. the distal convoluted tubule
D. the collecting ducts
E. the descending limb of the loop of Henle

22. In which region of the nephron does the fractional reabsorption of water vary the most in response to variation in the
state of hydration?
A. the glomerulus
B. the proximal convoluted tubule
C. the loop of Henle
D. the distal convoluted tubule
E. the collecting duct

23. Which is NOT true about the countercurrent multiplier system of the kidney?
A. It creates a hyperosmolar medullary interstitium that allows the kidneys to form hypertonic urine.
B. The descending loop of Henle is permeable to water.
C. There is active transport of sodium and chloride out of the ascending limb of the loop of Henle.
D. The ascending loop of Henle is not permeable to water.
E. The fraction of filtered NaCl reabsorbed from the ascending limb equals the fraction of filtered water reabsorbed from the descending limb.

24. How does the renal countercurrent multiplier mechanism allow the creation of a concentrated urine?
A. It transports NaCl from the medullary interstitium into the collecting duct, which directly increases the osmolarity of the urine.
B. It transports urea from the medullary interstitium into the collecting duct, which directly increases the osmolarity of the urine.
C. By concentrating NaCl in the renal medullary interstitium, it allows water to be reabsorbed from the collecting ducts when vasopressin is present.
D. By pumping NaCl and urea into the ascending limb of the loop of Henle, it raises the solute load, which turns into a concentrated urine once water is extracted from the collecting duct.
E. When anti-diuretic hormone is present, it stimulates the pumping of NaCl from the medullary interstitium and water follows, concentrating the urine.

25. Water and NaCl reabsorbed from the loop of Henle directly re-enter what blood vessels?
A. vasa recta
B. afferent arterioles
C. efferent arterioles
D. cortical peritubular capillaries
E. collecting ducts

26. In the condition diabetes mellitus, why does glucose appear in the urine?
A. The plasma concentration of glucose becomes so high that it diffuses from peritubular capillaries into the proximal tubule, down its concentration gradient.
B. The filtered load of glucose becomes greater than the tubular maximum for its reabsorption.
C. Without the hormone insulin, glucose cannot enter proximal tubule epithelial cells.
D. The rate of tubular secretion of glucose becomes greater than the sum of glucose filtration and reabsorption.
E. Without insulin, the glomerular filtration barrier becomes extremely leaky to glucose, which is not normally fiterable.

27. Which is TRUE about the hormone vasopressin (also known as antidiuretic hormone, ADH)?
A. It is a peptide hormone released from the adrenal gland.
B. It triggers insertion of aquaporins into the apical membranes of collecting duct cells.
C. It promotes the excretion of more water in the urine.
D. It stimulates the excretion of K^+ in the urine.
E. It's main function is to trigger the secretion of aldosterone.

28. Which would occur if a person lost the ability to synthesize vasopressin?
A. The ability to reabsorb water in the proximal tubule would be lost.
B. The excretion of glucose in the urine would increase.
C. The urine would become hypoosmotic compared to plasma.
D. The urine production would decrease dramatically, and the urine osmolarity would be hypertonic compared to plasma.
E. Blood pressure would increase significantly.

29. Which of these is deficient in the disease, diabetes insipidus?
A. ACTH
B.

vasopressin

C.

atrial natriuretic factor

D.

angiotensin II

E.

insulin

30. Which of the following most accurately describes the renal transport of Na^+?

A. Na^+ is actively transported in all segments of the tubule.

B. Primary active transport of Na^+ allows for secondary active transport of glucose and H^+ in the proximal tubule.

C. Most of the Na^+ transport occurs in the distal convoluted tubule and collecting ducts.

D. Na^+ is actively secreted into the nephron lumen by cells in the cortical collecting ducts.
E.

Na^+ is actively transported across the luminal membrane of proximal tubule cells in exchange for K^+, by Na^+/K^+ ATPase pumps.

31. What region of the nephron reabsorbs about two-thirds of filtered Na^+ and Cl^-?
A. ascending loop of Henle
B. glomerulus
C. proximal convoluted tubule
D. distal convoluted tubule
E. collecting duct

32.

Which would occur as a result of a decrease in the total body content of Na^+?

A. an increase in plasma volume, which induces an increase in GFR and Na^+ reabsorption rate

B. a decrease in plasma volume, which induces an increase in GFR and Na^+ reabsorption rate

C. an increase in plasma volume, which induces an increase in GFR and a decrease in Na^+ reabsorption rate
D.

a decrease in plasma volume, which induces a decrease in GFR and Na^+ reabsorption rate

E.

a decrease in plasma volume, which induces a decrease in GFR and an increase in Na^+ reabsorption rate

33. What is the rate-limiting (regulated) step for stimulating the secretion of aldosterone?
A. conversion of angiotensin I to angiotensin II in the blood
B. secretion of angiotensinogen by the liver
C. conversion of angiotensinogen to angiotensin I in the blood
D. secretion of ACTH by the anterior pituitary
E. secretion of angiotensin II by the kidney

34. Which of the following statements regarding renal handling of Na^+ is correct?

A. In the proximal tubule, Na^+ is actively transported across the luminal membrane of the tubular epithelial cells.

B. Atrial natriuretic factor increases Na^+ reabsorption.

C. In the absence of aldosterone, Na^+ will be secreted by the cortical collecting ducts.

D. Na^+ is actively reabsorbed in the ascending limb of the loop of Henle.

E. Without vasopressin, the collecting duct is impermeable to Na^+.

35. Which correctly describes renin?

A. It is secreted by juxtaglomerular cells in renal afferent arterioles.

B. Its secretion is enhanced by high levels of Na^+ in the macula densa.

C. Its secretion is stimulated by elevated blood pressure in the renal afferent arterioles.

D. It acts on the adrenal cortex to stimulate aldosterone secretion.

E. It is secreted by the liver in response to low blood pressure.

36. Which of the following organs is the main site of aldosterone secretion?

A. kidneys

B. adrenal glands

C. systemic and pulmonary blood vessels

D. liver

E. the atria of the heart

37. Which of the following would be most likely to increase GFR?

A. sympathetic stimulation of afferent arteriolar smooth muscle

B. constricting efferent arterioles

C. a decrease in plasma volume

D. an increase in the concentration of plasma proteins

E. increased secretion of renin

38. Which would result from ingesting a large amount of salt?

A. urine osmolarity would decrease

B. atrial natriuretic factor secretion would decrease

C. firing by hypothalamic osmoreceptors would decrease

D. secretion of atrial natriuretic factor would increase

E. secretion of vasopressin would decrease

39. In the presence of aldosterone, which nephron region reabsorbs the greatest fraction of the filtered Na^+?

A. proximal tubule

B. macula densa

C. descending limb of the loop of Henle

D. distal convoluted tubule
E. cortical collecting duct

40. Which of the following would cause a decrease in the excretion of Na^+ and water?
A. increased hydrostatic pressure in the afferent renal arterioles
B. increased mean arterial blood pressure
C. increased atrial distension
D. decreased aldosterone secretion
E. decreased atrial natriuretic peptide secretion

41.

Which of these would result in an increase in the osmolarity of urine?

A. increased levels of vasopressin in the plasma
B. increased levels of aldosterone in the plasma
C. decreased transport of Na^+ and Cl^- by the ascending limb of the loop of Henle
D. ingestion of a large volume of pure water
E. decreased urea permeability of the medullary collecting duct

42. Which stimulates vasopressin secretion?
A. increased plasma osmolarity
B. increased plasma volume
C. ingestion of alcohol
D. decreased aldosterone secretion
E. increased pressure in afferent arterioles

43. The loss of 0.5 L of sweat would stimulate a greater increase in vasopressin secretion than the loss of an equal amount of blood plasma over the same period of time. This statement is:
A. true, because sweat is hyperosmotic to plasma.
B. true, because sweat is hypoosmotic to plasma.
C. false, because sweat is hypoosmotic to plasma.
D. false, because sweat is isosmotic to plasma.
E. false, because sweat is hyperosmotic to plasma.

44. After prolonged exertion in a hot climate, baroreceptors would _____ firing, leading to _____ secretion of _____ and thus _____ renal reabsorption of _____.
A. increase; increased; renin; increased; Na^+
B. decrease; increased; renin; decreased; Na^+
C. decrease; increased; vasopressin; increased; water
D. increase; decreased; vasopressin; decreased; water
E. decrease; decreased; vasopressin; increased; water

45. Which of the following most accurately describes the actions of aldosterone?

A. Aldosterone increases Na^+ secretion and K^+ reabsorption in the cortical collecting ducts.

B. Aldosterone increases Na^+ reabsorption and K^+ secretion in the proximal tubule.

C. Aldosterone decreases Na^+ reabsorption and K^+ secretion in the cortical collecting ducts.

D. Aldosterone increases Na^+ secretion and K^+ reabsorption in the proximal tubule.

E. Aldosterone increases Na^+ reabsorption and K^+ secretion in the cortical collecting ducts.

46. Which would result in the greatest stimulation of aldosterone secretion?

A. increasing plasma K+ concentration and decreasing plasma angiotensin II concentration

B. decreasing plasma K+ concentration and increasing plasma angiotensin II concentration

C. increasing plasma Na^+ concentration and increasing plasma volume

D. increasing plasma K^+ concentration and increasing plasma angiotensin II concentration

E. decreasing plasma Na^+ concentration and decreasing plasma angiontensin II concentration

47. Which of the following drugs is least likely to decrease blood pressure?

A. a drug that interferes with aldosterone synthesis

B. a drug that is an agonist of atrial natriuretic factor

C. a drug that decreases sympathetic stimulation of renal arterioles

D. a drug that enhances the activity of angiotensin-converting enzyme

E. a drug that decreases liver production of angiotensinogen

48. Most of the reabsorption of filtered calcium is unregulated and occurs in the _____, but an additional amount can be reabsorbed in the _____, depending on the plasma concentration of parathyroid hormone.

A. proximal convoluted tubule, distal convoluted tubule

B. distal convoluted tubule, proximal convoluted tubule

C. proximal convoluted tubule, descending loop of Henle

D. distal convoluted tubule, medullary collecting ducts

E. distal convoluted tubule, renal corpuscle

49. Which of the following symptoms would a patient with a deficiency of parathyroid hormone be most likely to experience?

A. low plasma calcium levels and decreased muscular excitability

B. low plasma calcium levels and increased muscular excitability

C. high plasma calcium levels and decreased muscular excitability

D. high plasma calcium levels and increased muscular excitability

E. high plasma calcium levels and abnormally weak bones

50. When blood Ca^{2+} levels fall below normal, in what ways do the kidneys help restore them toward

normal?
A. by increasing 1,25-dihydroxyvitamin D3 formation, decreasing tubular phosphate reabsorption, and increasing tubular Ca^{2+} reabsorption
B. by increasing 1,25-dihydroxyvitamin D3 formation, increasing tubular phosphate reabsorption, and increasing tubular Ca^{2+} reabsorption
C. by decreasing 1,25-dihydroxyvitamin D3 formation, increasing tubular phosphate reabsorption, and increasing tubular Ca^{2+} reabsorption
D. Increasing 1,25-dihydroxyvitamin D3 formation and increasing secretion of parathyroid hormone
E. by increasing renal secretion of parathyroid hormone and increasing bone resorption

51. Which of the following statements regarding Ca^{2+} homeostasis is true?

A. Parathyroid hormone directly stimulates Ca^{2+} reabsorption by the kidneys.

B. Parathyroid hormone directly stimulates Ca^{2+} absorption from the GI tract.

C. In the absence of parathyroid hormone, plasma Ca^{2+} levels would be abnormally low, resulting in the hyperpolarization of nerve and muscle membranes.

D. When plasma Ca^{2+} increases above normal, the secretion of parathyroid hormone increases.

E. Vitamin D decreases the renal tubular reabsorption of Ca^{2+}.

52. Which would NOT be caused by a decrease in plasma Ca^{2+} levels in an otherwise normal person?
A. an increase in plasma parathyroid hormone levels
B. an increase in plasma 1,25-dihydroxyvitamin D3 levels
C. an increase in nerve and muscle excitability
D. a decrease in the filtered load of Ca^{2+}
E. an increase in bone density

53. What change in renal regulation of H^+ would help compensate for a metabolic acidosis?

A. a decrease in the filtered load of H^+
B. an increase in the urinary pH
C. a decrease in the tubular production of ammonia
D. a decrease in the amount of H+ secreted in the proximal tubule

E. an increase in the production of new plasma HCO_3^-

54. Which of the following statements about renal control of blood acid/base balance is TRUE?
A. Increased metabolism of glutamine by renal tubular cells increases the plasma bicarbonate concentration.
B. Excretion in the urine of hydrogen bound to phosphate buffers decreases plasma bicarbonate concentration.

C. H^+ that binds to filtered bicarbonate in the tubular fluid is excreted in the urine.
D. When hypoventilation occurs at the lungs, the kidneys compensate by reducing glutamine metabolism.
E. The kidneys compensate for a metabolic alkalosis by increasing CO_2 production.

55. Which would you observe in a person experiencing metabolic acidosis?
A. decreased renal secretion of hydrogen ion
B. decreased renal reabsorption of bicarbonate ion
C. increased plasma PCO_2
D. decreased urinary pH
E. decreased urinary ammonium

56. Which of these directly results from hypoventilation?
A. metabolic acidosis
B. respiratory acidosis
C. metabolic alkalosis
D. respiratory alkalosis

57. How would the kidneys respond to hypoventilation?
A. increasing secretion of H^+ and increasing production of newHCO_3^-
B. increasing secretion of H^+ and decreasing reabsorption of HCO_3^-
C. decreasing secretion of H^+ and increasing production of new HCO_3^-
D. decreasing secretion of H^+ and decreasing reabsorption of HCO_3^-
E. increasing excretion of CO_2

58. If a patient with pulmonary disease began to hypoventilate, how would plasma levels of $[H^+]$, $HCO3^-$, and P_{CO2} be changed, compared to normal?
A. increased $[H^+]$, increased P_{CO2}, and increased $[HCO_3^-]$
B. increased $[H^+]$, increased P_{CO2}, and decreased $[HCO_3^-]$
C. increased $[H^+]$, decreased P_{CO2}, and decreased $[HCO_3^-]$
D. decreased $[H^+]$, increased P_{CO2}, and decreased $[HCO_3^-]$
E. decreased $[H^+]$, decreased P_{CO2}, and decreased $[HCO_3^-]$

59. A man with hypertension takes a diuretic that is not potassium-sparing, and he does not increase his ingestion of potassium. Which of the following side-effects would the drug be most likely to cause?
A. increased blood volume
B. hyperpolarized neuronal cell membranes
C. hyperkalemia
D.

cardiac arrhytmia

E.

All of these side effects would occur.

60. Which of the following types of drugs would inhibit spontaneous emptying of the bladder (incontinence)?
A. drugs that enhance the effects of parasympathetic neurons on the detrusor muscle
B. drugs that block the effects of parasympathetic neurons on the detrusor muscle
C. drugs that inhibit the effects of sympathetic neurons on the internal urethral sphincter
D. drugs that inhibit the effects of somatic neurons on the bladder
E. drugs that inhibit the action of sympathetic neurons on the external urethral sphincter

61. The anatomic arrangement of juxtamedullary nephrons in the kidneys is such that the glomerulus, proximal tubule, and distal convoluted tubule are in the renal cortex, while the loop of Henle and collecting ducts lie mainly in the renal medulla.
True False

62. The distal convoluted tubules drain directly into the renal pelvis, which in turn drains into the ureter, a tube that carries urine to the bladder.
True False

63. The three basic processes of kidney function are filtration from the glomerulus into Bowman's capsule, secretion from the tubule into the peritubular capillaries, and reabsorption from the capillaries into the tubular lumen.
True False

64. Only substances that are filtered by the kidneys can be excreted by them.
True False

65. Large amounts of protein in a person's urine indicate that the person is eating a high-protein diet.
True False

66. The filtered load of water in an average person is approximately 180 L/day.
True False

67. Water, sodium, and glucose all undergo tubular reabsorption, but urea does not.

True False

68. The kidneys regulate the plasma concentrations of water, sodium, and glucose.
True False

69. If water intake (ingestion) is decreased, the kidney can decrease the amount of water excreted in urine by increasing the amount of water reabsorbed at the renal corpuscle.
True False

70. In healthy individuals, the amount of glucose present in urine will be virtually zero because the amount of glucose reabsorption from the filtrate back into the blood prevents excretion.
True False

71. The spinal reflex for micturition involves stretch receptors in the wall of the bladder that send messages about distension to sympathetic, parasympathetic, and motor neurons in the spinal cord.
True False

72. Voluntary control of micturition involves controlling somatic motor input to the muscles of the external urethral sphincter.
True False

73. Total-body balance of water and Na^+ is largely maintained by regulating urinary loss of these substances.
True False

74. Most of the body's water is located inside cells, whereas most of the body's Na^+ is in the interstitial fluid and plasma.
True False

75. The total solute concentration in the extracellular fluid is mainly dependent upon the concentration of Na^+ in the extracellular fluid.
True False

76. Water absorption from the proximal tubule is mainly driven by the active reabsorption of Na^+.

True False

77. A consequence of lack of vasopressin is excretion of sugar in the urine, which occurs in the condition diabetes mellitus.
True False

78. A person lacking vasopressin would have to drink 180 L of water per day to make up for the water lost in the urine.
True False

79. The countercurrent mechanism of the kidney enables the formation of hypertonic urine.
True False

80. The walls of the ascending limb of the loop of Henle are freely permeable to water.
True False

81. The fluid entering the distal convoluted tubule is hypoosmotic with respect to plasma.
True False

82. At the tip of the loop of Henle, the osmolarity of the tubular fluid is more than four times greater than that of the glomerular filtrate when a person is in an anti-diuretic state.
True False

83. The main force responsible for water reabsorption from the collecting ducts is the low hydrostatic pressure in the surrounding interstitial space.
True False

84. Unlike the renal cortical interstitial fluid, the interstitial fluid of the medulla is hyperosmotic.
True False

85. In the absence of vasopressin, urine is isoosmotic with plasma.
True False

86. Increasing the GFR tends to increase the excretion rate of sodium.

True False

87. Atrial distension is a stimulus for the secretion of atrial natriuretic factor, which stimulates the reabsorption of sodium by the kidneys.
True False

88. Following hemorrhage, vasopressin secretion increases because of increased firing of hypothalamic osmoreceptors.
True False

89. Because fluid lost as sweat is isosmotic, the baroreceptor reflexes are more important than osmoreceptor activity in restoring extracellular fluid volume after sweating.
True False

90. A fall in the osmolarity of the blood supplying the hypothalamus is a powerful stimulus for thirst.
True False

91. Regulation of extracellular K^+ is not critical to body function because only about two percent of the total body K^+ is in the extracellular fluid.
True False

92. Cardiac arrhythmias may be a clinical sign of either K^+ depletion or excess.
True False

93. Both Na^+ and Cl^- freely filter from the glomerular capillaries into Bowman's space, with no secretion along the renal tubule.
True False

94. The reabsorption of water in the nephron is accomplished as it follows the osmotic gradient created by Na^+ reabsorption.
True False

95. In the proximal convoluted tubule the reabsorption of Na^+ is unaffected by the presence or absence of other substances such as glucose or H^+ in the filtrate.

True False

96. Unlike Na^+, K^+ is secreted by the nephron tubules.
True False

97. Ingestion of large amounts of K^+ triggers reflexes to limit the amount of K^+ reabsorbed by the cortical collecting ducts.
True False

98. Stimuli that cause increased Na^+ reabsorption decrease K^+ secretion.
True False

99. A stimulus for increased aldosterone secretion is decreased plasma K^+ concentration.
True False

100. A substance that interferes with the active transport of Na^+ in the cortical collecting ducts will also interfere with K^+ reabsorption.
True False

101. A stimulus for increased aldosterone secretion is increased plasma levels of K^+.
True False

102.

Regulation of Ca^{2+} balance, like that of Na^+ and K^+ balance, is only determined by the kidneys.

True False

103. Parathyroid hormone influences Ca^{2+} and PO_4^- by stimulating their resorption from bone and stimulating their reabsorption in the kidneys.
True False

104. Most of the H^+ excreted in the urine is bound to bicarbonate ion.
True False

105. One response to increased H^+ production in the body is decreased reabsorption of HCO_3^- by the kidneys.
True False

106. In a person with respiratory acidosis, HCO_3^- is actively secreted into the urine by the tubular cells.
True False

107. The kidneys work to rectify metabolic acidosis and alkalosis but have no effect on respiratory acidosis and alkalosis.
True False

108. A compensation for an episode of severe vomiting is an increased alveolar ventilation rate.
True False

109. Diuretic drugs increase the rate of urine formation by stimulating the production of antidiuretic hormone.
True False

110. People taking diuretics that do not spare K^+ should increase their ingestion of Na^+.
True False

Chapter 14 Test Bank Key

1. Which is NOT a function of the kidneys in maintaining homeostasis?
A. regulation of extracellular fluid osmolarity
B. regulation of blood hydrogen ion concentration
C. regulation of blood glucose concentration
D. regulation of extracellular fluid volume

E. regulation of blood K^+ concentration

Bloom's: Level 2. Understand
Learning Outcome: 14.01
Learning Outcome: 14.03
Learning Outcome: 14.09
Learning Outcome: 14.12
Learning Outcome: 14.18
Section: 14.01
Section: 14.03
Section: 14.09
Section: 14.12
Section: 14.18
Topic: Human Development and Growth
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

2.

Which of the following does NOT correctly describe kidney function?

A. They contribute significantly to long-term regulation of arterial blood pressure by maintaining the proper plasma volume.
B. They produce urine of a constant composition at all times, in order to maintain homeostasis of extracellular fluid.
C. They excrete metabolic waste products.
D. They assist in maintaining proper acid-base balance in the body.
E. They secrete hormones.

Bloom's: Level 1. Remember
Learning Outcome: 14.01
Section: 14.01
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

3. Which correctly describes a basic renal process?
A. Fluid is filtered from Bowman's capsule into the glomerulus.
B. Substances are secreted from the tubule into the peritubular capillaries.
C. Substances are reabsorbed from the capillaries into the tubular lumen.
D. Substances are actively secreted from glomerular capillaries into Bowman's capsule.
E. Fluid moves by bulk flow from glomerular capillaries into Bowman's space.

Bloom's: Level 1. Remember
Learning Outcome: 14.03
Section: 14.03
Topic: Urinary System

4. The amount of a substance that is excreted in the urine is equal to the amount that is _____ plus the amount that is _____ minus the amount that is _____.
A. filtered; reabsorbed; secreted
B. reabsorbed; filtered; secreted
C. secreted; reabsorbed; filtered
D. filtered; secreted; reabsorbed

E. reabsorbed; secreted; filtered

Bloom's: Level 1. Remember
Learning Outcome: 14.03
Section: 14.03
Topic: Urinary System

5. Which of the following is least likely to be filtered into Bowman's capsule in a normal, healthy person?
A. glucose
B. plasma protein
C. sodium
D. urea
E. bicarbonate ion

Bloom's: Level 1. Remember
Learning Outcome: 14.03
Section: 14.03
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

6.

All of the following substances are present in proximal tubular fluid in the kidney, but which one is NOT normally present in urine?

A. Ca^{2+}
B. H^{+}
C. K^{+}
D. $HPO4^{-}$
E. glucose

Bloom's: Level 1. Remember
Learning Outcome: 14.03
Section: 14.03
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

7.

Which one of the following substances is LEAST dependent on the kidney for regulation of its plasma concentration?

A. water
B. Na^{+}
C. K^{+}
D. HPO_4^{-}
E. glucose

Bloom's: Level 1. Remember
Learning Outcome: 14.03
Section: 14.03
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

8. Which is TRUE about the juxtaglomerular apparatus?
A. It is composed of parts of the ascending limb of the loop of Henle and the efferent arteriole.
B. It is composed of glomerular capillaries and the macula densa.
C. It is the site of renin secretion.
D. It is created by the the junction between the proximal tubule and the afferent arteriole.
E. It is composed of cells that secrete atrial natriuretic peptide and cells that secrete norepinephrine.

Bloom's: Level 1. Remember
Learning Outcome: 14.02
Section: 14.02
Topic: Urinary System

9. Which correctly describes the composition of the glomerular filtrate?
A. It is identical to urine, but has a much smaller flow rate.
B. It is identical to urine, but has a much larger flow rate.
C. It is identical to blood plasma, except it lacks red blood cells.
D. It is highly similar to plasma, except it contains plasma proteins.
E. It is highly similar to plasma, except it does not contain plasma proteins.

Bloom's: Level 1. Remember
Learning Outcome: 14.03
Section: 14.03
Topic: Urinary System

10. Which of the following statements concerning the process of glomerular filtration is correct?
A. The hydrostatic pressure in Bowman's space opposes filtration.
B. The glomerular filtration rate is limited by a transport maximum.
C. All of the plasma that enters the glomerular capillaries is filtered.
D. The osmotic force due to plasma proteins favors filtration.
E. The hydrostatic pressure in glomerular capillaries opposes filtration.

Bloom's: Level 1. Remember
Learning Outcome: 14.03
Section: 14.03
Topic: Urinary System

11. Which equation is equal to the net glomerular filtration pressure?
A. = hydrostatic pressure in glomerular capillaries - hydrostatic pressure in Bowman's capsule - osmotic pressure due to protein in Bowman's capsule
B. = osmotic pressure due to protein in plasma - hydrostatic pressure in glomerular capillaries - hydrostatic pressure in Bowman's capsule
C. = hydrostatic pressure in glomerular capillaries + hydrostatic pressure in Bowman's capsule + osmotic pressure due to protein in plasma
D. = hydrostatic pressure in glomerular capillaries + hydrostatic pressure in Bowman's capsule - osmotic pressure due to protein in plasma
E. = hydrostatic pressure in glomerular capillaries - hydrostatic pressure in Bowman's capsule - osmotic

force due to proteins in plasma

Bloom's: Level 1. Remember
Learning Outcome: 14.03
Section: 14.03
Topic: Urinary System

12. Constriction of the _____ decreases hydrostatic pressure in _____.
A. afferent arterioles, glomerular capillaries
B. efferent arterioles, proximal convoluted tubules
C. renal vein, peritubular capillaries
D. efferent arterioles, glomerular capillaries
E. efferent arterioles, Bowman's capsule

Bloom's: Level 1. Remember
Learning Outcome: 14.03
Section: 14.03
Topic: Urinary System

13. Which is TRUE regarding renal tubular reabsorption?
A. Reabsorption of Na+ from the proximal tubule occurs as a result of water reabsorption.
B. Reabsorption of glucose saturates at a maximum transport rate.
C. Urea reabsorption cannot occur at any point along the nephron.
D. Toxic substances are removed from the body by reabsorption from peritubular capillaries into the proxmial tubule.
E. Reabsorption of Na^+ only occurs from nephron regions that come after the descending limb of the loop of Henle.

Bloom's: Level 1. Remember
Learning Outcome: 14.03
Section: 14.03
Topic: Urinary System

14. Which of the following describes tubular reabsorption in the kidney?
A. the movement of substances from the peritubular capillaries into the tubular fluid
B. the movement of substances from the proximal tubule into the loop of Henle
C. transepithelial transport from the lumen of the tubule into renal interstitial fluid
D. movement of Na^+, Cl^- and water from glomerular capillaries into Bowman's capsule
E. transport of solutes from the renal medullary interstitium into the collecting duct

Bloom's: Level 1. Remember
Learning Outcome: 14.03
Section: 14.03
Topic: Urinary System

15. Which is NOT a transport mechanism typically seen in renal tubular epithelial cells?
A. cotransport proteins in the luminal membrane of the proximal tubule that move Na+ and glucose from the proximal tubule into epithelial cells
B. transport proteins that move glucose by facilitated diffusion from inside of proximal tubule cells into the

renal interstitial fluid
C. ion channels that allow Na+ to move by diffusion from the lumen of the proximal tubule into epithelial cells
D. Na^+-K^+ ATPase pumps in the luminal membrane of proximal tubule epithelial cells that move Na^+ from inside the cell into the tubule and K^+ from the tubule lumen into the cell
E. countertransport proteins that move Na^+ into proximal tubule epithelial cells while moving H^+ from the cells into the lumen

Bloom's: Level 2. Understand
Learning Outcome: 14.07
Section: 14.07
Topic: Urinary System

16. Which of the following substances undergo renal tubular secretion?
A. Ca^{2+}
B. Na^+
C. K^+
D. H_20

Bloom's: Level 1. Remember
Learning Outcome: 14.03
Section: 14.03
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

17. Which is true for a man who is in balance for total body water?
A. he must ingest more water than is lost in the urine
B. he must ingest more water than is lost by all output pathways combined
C. he must ingest less water than is lost in the urine
D. the water filtered into Bowman's capsule must be 100% reabsorbed
E. the amount ingested plus that metabolically produced must equal the amount of water in the urine

Bloom's: Level 2. Understand
Learning Outcome: 14.03
Learning Outcome: 14.06
Learning Outcome: 14.07
Section: 14.03
Section: 14.06
Section: 14.07
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

18. Which of the following is TRUE about how water is handled by the nephron?
A. Water is filtered out of glomerular capillaries by bulk flow.
B. Water is actively reabsorbed from the proximal tubule, and Na+ follows down its diffusion gradient.
C. Water is actively secreted into the descending loop of Henle.
D. The permeability of the ascending limb of the loop of Henle is modified by vasopressin.
E. Vasopressin inserts pumps in the collecting duct membrane that move water against its concentration gradient.

Bloom's: Level 1. Remember
Learning Outcome: 14.03
Section: 14.03
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

19. Where do Na^+/K^+ ATPase pumps play an active role in reabsorbing Na^+?
A. in Bowman's capsule epithelial cells, facing the interior of Bowman's space
B. in the basolateral membrane of cells of the cortical collecting duct
C. in the apical membrane of epithelial cells of the proximal tubule
D. in the luminal membrane of epithelial cells of the distal convoluted tubule
E. in the basolateral membrane of endothelial cells of peritubular capillaries

Bloom's: Level 1. Remember
Learning Outcome: 14.07
Section: 14.07
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

20. Compared to the normal plasma osmolarity, the tubular fluid is _____ as it enters Bowman's space, _____ at the beginning of the loop of Henle, _____ at the tip of the loop and _____ at the beginning of the distal convoluted tubule.
A. isosmotic; hyperosmotic; hyperosmotic; isosmotic
B. isosmotic; isosmotic; hypoosmotic; hypoosmotic
C. isosmotic; isosmotic; hyperosmotic; hypoosmotic
D. isosmotic; isosmotic; hypoosmotic; hyperosmotic
E. isosmotic; isosmotic; hyperosmotic; isosmotic

Bloom's: Level 1. Remember
Learning Outcome: 14.07
Section: 14.07
Topic: Urinary System

21. In what segment of the nephron is the greatest fraction of filtered water reabsorbed?
A. the proximal tubule
B. the ascending limb of the loop of Henle
C. the distal convoluted tubule
D. the collecting ducts
E. the descending limb of the loop of Henle

Bloom's: Level 1. Remember
Learning Outcome: 14.03
Learning Outcome: 14.14
Section: 14.03
Section: 14.14
Topic: Urinary System

22. In which region of the nephron does the fractional reabsorption of water vary the most in response to variation in the
state of hydration?
A. the glomerulus

B. the proximal convoluted tubule
C. the loop of Henle
D. the distal convoluted tubule
E. the collecting duct

Bloom's: Level 2. Understand
Learning Outcome: 14.07
Section: 14.07
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

23. Which is NOT true about the countercurrent multiplier system of the kidney?
A. It creates a hyperosmolar medullary interstitium that allows the kidneys to form hypertonic urine.
B. The descending loop of Henle is permeable to water.
C. There is active transport of sodium and chloride out of the ascending limb of the loop of Henle.
D. The ascending loop of Henle is not permeable to water.
E. The fraction of filtered NaCl reabsorbed from the ascending limb equals the fraction of filtered water reabsorbed from the descending limb.

Bloom's: Level 1. Remember
Learning Outcome: 14.07
Section: 14.07
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

24. How does the renal countercurrent multiplier mechanism allow the creation of a concentrated urine?
A. It transports NaCl from the medullary interstitium into the collecting duct, which directly increases the osmolarity of the urine.
B. It transports urea from the medullary interstitium into the collecting duct, which directly increases the osmolarity of the urine.
C. By concentrating NaCl in the renal medullary interstitium, it allows water to be reabsorbed from the collecting ducts when vasopressin is present.
D. By pumping NaCl and urea into the ascending limb of the loop of Henle, it raises the solute load, which turns into a concentrated urine once water is extracted from the collecting duct.
E. When anti-diuretic hormone is present, it stimulates the pumping of NaCl from the medullary interstitium and water follows, concentrating the urine.

Bloom's: Level 2. Understand
Learning Outcome: 14.07
Section: 14.07
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

25. Water and NaCl reabsorbed from the loop of Henle directly re-enter what blood vessels?
A. vasa recta
B. afferent arterioles
C. efferent arterioles
D. cortical peritubular capillaries
E. collecting ducts

Bloom's: Level 1. Remember

Learning Outcome: 14.02
Learning Outcome: 14.03
Section: 14.02
Section: 14.03
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

26. In the condition diabetes mellitus, why does glucose appear in the urine?
A. The plasma concentration of glucose becomes so high that it diffuses from peritubular capillaries into the proximal tubule, down its concentration gradient.
B. The filtered load of glucose becomes greater than the tubular maximum for its reabsorption.
C. Without the hormone insulin, glucose cannot enter proximal tubule epithelial cells.
D. The rate of tubular secretion of glucose becomes greater than the sum of glucose filtration and reabsorption.
E. Without insulin, the glomerular filtration barrier becomes extremely leaky to glucose, which is not normally fiterable.

Bloom's: Level 2. Understand
Learning Outcome: 14.03
Section: 14.03
Topic: Urinary System

27. Which is TRUE about the hormone vasopressin (also known as antidiuretic hormone, ADH)?
A. It is a peptide hormone released from the adrenal gland.
B. It triggers insertion of aquaporins into the apical membranes of collecting duct cells.
C. It promotes the excretion of more water in the urine.
D. It stimulates the excretion of K^+ in the urine.
E. It's main function is to trigger the secretion of aldosterone.

Bloom's: Level 1. Remember
Learning Outcome: 14.07
Section: 14.07
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

28. Which would occur if a person lost the ability to synthesize vasopressin?
A. The ability to reabsorb water in the proximal tubule would be lost.
B. The excretion of glucose in the urine would increase.
C. The urine would become hypoosmotic compared to plasma.
D. The urine production would decrease dramatically, and the urine osmolarity would be hypertonic compared to plasma.
E. Blood pressure would increase significantly.

Bloom's: Level 3. Apply
Learning Outcome: 14.07
Section: 14.07
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

29. Which of these is deficient in the disease, diabetes insipidus?
A. ACTH

B.

vasopressin

C.

atrial natriuretic factor

D.

angiotensin II

E.

insulin

Bloom's: Level 1. Remember
Learning Outcome: 14.07
Section: 14.07
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

30. Which of the following most accurately describes the renal transport of Na^+?

A. Na^+ is actively transported in all segments of the tubule.

B. Primary active transport of Na^+ allows for secondary active transport of glucose and H^+ in the proximal tubule.

C. Most of the Na^+ transport occurs in the distal convoluted tubule and collecting ducts.

D. Na^+ is actively secreted into the nephron lumen by cells in the cortical collecting ducts.

E.

Na^+ is actively transported across the luminal membrane of proximal tubule cells in exchange for K^+, by Na^+/K^+ ATPase pumps.

Bloom's: Level 2. Understand
Learning Outcome: 14.07
Learning Outcome: 14.08
Section: 14.07
Section: 14.08
Topic: Urinary System

31. What region of the nephron reabsorbs about two-thirds of filtered Na^+ and Cl^-?

A. ascending loop of Henle
B. glomerulus
C. proximal convoluted tubule
D. distal convoluted tubule
E. collecting duct

Bloom's: Level 1. Remember
Learning Outcome: 14.03
Learning Outcome: 14.07
Section: 14.03
Section: 14.07
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

32.

Which would occur as a result of a decrease in the total body content of Na^+?

A. an increase in plasma volume, which induces an increase in GFR and Na^+ reabsorption rate

B. a decrease in plasma volume, which induces an increase in GFR and Na^+ reabsorption rate

C. an increase in plasma volume, which induces an increase in GFR and a decrease in Na^+ reabsorption rate

D.

a decrease in plasma volume, which induces a decrease in GFR and Na^+ reabsorption rate

E.

a decrease in plasma volume, which induces a decrease in GFR and an increase in Na^+ reabsorption rate

Bloom's: Level 2. Understand
Learning Outcome: 14.08
Section: 14.08
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

33. What is the rate-limiting (regulated) step for stimulating the secretion of aldosterone?
A. conversion of angiotensin I to angiotensin II in the blood
B. secretion of angiotensinogen by the liver
C. conversion of angiotensinogen to angiotensin I in the blood
D. secretion of ACTH by the anterior pituitary
E. secretion of angiotensin II by the kidney

Bloom's: Level 1. Remember
Learning Outcome: 14.08
Section: 14.08
Topic: Urinary System

34. Which of the following statements regarding renal handling of Na^+ is correct?

A. In the proximal tubule, Na^+ is actively transported across the luminal membrane of the tubular epithelial cells.

B. Atrial natriuretic factor increases Na^+ reabsorption.

C. In the absence of aldosterone, Na^+ will be secreted by the cortical collecting ducts.

D. Na^+ is actively reabsorbed in the ascending limb of the loop of Henle.

E. Without vasopressin, the collecting duct is impermeable to Na^+.

Bloom's: Level 2. Understand
Learning Outcome: 14.07
Learning Outcome: 14.08
Section: 14.07
Section: 14.08
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

35. Which correctly describes renin?
A. It is secreted by juxtaglomerular cells in renal afferent arterioles.
B. Its secretion is enhanced by high levels of Na^+ in the macula densa.
C. Its secretion is stimulated by elevated blood pressure in the renal afferent arterioles.
D. It acts on the adrenal cortex to stimulate aldosterone secretion.
E. It is secreted by the liver in response to low blood pressure.

Bloom's: Level 2. Understand
Learning Outcome: 14.02
Learning Outcome: 14.08
Section: 14.02
Section: 14.08
Topic: Urinary System

36. Which of the following organs is the main site of aldosterone secretion?
A. kidneys
B. adrenal glands
C. systemic and pulmonary blood vessels
D. liver
E. the atria of the heart

Bloom's: Level 1. Remember
Learning Outcome: 14.08
Section: 14.08
Topic: Urinary System

37. Which of the following would be most likely to increase GFR?
A. sympathetic stimulation of afferent arteriolar smooth muscle
B. constricting efferent arterioles
C. a decrease in plasma volume
D. an increase in the concentration of plasma proteins
E. increased secretion of renin

Bloom's: Level 1. Remember
Learning Outcome: 14.03
Section: 14.03
Topic: Urinary System

38. Which would result from ingesting a large amount of salt?
A. urine osmolarity would decrease

B. atrial natriuretic factor secretion would decrease
C. firing by hypothalamic osmoreceptors would decrease
D. secretion of atrial natriuretic factor would increase
E. secretion of vasopressin would decrease

Bloom's: Level 1. Remember
Learning Outcome: 14.08
Section: 14.08
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

39. In the presence of aldosterone, which nephron region reabsorbs the greatest fraction of the filtered Na^+?

A. proximal tubule
B. macula densa
C. descending limb of the loop of Henle
D. distal convoluted tubule
E. cortical collecting duct

Bloom's: Level 1. Remember
Learning Outcome: 14.03
Learning Outcome: 14.08
Section: 14.03
Section: 14.08
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

40. Which of the following would cause a decrease in the excretion of Na^+ and water?
A. increased hydrostatic pressure in the afferent renal arterioles
B. increased mean arterial blood pressure
C. increased atrial distension
D. decreased aldosterone secretion
E. decreased atrial natriuretic peptide secretion

Bloom's: Level 1. Remember
Learning Outcome: 14.08
Section: 14.08
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

41.

Which of these would result in an increase in the osmolarity of urine?

A. increased levels of vasopressin in the plasma
B. increased levels of aldosterone in the plasma
C. decreased transport of Na^+ and Cl^- by the ascending limb of the loop of Henle
D. ingestion of a large volume of pure water
E. decreased urea permeability of the medullary collecting duct

Bloom's: Level 1. Remember
Learning Outcome: 14.09
Section: 14.09
Topic: Urinary System

42. Which stimulates vasopressin secretion?
A. increased plasma osmolarity
B. increased plasma volume
C. ingestion of alcohol
D. decreased aldosterone secretion
E. increased pressure in afferent arterioles

Bloom's: Level 1. Remember
Learning Outcome: 14.09
Section: 14.09
Topic: Urinary System

43. The loss of 0.5 L of sweat would stimulate a greater increase in vasopressin secretion than the loss of an equal amount of blood plasma over the same period of time. This statement is:
A. true, because sweat is hyperosmotic to plasma.
B. true, because sweat is hypoosmotic to plasma.
C. false, because sweat is hypoosmotic to plasma.
D. false, because sweat is isosmotic to plasma.
E. false, because sweat is hyperosmotic to plasma.

Bloom's: Level 2. Understand
Learning Outcome: 14.07
Learning Outcome: 14.09
Learning Outcome: 14.10
Section: 14.07
Section: 14.09
Section: 14.10
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

44. After prolonged exertion in a hot climate, baroreceptors would _____ firing, leading to _____ secretion of _____ and thus _____ renal reabsorption of _____.
A. increase; increased; renin; increased; Na^+
B. decrease; increased; renin; decreased; Na^+
C. decrease; increased; vasopressin; increased; water
D. increase; decreased; vasopressin; decreased; water
E. decrease; decreased; vasopressin; increased; water

Bloom's: Level 2. Understand
Learning Outcome: 14.09
Section: 14.09
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

45. Which of the following most accurately describes the actions of aldosterone?
A. Aldosterone increases Na^+ secretion and K^+ reabsorption in the cortical collecting ducts.

B. Aldosterone increases Na^+ reabsorption and K^+ secretion in the proximal tubule.

C. Aldosterone decreases Na^+ reabsorption and K^+ secretion in the cortical collecting ducts.

D. Aldosterone increases Na^+ secretion and K^+ reabsorption in the proximal tubule.

E. Aldosterone increases Na^+ reabsorption and K^+ secretion in the cortical collecting ducts.

Bloom's: Level 1. Remember
Learning Outcome: 14.08
Learning Outcome: 14.12
Section: 14.08
Section: 14.12
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

46. Which would result in the greatest stimulation of aldosterone secretion?
A. increasing plasma K+ concentration and decreasing plasma angiotensin II concentration
B. decreasing plasma K+ concentration and increasing plasma angiotensin II concentration
C. increasing plasma Na^+ concentration and increasing plasma volume
D. increasing plasma K^+ concentration and increasing plasma angiotensin II concentration
E. decreasing plasma Na^+ concentration and decreasing plasma angiontensin II concentration

Bloom's: Level 2. Understand
Learning Outcome: 14.08
Learning Outcome: 14.12
Section: 14.08
Section: 14.12
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

47. Which of the following drugs is least likely to decrease blood pressure?
A. a drug that interferes with aldosterone synthesis
B. a drug that is an agonist of atrial natriuretic factor
C. a drug that decreases sympathetic stimulation of renal arterioles
D. a drug that enhances the activity of angiotensin-converting enzyme
E. a drug that decreases liver production of angiotensinogen

Bloom's: Level 2. Understand
Learning Outcome: 14.08
Section: 14.08
Topic: Urinary System

48. Most of the reabsorption of filtered calcium is unregulated and occurs in the _____, but an additional amount can be reabsorbed in the _____, depending on the plasma concentration of parathyroid hormone.
A. proximal convoluted tubule, distal convoluted tubule
B. distal convoluted tubule, proximal convoluted tubule
C. proximal convoluted tubule, descending loop of Henle
D. distal convoluted tubule, medullary collecting ducts
E. distal convoluted tubule, renal corpuscle

Bloom's: Level 1. Remember
Learning Outcome: 14.13
Section: 14.13
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

49. Which of the following symptoms would a patient with a deficiency of parathyroid hormone be most likely to experience?
A. low plasma calcium levels and decreased muscular excitability
B. low plasma calcium levels and increased muscular excitability
C. high plasma calcium levels and decreased muscular excitability
D. high plasma calcium levels and increased muscular excitability
E. high plasma calcium levels and abnormally weak bones

Bloom's: Level 2. Understand
Learning Outcome: 14.13
Section: 14.13
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

50. When blood Ca^{2+} levels fall below normal, in what ways do the kidneys help restore them toward normal?
A. by increasing 1,25-dihydroxyvitamin D3 formation, decreasing tubular phosphate reabsorption, and increasing tubular Ca^{2+} reabsorption
B. by increasing 1,25-dihydroxyvitamin D3 formation, increasing tubular phosphate reabsorption, and increasing tubular Ca^{2+} reabsorption
C. by decreasing 1,25-dihydroxyvitamin D3 formation, increasing tubular phosphate reabsorption, and increasing tubular Ca^{2+} reabsorption
D. Increasing 1,25-dihydroxyvitamin D3 formation and increasing secretion of parathyroid hormone
E. by increasing renal secretion of parathyroid hormone and increasing bone resorption

Bloom's: Level 1. Remember
Learning Outcome: 14.13
Section: 14.13
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

51. Which of the following statements regarding Ca^{2+} homeostasis is true?
A. Parathyroid hormone directly stimulates Ca^{2+} reabsorption by the kidneys.
B. Parathyroid hormone directly stimulates Ca^{2+} absorption from the GI tract.
C. In the absence of parathyroid hormone, plasma Ca^{2+} levels would be abnormally low, resulting in the hyperpolarization of nerve and muscle membranes.
D. When plasma Ca^{2+} increases above normal, the secretion of parathyroid hormone increases.
E. Vitamin D decreases the renal tubular reabsorption of Ca^{2+}.

Bloom's: Level 1. Remember
Learning Outcome: 14.13
Section: 14.13

Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

52. Which would NOT be caused by a decrease in plasma Ca^{2+} levels in an otherwise normal person?
A. an increase in plasma parathyroid hormone levels
B. an increase in plasma 1,25-dihydroxyvitamin D3 levels
C. an increase in nerve and muscle excitability
D. a decrease in the filtered load of Ca^{2+}
E. an increase in bone density

Bloom's: Level 2. Understand
Learning Outcome: 14.13
Section: 14.13
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

53. What change in renal regulation of H^+ would help compensate for a metabolic acidosis?
A. a decrease in the filtered load of H^+
B. an increase in the urinary pH
C. a decrease in the tubular production of ammonia
D. a decrease in the amount of H+ secreted in the proximal tubule
E. an increase in the production of new plasma HCO_3^-

Bloom's: Level 2. Understand
Learning Outcome: 14.16
Learning Outcome: 14.18
Learning Outcome: 14.19
Learning Outcome: 14.20
Section: 14.16
Section: 14.18
Section: 14.19
Section: 14.20
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

54. Which of the following statements about renal control of blood acid/base balance is TRUE?
A. Increased metabolism of glutamine by renal tubular cells increases the plasma bicarbonate concentration.
B. Excretion in the urine of hydrogen bound to phosphate buffers decreases plasma bicarbonate concentration.
C. H^+ that binds to filtered bicarbonate in the tubular fluid is excreted in the urine.
D. When hypoventilation occurs at the lungs, the kidneys compensate by reducing glutamine metabolism.
E. The kidneys compensate for a metabolic alkalosis by increasing CO_2 production.

Bloom's: Level 2. Understand
Learning Outcome: 14.18
Learning Outcome: 14.19
Learning Outcome: 14.20
Section: 14.18
Section: 14.19
Section: 14.20
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

55. Which would you observe in a person experiencing metabolic acidosis?
A. decreased renal secretion of hydrogen ion
B. decreased renal reabsorption of bicarbonate ion
C. increased plasma PCO_2
D. decreased urinary pH
E. decreased urinary ammonium

Bloom's: Level 1. Remember
Learning Outcome: 14.18
Learning Outcome: 14.19
Learning Outcome: 14.20
Section: 14.18
Section: 14.19
Section: 14.20
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

56. Which of these directly results from hypoventilation?
A. metabolic acidosis
B. respiratory acidosis
C. metabolic alkalosis
D. respiratory alkalosis

Bloom's: Level 1. Remember
Learning Outcome: 14.20
Section: 14.20
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

57. How would the kidneys respond to hypoventilation?
A. increasing secretion of H^+ and increasing production of newHCO_3^-
B. increasing secretion of H^+ and decreasing reabsorption of HCO_3^-
C. decreasing secretion of H^+ and increasing production of new HCO_3^-
D. decreasing secretion of H^+ and decreasing reabsorption of HCO_3^-
E. increasing excretion of CO_2

Bloom's: Level 1. Remember
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58. If a patient with pulmonary disease began to hypoventilate, how would plasma levels of $[H^+]$, $HCO3^-$, and P_{CO2} be changed, compared to normal?

A. increased $[H^+]$, increased P_{CO2}, and increased $[HCO_3^-]$

B. increased $[H^+]$, increased P_{CO2}, and decreased $[HCO_3^-]$

C. increased $[H^+]$, decreased P_{CO2}, and decreased $[HCO_3^-]$

D. decreased $[H^+]$, increased P_{CO2}, and decreased $[HCO_3^-]$

E. decreased $[H^+]$, decreased P_{CO2}, and decreased $[HCO_3^-]$

Bloom's: Level 2. Understand
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59. A man with hypertension takes a diuretic that is not potassium-sparing, and he does not increase his ingestion of potassium. Which of the following side-effects would the drug be most likely to cause?
A. increased blood volume
B. hyperpolarized neuronal cell membranes
C. hyperkalemia
D.

cardiac arrhytmia

E.

All of these side effects would occur.

Bloom's: Level 3. Apply
Learning Outcome: 14.15
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Topic: Urinary System

60. Which of the following types of drugs would inhibit spontaneous emptying of the bladder (incontinence)?
A. drugs that enhance the effects of parasympathetic neurons on the detrusor muscle
B. drugs that block the effects of parasympathetic neurons on the detrusor muscle
C. drugs that inhibit the effects of sympathetic neurons on the internal urethral sphincter
D. drugs that inhibit the effects of somatic neurons on the bladder
E. drugs that inhibit the action of sympathetic neurons on the external urethral sphincter

Bloom's: Level 1. Remember
Learning Outcome: 14.05
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Topic: Urinary System

61. The anatomic arrangement of juxtamedullary nephrons in the kidneys is such that the glomerulus, proximal tubule, and distal convoluted tubule are in the renal cortex, while the loop of Henle and collecting ducts lie mainly in the renal medulla.
TRUE

Bloom's: Level 1. Remember
Learning Outcome: 14.02
Section: 14.02
Topic: Urinary System

62. The distal convoluted tubules drain directly into the renal pelvis, which in turn drains into the ureter, a tube that carries urine to the bladder.
FALSE

Bloom's: Level 1. Remember
Learning Outcome: 14.02
Section: 14.02
Topic: Urinary System

63. The three basic processes of kidney function are filtration from the glomerulus into Bowman's capsule, secretion from the tubule into the peritubular capillaries, and reabsorption from the capillaries into the tubular lumen.
FALSE

Bloom's: Level 1. Remember
Learning Outcome: 14.03
Section: 14.03
Topic: Urinary System

64. Only substances that are filtered by the kidneys can be excreted by them.
FALSE

Bloom's: Level 1. Remember
Learning Outcome: 14.03
Section: 14.03
Topic: Urinary System

65. Large amounts of protein in a person's urine indicate that the person is eating a high-protein diet.
FALSE

Bloom's: Level 2. Understand
Learning Outcome: Clinical Case Study
Section: Clinical Case Study
Topic: Urinary System

66. The filtered load of water in an average person is approximately 180 L/day.

TRUE

Bloom's: Level 1. Remember
Learning Outcome: 14.03
Section: 14.03
Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

67. Water, sodium, and glucose all undergo tubular reabsorption, but urea does not.
FALSE

Bloom's: Level 1. Remember
Learning Outcome: 14.03
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Topic: Urinary System
Topic: Water, Electrolyte, and Acid-Base Balance

68. The kidneys regulate the plasma concentrations of water, sodium, and glucose.
FALSE

Bloom's: Level 1. Remember
Learning Outcome: 14.03
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Topic: Water, Electrolyte, and Acid-Base Balance

69. If water intake (ingestion) is decreased, the kidney can decrease the amount of water excreted in urine by increasing the amount of water reabsorbed at the renal corpuscle.
FALSE

Bloom's: Level 2. Understand
Learning Outcome: 14.03
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Topic: Water, Electrolyte, and Acid-Base Balance

70. In healthy individuals, the amount of glucose present in urine will be virtually zero because the amount of glucose reabsorption from the filtrate back into the blood prevents excretion.
TRUE

Bloom's: Level 1. Remember
Learning Outcome: 14.03
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71. The spinal reflex for micturition involves stretch receptors in the wall of the bladder that send messages about distension to sympathetic, parasympathetic, and motor neurons in the spinal cord.
TRUE

Bloom's: Level 1. Remember
Learning Outcome: 14.05
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72. Voluntary control of micturition involves controlling somatic motor input to the muscles of the external urethral sphincter.
TRUE

Bloom's: Level 1. Remember
Learning Outcome: 14.05
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Topic: Urinary System

73. Total-body balance of water and Na^+ is largely maintained by regulating urinary loss of these substances.
TRUE

Bloom's: Level 1. Remember
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74. Most of the body's water is located inside cells, whereas most of the body's Na^+ is in the interstitial fluid and plasma.
TRUE

Bloom's: Level 1. Remember
Learning Outcome: 14.06
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Topic: Urinary System
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75. The total solute concentration in the extracellular fluid is mainly dependent upon the concentration of Na^+ in the extracellular fluid.
TRUE

Bloom's: Level 2. Understand
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76. Water absorption from the proximal tubule is mainly driven by the active reabsorption of Na^+.
TRUE

Bloom's: Level 1. Remember
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77. A consequence of lack of vasopressin is excretion of sugar in the urine, which occurs in the condition diabetes mellitus.
FALSE

Bloom's: Level 1. Remember
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78. A person lacking vasopressin would have to drink 180 L of water per day to make up for the water lost in the urine.
FALSE

Bloom's: Level 2. Understand
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79. The countercurrent mechanism of the kidney enables the formation of hypertonic urine.
TRUE

Bloom's: Level 1. Remember
Learning Outcome: 14.07
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80. The walls of the ascending limb of the loop of Henle are freely permeable to water.
FALSE

Bloom's: Level 1. Remember
Learning Outcome: 14.07
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81. The fluid entering the distal convoluted tubule is hypoosmotic with respect to plasma.

TRUE

Bloom's: Level 1. Remember
Learning Outcome: 14.07
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82. At the tip of the loop of Henle, the osmolarity of the tubular fluid is more than four times greater than that of the glomerular filtrate when a person is in an anti-diuretic state.
TRUE

Bloom's: Level 1. Remember
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83. The main force responsible for water reabsorption from the collecting ducts is the low hydrostatic pressure in the surrounding interstitial space.
FALSE

Bloom's: Level 1. Remember
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84. Unlike the renal cortical interstitial fluid, the interstitial fluid of the medulla is hyperosmotic.
TRUE

Bloom's: Level 1. Remember
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85. In the absence of vasopressin, urine is isoosmotic with plasma.
FALSE

Bloom's: Level 1. Remember
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86. Increasing the GFR tends to increase the excretion rate of sodium.
TRUE

Bloom's: Level 2. Understand
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87. Atrial distension is a stimulus for the secretion of atrial natriuretic factor, which stimulates the reabsorption of sodium by the kidneys.
FALSE

Bloom's: Level 1. Remember
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88. Following hemorrhage, vasopressin secretion increases because of increased firing of hypothalamic osmoreceptors.
FALSE

Bloom's: Level 1. Remember
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89. Because fluid lost as sweat is isosmotic, the baroreceptor reflexes are more important than osmoreceptor activity in restoring extracellular fluid volume after sweating.
FALSE

Bloom's: Level 1. Remember
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90. A fall in the osmolarity of the blood supplying the hypothalamus is a powerful stimulus for thirst.
FALSE

Bloom's: Level 1. Remember
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91. Regulation of extracellular K^+ is not critical to body function because only about two percent of the total body K^+ is in the extracellular fluid.
FALSE

Bloom's: Level 1. Remember
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92. Cardiac arrhythmias may be a clinical sign of either K^+ depletion or excess.
TRUE

Bloom's: Level 1. Remember
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93. Both Na^+ and Cl^- freely filter from the glomerular capillaries into Bowman's space, with no secretion along the renal tubule.
TRUE

Bloom's: Level 1. Remember
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94. The reabsorption of water in the nephron is accomplished as it follows the osmotic gradient created by Na^+ reabsorption.
TRUE

Bloom's: Level 1. Remember
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95. In the proximal convoluted tubule the reabsorption of Na^+ is unaffected by the presence or absence of other substances such as glucose or H^+ in the filtrate.
FALSE

Bloom's: Level 1. Remember
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96. Unlike Na^+, K^+ is secreted by the nephron tubules.
TRUE

Bloom's: Level 1. Remember
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97. Ingestion of large amounts of K^+ triggers reflexes to limit the amount of K^+ reabsorbed by the cortical collecting ducts.
FALSE

Bloom's: Level 1. Remember
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98. Stimuli that cause increased Na^+ reabsorption decrease K^+ secretion.
FALSE

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99. A stimulus for increased aldosterone secretion is decreased plasma K^+ concentration.
FALSE

Bloom's: Level 1. Remember
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100. A substance that interferes with the active transport of Na^+ in the cortical collecting ducts will also interfere with K^+ reabsorption.
FALSE

Bloom's: Level 2. Understand
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101. A stimulus for increased aldosterone secretion is increased plasma levels of K^+.
TRUE

Bloom's: Level 1. Remember
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102.

Regulation of Ca^{2+} balance, like that of Na^+ and K^+ balance, is only determined by the kidneys.

FALSE

Bloom's: Level 1. Remember
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103. Parathyroid hormone influences Ca^{2+} and PO_4^- by stimulating their resorption from bone and stimulating their reabsorption in the kidneys.
FALSE

Bloom's: Level 1. Remember
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104. Most of the H^+ excreted in the urine is bound to bicarbonate ion.
FALSE

Bloom's: Level 1. Remember
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105. One response to increased H^+ production in the body is decreased reabsorption of HCO_3^- by the kidneys.
FALSE

Bloom's: Level 1. Remember
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106. In a person with respiratory acidosis, HCO_3^- is actively secreted into the urine by the tubular cells.
FALSE

Bloom's: Level 1. Remember
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107. The kidneys work to rectify metabolic acidosis and alkalosis but have no effect on respiratory acidosis and alkalosis.
FALSE

Bloom's: Level 1. Remember
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108. A compensation for an episode of severe vomiting is an increased alveolar ventilation rate.
FALSE

Bloom's: Level 1. Remember
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109. Diuretic drugs increase the rate of urine formation by stimulating the production of antidiuretic hormone.
FALSE

Bloom's: Level 1. Remember
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110. People taking diuretics that do not spare K^+ should increase their ingestion of Na^+.
FALSE

Bloom's: Level 2. Understand
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