

Essentials of Human Anatomy and Physiology, 11e (Marieb)
Chapter 15 The Urinary System

15.1 Multiple Choice Part I Questions

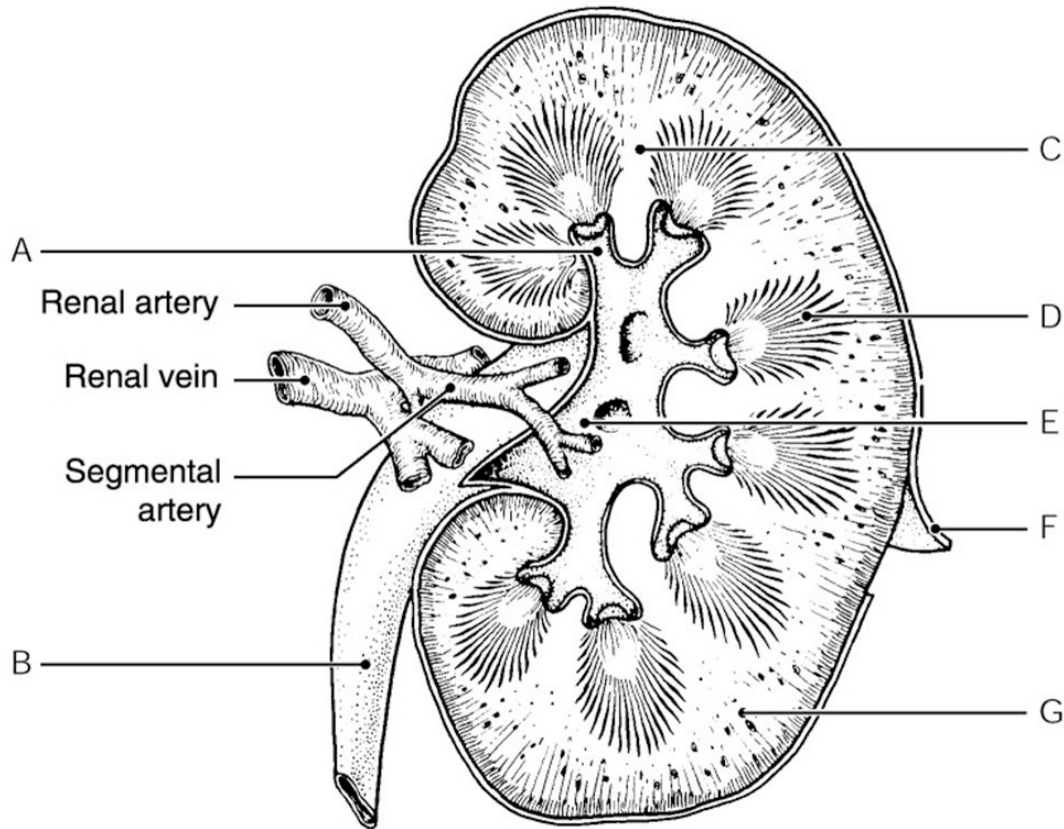


Figure 15.1

Using Figure 15.1, identify the following:

1) The ureter is indicated by _____.

A) Label E

B) Label A

C) Label G

D) Label F

E) Label B

Answer: E

Page Ref: 514

Bloom's: 1) Knowledge

2) The renal cortex is indicated by _____.

- A) Label F
- B) Label G
- C) Label D
- D) Label E
- E) Label A

Answer: B

Page Ref: 514

Bloom's: 1) Knowledge

3) The renal pelvis is indicated by _____.

- A) Label E
- B) Label A
- C) Label G
- D) Label F
- E) Label B

Answer: A

Page Ref: 514

Bloom's: 1) Knowledge

4) A calyx is indicated by _____.

- A) Label G
- B) Label F
- C) Label A
- D) Label B
- E) Label C

Answer: C

Page Ref: 514

Bloom's: 1) Knowledge

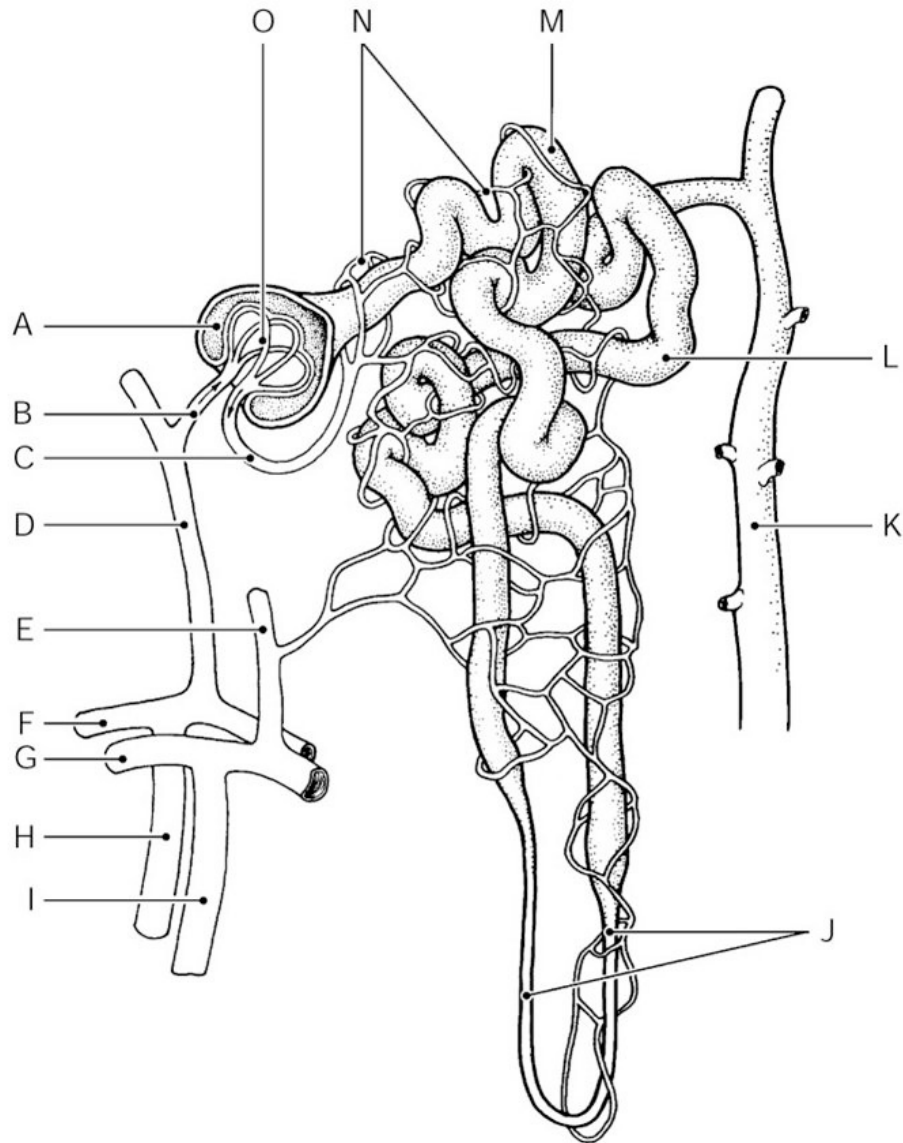


Figure 15.2

Using Figure 15.2, identify the following:

5) The nephron loop, or loop of Henle, is indicated by _____.

- A) Label I
- B) Label J
- C) Label K
- D) Label M
- E) Label O

Answer: B

Page Ref: 515

Bloom's: 1) Knowledge

6) The peritubular capillaries are indicated by _____.

- A) Label N
- B) Label M
- C) Label O
- D) Label L
- E) Label K

Answer: A

Page Ref: 515

Bloom's: 1) Knowledge

7) The glomerular capsule (Bowman's capsule) is indicated by _____.

- A) Label G
- B) Label F
- C) Label A
- D) Label I
- E) Label C

Answer: C

Page Ref: 515

Bloom's: 1) Knowledge

8) The proximal convoluted tubule is indicated by _____.

- A) Label M
- B) Label N
- C) Label O
- D) Label I
- E) Label F

Answer: A

Page Ref: 515

Bloom's: 1) Knowledge

9) The efferent arteriole is indicated by _____.

- A) Label D
- B) Label C
- C) Label L
- D) Label K
- E) Label B

Answer: B

Page Ref: 515

Bloom's: 1) Knowledge

10) The cortical radiate artery is indicated by _____.

- A) Label E
- B) Label A
- C) Label I
- D) Label M
- E) Label D

Answer: E

Page Ref: 515

Bloom's: 1) Knowledge

11) The glomerulus is indicated by _____.

- A) Label F
- B) Label I
- C) Label K
- D) Label O
- E) Label M

Answer: D

Page Ref: 515

Bloom's: 1) Knowledge

12) The medial indentation where the ureter, blood vessels, and nerves are connected to the kidney is called the _____.

- A) renal capsule
- B) renal column
- C) renal pyramid
- D) renal hilum

Answer: D

Page Ref: 513

Bloom's: 1) Knowledge

13) There are three regions of the kidney; the outermost region is known as the _____.

- A) renal medulla
- B) renal cortex
- C) renal pelvis
- D) renal hilum

Answer: B

Page Ref: 513

Bloom's: 1) Knowledge

14) Renal (medullary) pyramids are separated by extensions of cortex-like tissue called the _____.

- A) renal columns
- B) renal pelvis
- C) renal hilum
- D) renal capsule

Answer: A

Page Ref: 513

Bloom's: 1) Knowledge

15) The blood vessel carrying blood from the aorta into the kidney is the _____.

- A) hepatic artery
- B) renal artery
- C) renal vein
- D) glomerulus

Answer: B

Page Ref: 513

Bloom's: 1) Knowledge

16) The functional unit of the kidney that filters blood and forms urine is the _____.

- A) glomerulus
- B) nephron
- C) renal pyramid
- D) renal pelvis

Answer: B

Page Ref: 513

Bloom's: 1) Knowledge

17) The blood vessel directly feeding the glomerulus with blood from the cortical radiate artery is the _____.

- A) peritubular capillary
- B) efferent arteriole
- C) renal vein
- D) afferent arteriole

Answer: D

Page Ref: 514, 515

Bloom's: 1) Knowledge

18) Filtrate formed during glomerular filtration is captured by the _____.

- A) renal pyramid
- B) renal hilum
- C) glomerular (Bowman's) capsule
- D) renal column

Answer: C

Page Ref: 516

Bloom's: 1) Knowledge

19) The process that removes ions such as potassium and hydrogen from the blood and places them into the nephron for removal from the body as urine is known as _____.

- A) glomerular filtration
- B) tubular reabsorption
- C) tubular secretion
- D) osmosis

Answer: C

Page Ref: 518

Bloom's: 1) Knowledge

20) Filtrate contains everything in blood plasma except for _____.

- A) water
- B) blood proteins
- C) solutes
- D) electrolytes

Answer: B

Page Ref: 517

Bloom's: 1) Knowledge

21) Specific gravity is the term used to compare how much heavier urine is than _____.

- A) distilled water
- B) milk
- C) saliva
- D) blood

Answer: A

Page Ref: 519

Bloom's: 1) Knowledge

22) The tube connecting each kidney to the urinary bladder is the _____.

- A) urethra
- B) calyx
- C) ureter
- D) ductus (vas) deferens

Answer: C

Page Ref: 520

Bloom's: 1) Knowledge

23) The smooth triangular region of the urinary bladder base that is outlined by the openings of the two ureters and the urethra is called the _____.

- A) trigone
- B) calyx
- C) pelvis
- D) hilum

Answer: A

Page Ref: 521

Bloom's: 1) Knowledge

24) Inflammation of the urethra is called _____.

- A) pyelonephritis
- B) urethritis
- C) cystitis
- D) glomerulonephritis

Answer: B

Page Ref: 523

Bloom's: 1) Knowledge

25) The involuntary sphincter that keeps the urethra closed when urine is not being passed is called the _____.

- A) external urethral sphincter
- B) internal anal sphincter
- C) internal urethral sphincter
- D) ileocecal sphincter

Answer: C

Page Ref: 523

Bloom's: 1) Knowledge

26) The inability to voluntarily control the external urethral sphincter is known as _____.

- A) incontinence
- B) urinary retention
- C) urgency
- D) hyperplasia

Answer: A

Page Ref: 524

Bloom's: 1) Knowledge

27) The process of emptying the urinary bladder is known as voiding or _____.

- A) urgency
- B) incontinence
- C) micturition
- D) nocturia

Answer: C

Page Ref: 523

Bloom's: 1) Knowledge

28) About two-thirds of body fluid is found within living cells; this fluid is called the _____.

- A) lymph
- B) plasma
- C) extracellular fluid or ECF
- D) intracellular fluid or ICF

Answer: D

Page Ref: 524

Bloom's: 1) Knowledge

29) The driving force for water intake is _____.

- A) metabolism
- B) the thirst mechanism
- C) the renin-angiotensin mechanism
- D) glomerular filtration

Answer: B

Page Ref: 526

Bloom's: 1) Knowledge

30) Highly sensitive cells within the hypothalamus that react to changes in blood composition and cause the release of antidiuretic hormone (ADH) when appropriate are called _____.

- A) thermoreceptors
- B) baroreceptors
- C) mechanoreceptors
- D) osmoreceptors

Answer: D

Page Ref: 526

Bloom's: 1) Knowledge

31) The abnormal condition that results from the lack of ADH release, causing huge amounts of very dilute urine to be voided, is called _____.

- A) diabetes insipidus
- B) glomerulonephritis
- C) diabetes mellitus
- D) urethritis

Answer: A

Page Ref: 527

Bloom's: 1) Knowledge

32) The hormone released by the posterior pituitary to prevent excessive water loss in the urine is _____.

- A) aldosterone
- B) cortisol
- C) antidiuretic hormone (ADH)
- D) insulin

Answer: C

Page Ref: 526

Bloom's: 1) Knowledge

33) Arterial blood pH above 7.45 is considered to be _____.

- A) acidosis
- B) normal
- C) alkalosis
- D) physiological acidosis

Answer: C

Page Ref: 529

Bloom's: 1) Knowledge

34) A strong acid will dissociate and liberate more _____ ions in water than a weak acid.

- A) bicarbonate
- B) hydrogen
- C) sodium
- D) potassium

Answer: B

Page Ref: 530

Bloom's: 1) Knowledge

35) The kidneys can help maintain a rising blood pH by excreting _____ ions and reabsorbing _____ ions by the tubule cells.

- A) bicarbonate; hydrogen
- B) carbon dioxide; oxygen
- C) ammonia; carbonic acid
- D) hydrogen; bicarbonate

Answer: A

Page Ref: 531

Bloom's: 1) Knowledge

36) The need to urinate frequently at night, which plagues over 50% of the elderly, is called _____.

- A) nocturia
- B) incontinence
- C) urgency
- D) cystitis

Answer: A

Page Ref: 533

Bloom's: 1) Knowledge

37) Untreated streptococcal infections in childhood that can lead to the kidney infection characterized by antigen-antibody complexes clogging the glomerular filters is known as _____.

- A) cystitis
- B) hypospadias
- C) urethritis
- D) glomerulonephritis

Answer: D

Page Ref: 533

Bloom's: 1) Knowledge

38) A feeling that it is necessary to void, which is experienced more regularly in the elderly, is known as _____.

- A) urgency
- B) nocturia
- C) frequency
- D) urethritis

Answer: A

Page Ref: 533

Bloom's: 1) Knowledge

15.2 Multiple Choice Part II Questions

1) Which one of the following is NOT one of the functions of the kidneys?

- A) manufacture urine
- B) convert vitamin D from its inactive to its active form
- C) dispose of metabolic waste products
- D) produce hormones that assist in digestion
- E) regulate blood volume

Answer: D

Page Ref: 511

Bloom's: 1) Knowledge

2) Which organ filters blood, regulates blood volume and chemical makeup?

- A) kidney
- B) ureter
- C) liver
- D) urinary bladder
- E) urethra

Answer: A

Page Ref: 511

Bloom's: 1) Knowledge

3) Which one of the following terms describes the location of the kidneys?

- A) suprarenal
- B) retroperineal
- C) adrenal
- D) intraperitoneal
- E) retroperitoneal

Answer: E

Page Ref: 512

Bloom's: 1) Knowledge

4) What region of the kidney is deep to the renal cortex?

- A) renal fascia
- B) renal medulla
- C) renal column
- D) calyx
- E) renal hilum

Answer: B

Page Ref: 513

Bloom's: 1) Knowledge

5) The triangular regions of the kidneys that are striped in appearance and separated by the renal columns are the _____.

- A) renal cortex
- B) renal fascia
- C) renal (medullary) pyramids
- D) renal pelvis
- E) calyces

Answer: C

Page Ref: 513

Bloom's: 1) Knowledge

6) As venous blood is drained from the kidney, which path does it follow _____.

- A) cortical radiate veins, arcuate veins, interlobar veins, renal vein
- B) renal vein, interlobar veins, segmental veins, arcuate veins
- C) arcuate veins, cortical radiate veins, interlobar veins, renal vein
- D) renal vein, segmental veins, interlobar veins, arcuate veins, cortical radiate veins
- E) cortical radiate veins, arcuate veins, interlobar veins, segmental veins, renal vein

Answer: A

Page Ref: 514

Bloom's: 4) Analysis

7) Items in the blood that are NOT filtered will travel from the glomerulus to the _____.

- A) glomerular (Bowman's) capsule
- B) afferent arteriole
- C) efferent arteriole
- D) proximal convoluted tubule
- E) nephron loop (loop of Henle)

Answer: C

Page Ref: 514, 516-517

Bloom's: 2) Comprehension

8) The capillary bed surrounding the renal tubule is the _____.

- A) afferent arteriole
- B) segmental arteries
- C) peritubular capillaries
- D) cortical radiate arteries
- E) glomerular capillaries

Answer: C

Page Ref: 516

Bloom's: 1) Knowledge

9) Starting from the glomerular capsule, the correct order of the renal tubule regions is _____.

- A) proximal convoluted tubule, distal convoluted tubule, nephron loop (loop of Henle)
- B) distal convoluted tubule, nephron loop (loop of Henle), proximal convoluted tubule
- C) nephron loop (loop of Henle), proximal convoluted tubule, distal convoluted tubule
- D) proximal convoluted tubule, nephron loop (loop of Henle), distal convoluted tubule
- E) distal convoluted tubule, proximal convoluted tubule, nephron loop (loop of Henle)

Answer: D

Page Ref: 516

Bloom's: 4) Analysis

10) The portion of the renal tubule closest to the glomerulus is the _____.

- A) collecting duct
- B) proximal convoluted tubule (PCT)
- C) glomerular (Bowman's) capsule
- D) distal convoluted tubule (DCT)
- E) nephron loop (loop of Henle)

Answer: B

Page Ref: 516

Bloom's: 1) Knowledge

11) Most nephrons are located within the renal _____.

- A) pelvis
- B) calyces
- C) medulla
- D) pyramids
- E) cortex

Answer: E

Page Ref: 516

Bloom's: 1) Knowledge

12) The percentage of filtrate eventually reabsorbed into the bloodstream is closest to _____.

- A) 10%
- B) 25%
- C) 50%
- D) 80%
- E) 99%

Answer: E

Page Ref: 516

Bloom's: 1) Knowledge

13) Of the capillary beds associated with each nephron, the one that is both fed and drained by arterioles is the _____.

- A) peritubular capillaries
- B) pyramidal capillaries
- C) glomerulus
- D) Henle capillaries
- E) Bowman's capillaries

Answer: C

Page Ref: 516

Bloom's: 1) Knowledge

14) Filtrate typically does NOT contain _____.

- A) water
- B) blood proteins
- C) glucose
- D) ions
- E) amino acids

Answer: B

Page Ref: 516-517

Bloom's: 1) Knowledge

15) The nonselective, passive process performed by the glomerulus that forms blood plasma without blood proteins is called _____.

- A) micturition
- B) tubular secretion
- C) glomerular filtration
- D) tubular reabsorption
- E) glomerular reabsorption

Answer: C

Page Ref: 516-517

Bloom's: 1) Knowledge

16) Nitrogenous waste products, such as urea and uric acid, are _____.

- A) filtered and usually reabsorbed
- B) filtered but poorly reabsorbed
- C) not filtered
- D) not filtered but often reabsorbed
- E) only secreted

Answer: B

Page Ref: 517

Bloom's: 1) Knowledge

17) Which one of the following is NOT a substance typically reabsorbed by the tubules under normal healthy conditions?

- A) glucose
- B) urea
- C) amino acids
- D) sodium
- E) water

Answer: B

Page Ref: 517

Bloom's: 1) Knowledge

18) In a 24-hour period, a typical volume of urine production is _____.

- A) 0.5 L
- B) 0.9 L
- C) 1.4 L
- D) 2.0 L
- E) 3.4 L

Answer: C

Page Ref: 519

Bloom's: 1) Knowledge

19) Which one of the following substances is normally found in urine?

- A) blood proteins
- B) red blood cells
- C) hemoglobin
- D) white blood cells
- E) creatinine

Answer: E

Page Ref: 519

Bloom's: 1) Knowledge

20) Determine the possible cause of bile pigments in the urine _____.

- A) diabetes mellitus
- B) kidney infection
- C) hypertension
- D) kidney stones
- E) liver disease

Answer: E

Page Ref: 520

Bloom's: 3) Application

21) Dilute urine would have a specific gravity closest to _____.

- A) 0.005
- B) 1.001
- C) 1.010
- D) 1.020
- E) 1.030

Answer: B

Page Ref: 519

Bloom's: 1) Knowledge

22) Renal calculi can lead to _____.

- A) hematuria
- B) diabetes mellitus
- C) bilirubinuria
- D) ketonuria
- E) hepatitis

Answer: A

Page Ref: 520

Bloom's: 1) Knowledge

23) Why is the trigone of the urinary bladder clinically important?

- A) The trigone is longer in males than in females.
- B) Infections tend to persist in the trigone.
- C) Females have a trigone but males lack the trigone.
- D) The prostate gland is present in males in the trigone.
- E) Both sperm and urine pass through the trigone in males.

Answer: B

Page Ref: 521

Bloom's: 2) Comprehension

24) The urinary bladder is able to expand as urine accumulates within it due to the presence of _____.

- A) simple squamous epithelium
- B) transitional epithelium
- C) stratified squamous epithelium
- D) pseudostratified epithelium
- E) sphincters

Answer: B

Page Ref: 521

Bloom's: 1) Knowledge

25) Urine is transported from the urinary bladder to the outside of the body by the _____.

- A) ureter
- B) trigone
- C) prostate gland
- D) urethra
- E) collecting duct

Answer: D

Page Ref: 523

Bloom's: 1) Knowledge

26) The average adult urinary bladder is moderately full with _____ of urine within it.

- A) 100 mL
- B) 500 mL
- C) 1 liter
- D) 2 liters
- E) 1 gallon

Answer: B

Page Ref: 523

Bloom's: 1) Knowledge

27) The voluntarily controlled sphincter fashioned by skeletal muscle at the point where the urethra passes through the pelvic floor is called the _____.

- A) internal urethral sphincter
- B) internal anal sphincter
- C) external urethral sphincter
- D) trigone
- E) detrusor sphincter

Answer: C

Page Ref: 523

Bloom's: 1) Knowledge

28) The process of emptying the urinary bladder is referred to as voiding or _____.

- A) nocturia
- B) filtration
- C) urethritis
- D) incontinence
- E) micturition

Answer: E

Page Ref: 523

Bloom's: 1) Knowledge

29) In males, the urethra is part of both the urinary system and _____.

- A) endocrine system
- B) digestive system
- C) immune system
- D) respiratory system
- E) reproductive system

Answer: E

Page Ref: 523

Bloom's: 1) Knowledge

30) The micturition reflex forces urine into the upper part of the _____.

- A) urethra
- B) ureter
- C) urinary bladder
- D) kidney
- E) rectum

Answer: A

Page Ref: 523

Bloom's: 2) Comprehension

31) In one 24-hour period, the kidneys of an average-sized healthy adult filter approximately _____ through their glomeruli into the tubules.

- A) 10-15 liters of blood plasma
- B) 50-75 liters of blood plasma
- C) 100-125 liters of blood plasma
- D) 150-180 liters of blood plasma
- E) 200-240 liters of blood plasma

Answer: D

Page Ref: 519

Bloom's: 1) Knowledge

32) Who has the highest percentage of water in the body?

- A) adult male
- B) adult female
- C) infant
- D) elderly female
- E) elderly male

Answer: C

Page Ref: 524

Bloom's: 1) Knowledge

33) Which one of the following is NOT one of the major roles of the kidneys in normal healthy adults?

- A) excretion of nitrogen-containing wastes
- B) maintenance of water balance of the blood
- C) maintenance of electrolyte balance of the blood
- D) conversion of ammonia to bicarbonate ion
- E) ensuring proper blood pH

Answer: D

Page Ref: 524

Bloom's: 1) Knowledge

34) Which of the following is the major stimulus for the thirst mechanism?

- A) hunger
- B) decreased urination
- C) increased osmolarity of blood plasma
- D) defecation
- E) increased saliva production

Answer: C

Page Ref: 527

Bloom's: 1) Knowledge

35) Extracellular fluid is found everywhere in the body EXCEPT _____.

- A) within living cells
- B) blood plasma
- C) interstitial fluid
- D) cerebrospinal fluid
- E) humors of the eye and lymph

Answer: A

Page Ref: 524

Bloom's: 1) Knowledge

36) The main hormone that acts on the kidneys to regulate sodium ion concentration of the extracellular fluid (ECF) is _____.

- A) ADH
- B) renin
- C) secretin
- D) aldosterone
- E) epinephrine

Answer: D

Page Ref: 527

Bloom's: 1) Knowledge

37) Antidiuretic hormone prevents excessive water loss by promoting water reabsorption in the _____.

- A) glomerulus
- B) proximal convoluted tubule
- C) distal convoluted tubule
- D) collecting duct
- E) urinary bladder

Answer: D

Page Ref: 526

Bloom's: 1) Knowledge

38) Aldosterone does NOT directly or indirectly regulate _____.

- A) sodium
- B) chlorine
- C) magnesium
- D) potassium
- E) glucose

Answer: E

Page Ref: 527

Bloom's: 1) Knowledge

39) What stimulates the release of renin from the juxtaglomerular (JG) apparatus?

- A) high blood pressure
- B) high blood sodium levels
- C) low blood pressure
- D) low blood potassium levels
- E) high blood volume

Answer: C

Page Ref: 528, 529

Bloom's: 1) Knowledge

- 40) What role does angiotensin II play in restoring blood pressure to normal?
- A) Angiotensin II promotes tubular reabsorption of sodium from the filtrate.
 - B) Angiotensin II promotes tubular reabsorption of both sodium and water from the filtrate.
 - C) Angiotensin II causes blood vessels to vasoconstrict.
 - D) Angiotensin II promotes tubular reabsorption of water from the filtrate.
 - E) Angiotensin II causes blood vessels to vasodilate.

Answer: C

Page Ref: 529

Bloom's: 1) Knowledge

- 41) The chemical buffer system that includes carbonic acid and its salt, which ties up the H^+ released by strong acids, is called the _____.

- A) phosphate buffer system
- B) protein buffer system
- C) ionic buffer system
- D) bicarbonate buffer system
- E) carbonic buffer system

Answer: D

Page Ref: 530

Bloom's: 1) Knowledge

- 42) Which of these chemicals dissociates completely and liberates all the hydrogen ions when dissolved in water?

- A) strong acids
- B) weak acids
- C) neutral substances
- D) weak bases
- E) strong bases

Answer: A

Page Ref: 530

Bloom's: 1) Knowledge

- 43) Which system removes excess carbon dioxide from the blood?

- A) urinary system
- B) respiratory system
- C) digestive system
- D) cardiovascular system
- E) endocrine system

Answer: B

Page Ref: 530-531

Bloom's: 1) Knowledge

44) When blood pH begins to rise, the respiratory control centers in the brain are _____.

- A) accelerated
- B) depressed
- C) not effected
- D) shut off
- E) controlled by the kidneys

Answer: B

Page Ref: 531

Bloom's: 1) Knowledge

45) How does the urinary system respond to blood that has become acidic?

- A) secrete more hydrogen ions only
- B) breathing rate increases
- C) reabsorb more bicarbonate ions only
- D) breathing rate decreases
- E) both secrete more hydrogen ions and reabsorb more bicarbonate ions

Answer: E

Page Ref: 531

Bloom's: 1) Knowledge

46) The need to get up during the night to urinate is called _____.

- A) hypospadias
- B) frequency
- C) nocturia
- D) urgency
- E) glomerulonephritis

Answer: C

Page Ref: 533

Bloom's: 1) Knowledge

47) The degenerative condition in which blisterlike sacs (cysts) containing urine form on the kidneys and obstruct urine drainage is called _____.

- A) cystitis
- B) dysuria
- C) hypospadias
- D) epispadias
- E) polycystic kidney

Answer: E

Page Ref: 533

Bloom's: 1) Knowledge

48) Hypospadias is a condition of male children that involves _____.

- A) atrophied prostate
- B) opening of the urethra on the ventral surface of the penis
- C) cysts on the kidneys
- D) closing of the foreskin over the end of the penis
- E) inflammation of the glomerulus

Answer: B

Page Ref: 533

Bloom's: 1) Knowledge

49) Childhood streptococcal infections that go untreated can lead to _____.

- A) renal calculi
- B) glomerulonephritis
- C) urethritis
- D) cystitis
- E) nocturia

Answer: B

Page Ref: 533

Bloom's: 1) Knowledge

50) Control of the voluntary urethral sphincter in normal children is related to _____.

- A) intelligence
- B) nervous system development
- C) enzymatic regulation
- D) hormone regulation
- E) muscular development

Answer: B

Page Ref: 533

Bloom's: 1) Knowledge

51) From childhood through late middle age, one of the most common bacteria to infect and inflame the urinary tract and cause urethritis and cystitis is _____.

- A) streptococcus
- B) staphylococcus
- C) *Escherichia coli*
- D) *Mycobacterium tuberculosis*
- E) *Clostridium botulinum*

Answer: C

Page Ref: 533

Bloom's: 1) Knowledge

15.3 True/False Questions

1) The kidneys are situated in a retroperitoneal position and found between the T₁₂ and L₃ vertebrae.

Answer: TRUE

Page Ref: 512

Bloom's: 1) Knowledge

2) The structural and functional units of the kidney are the renal (medullary) pyramids.

Answer: FALSE

Page Ref: 513

Bloom's: 1) Knowledge

3) The lumen surfaces of the tubule cells within the proximal convoluted tubule are covered with microvilli.

Answer: TRUE

Page Ref: 516

Bloom's: 1) Knowledge

4) The region of the renal tubule closest to the glomerular capsule is the distal convoluted tubule.

Answer: FALSE

Page Ref: 516

Bloom's: 1) Knowledge

5) The peritubular capillary bed arises from the afferent arteriole.

Answer: FALSE

Page Ref: 516

Bloom's: 1) Knowledge

6) Blood proteins and blood cells are too large to pass through the filtration membrane and should not be found in filtrate.

Answer: TRUE

Page Ref: 517

Bloom's: 1) Knowledge

7) Tubular reabsorption begins in the glomerulus.

Answer: FALSE

Page Ref: 517

Bloom's: 1) Knowledge

8) Most reabsorption occurs in the proximal convoluted tubule of the nephron.

Answer: TRUE

Page Ref: 518

Bloom's: 1) Knowledge

9) Tubular secretion moves items from the blood of the peritubular capillaries to the filtrate for elimination in the urine.

Answer: TRUE

Page Ref: 518

Bloom's: 1) Knowledge

10) A diet rich in proteins such as eggs, cheese, and whole-wheat products produces urine with an alkaline pH.

Answer: FALSE

Page Ref: 519

Bloom's: 1) Knowledge

11) Urine has a specific gravity closest to 1.001 when excessive fluids are consumed.

Answer: TRUE

Page Ref: 519

Bloom's: 1) Knowledge

12) Urine moves down the ureters into the urinary bladder due to gravitational pull alone.

Answer: FALSE

Page Ref: 520

Bloom's: 1) Knowledge

13) Urine may routinely contain sodium, potassium, proteins, and red blood cells.

Answer: FALSE

Page Ref: 519

Bloom's: 1) Knowledge

14) The urethra, which carries urine exiting the urinary bladder by peristalsis, is typically shorter in females than in males.

Answer: TRUE

Page Ref: 523

Bloom's: 1) Knowledge

15) The involuntary internal urethral sphincter is composed of skeletal muscle.

Answer: FALSE

Page Ref: 523

Bloom's: 1) Knowledge

16) The fluid stored inside cells is referred to as extracellular fluid (ECF).

Answer: FALSE

Page Ref: 524

Bloom's: 1) Knowledge

17) Excess blood plasma in the bloodstream initiates the thirst mechanism to restore fluid balance.

Answer: FALSE

Page Ref: 526

Bloom's: 3) Application

18) Antidiuretic hormone (ADH) causes increased water loss through the urine.

Answer: FALSE

Page Ref: 526

Bloom's: 1) Knowledge

19) The most important trigger for aldosterone release is the renin-angiotensin mechanism, mediated by the renal tubules.

Answer: TRUE

Page Ref: 529

Bloom's: 1) Knowledge

20) Blood buffers are important in maintaining blood pressure.

Answer: FALSE

Page Ref: 529-530

Bloom's: 1) Knowledge

21) The bicarbonate buffer system prevents changes in blood pH through the action of carbonic acid and its salt, sodium bicarbonate.

Answer: TRUE

Page Ref: 530

Bloom's: 1) Knowledge

22) When blood pH becomes too acidic, the tubule cells of the kidneys excrete bicarbonate ions and retain hydrogen ions.

Answer: FALSE

Page Ref: 531

Bloom's: 3) Application

23) Sexually transmitted infections (STIs) are primarily infections of the reproductive tracts but may also cause urinary tract infections.

Answer: TRUE

Page Ref: 533

Bloom's: 1) Knowledge

24) Incontinence is often the final outcome of the urinary system during the aging process.

Answer: TRUE

Page Ref: 533

Bloom's: 1) Knowledge

15.4 Matching Questions

Identify the process that occurs in the kidney.

- A) tubular reabsorption
- B) glomerular filtration
- C) tubular secretion

1) Water and solutes are forced from the blood into the glomerular capsule of the nephron

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Bloom's: 1) Knowledge

2) Water, glucose, amino acids, and needed ions are moved from the filtrate back into the blood

Page Ref: 517

Bloom's: 1) Knowledge

3) Aldosterone promotes sodium and thus water to move from the filtrate through the tubule cells into the blood

Page Ref: 517, 527

Bloom's: 1) Knowledge

4) Antidiuretic hormone (ADH) promotes the movement of water from the filtrate back into the blood of the peritubular capillaries

Page Ref: 517, 526

Bloom's: 1) Knowledge

5) Unneeded substances such as potassium, urea, and creatinine are moved from the blood of the peritubular capillaries into the filtrate

Page Ref: 518

Bloom's: 1) Knowledge

6) Opposite process to tubular reabsorption

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Bloom's: 1) Knowledge

Answers: 1) B 2) A 3) A 4) A 5) C 6) C

Identify the urinary structure with its associated description:

- A) renal vein
- B) renal medulla
- C) calyces
- D) renal pelvis
- E) renal (medullary) pyramids
- F) renal columns
- G) renal cortex

7) Cup-shaped extensions of the pelvis that enclose the tips of the renal (medullary) pyramids

Page Ref: 513

Bloom's: 1) Knowledge

8) Outer, lighter region of the kidney

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Bloom's: 1) Knowledge

9) Blood is transported away from the kidney in this vessel

Page Ref: 513

Bloom's: 1) Knowledge

10) Cortex-like extensions that separate the renal (medullary) pyramids

Page Ref: 513

Bloom's: 1) Knowledge

11) Darker, reddish-brown internal area of the kidney

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Bloom's: 1) Knowledge

12) Triangular regions with a striped appearance

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Bloom's: 1) Knowledge

13) Flat, basinlike cavity medial to the renal hilum of the kidney

Page Ref: 513

Bloom's: 1) Knowledge

Answers: 7) C 8) G 9) A 10) F 11) B 12) E 13) D

Identify these organs of the urinary system with their associated descriptions:

- A) ureter
- B) urethra
- C) urinary bladder

14) Tube that drains urine from the kidney to the urinary bladder

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Bloom's: 1) Knowledge

15) Muscular sac suitable for temporary urine storage

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Bloom's: 1) Knowledge

16) Transports urine and sperm in males

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Bloom's: 1) Knowledge

17) Contains three layers of smooth muscle known as the detrusor muscle

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Bloom's: 1) Knowledge

18) Contains an area called the trigone formed by the openings of the ureters and urethra

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Bloom's: 1) Knowledge

19) Micturition reflex causes this organ to go into contractions

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Bloom's: 1) Knowledge

Answers: 14) A 15) C 16) B 17) C 18) C 19) C

15.5 Essay Questions

1) Explain how tubular reabsorption and tubular secretion are nearly opposite processes.

Answer: Tubular reabsorption is the process by which the body reclaims substances within the filtrate that it wants to keep. Most reabsorption is an active process using membrane carriers. Substances that are typically reabsorbed include amino acids, glucose, and ions. Most reabsorption occurs in the proximal convoluted tubules. Tubular secretion is the opposite process. With secretion, substances such as hydrogen ions, potassium ions, and creatinine are removed from the peritubular capillaries into the tubules to be eliminated in urine.

Page Ref: 517-518

Bloom's: 2) Comprehension

2) Describe the normal characteristics of freshly-voided urine in a healthy adult.

Answer: Urine is a pale, straw-colored liquid that progressively becomes a darker yellow color as it becomes more concentrated. The yellow color is a result of the presence of urochrome pigment, a by-product of hemoglobin breakdown. Urine is more concentrated than water with a specific gravity that ranges from 1.001 at its most dilute to 1.035 at its most concentrated. Urine is sterile and slightly aromatic. Urine often has an acidic pH of around 6 but can be either acidic or basic depending on metabolism or diet. Urine normally contains water, sodium and potassium ions, urea, uric acid, creatinine, ammonia, and bicarbonate ions, as well as other ions that the body needs to dispose.

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Bloom's: 2) Comprehension

3) Trace the pathway of a red blood cell through the kidney from the renal artery to the renal vein.

Answer: Red blood cells are not filtered by the glomerulus since they are too large to pass through the filtration membrane. Instead, red blood cells travel through the renal artery, segmental artery, interlobar artery, arcuate artery, cortical radiate artery, afferent arteriole, glomerulus, and on to the efferent arteriole. Then, the red blood cell continues its travels to the peritubular capillaries and exits the kidney via the cortical radiate vein, arcuate vein, interlobar vein, and the renal vein.

Page Ref: 514

Bloom's: 4) Analysis

4) Compare and contrast filtrate from blood plasma.

Answer: Filtrate and blood plasma both contain water and solutes. Filtrate is essentially blood plasma without the blood proteins. However, filtrate differs from blood plasma since blood proteins are too large to fit through the filtration membrane of the glomerulus.

Page Ref: 516-517

Bloom's: 4) Analysis

5) Explain the renin-angiotensin mechanism.

Answer: The renin-angiotensin mechanism is the most important trigger for the release of aldosterone. It is mediated by the juxtaglomerular (JG) apparatus of the renal tubules. The JG apparatus consists of modified smooth muscle cells that are stimulated by low blood pressure within the afferent arteriole or changes in solute content of the filtrate. The JG cells respond to these changes by releasing renin into the blood. Renin catalyzes reactions that lead to angiotensin II production, which then acts directly on the blood vessels to cause vasoconstriction as well as aldosterone release. Aldosterone then causes the reabsorption of sodium and water, leading to increased blood volume and blood pressure.

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Bloom's: 2) Comprehension

6) Describe how the bicarbonate buffer system functions to maintain pH.

Answer: The bicarbonate buffer system utilizes carbonic acid and its salt, sodium bicarbonate. When blood is too acidic, the bicarbonate ions of the salt act as a base and tie up more hydrogen ions. Thus, more carbonic acid is formed. A strong acid is changed to a weak acid which has less of an effect on pH. Under alkaline conditions, carbonic acid releases more hydrogen ions to bind with the hydroxide ions released by the strong base. A strong base is changed to a weak base which has less of an effect on pH.

Page Ref: 530

Bloom's: 2) Comprehension