Chapter 15: The Urinary System

Short Answer

Using Figure 15.1, identify the following:

1) The ureter is indicated by letter __________.

2) The renal pyramid is indicated by letter __________.

3) The fibrous capsule is indicated by letter __________.

4) The renal column is indicated by letter __________.
Using Figure 15.2, identify the following:

5) The loop of Henle is indicated by letter __________.

6) The collecting duct is indicated by letter __________.

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

8) The proximal convoluted tubule is indicated by letter __________.

9) The afferent arteriole is indicated by letter __________.

10) The arcuate vein is indicated by letter __________.

11) The glomerulus is indicated by letter __________.
Multiple Choice

12) 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

13) Which of the following is NOT an organ found in the urinary system:
   A) kidney
   B) ureter
   C) pancreas
   D) urinary bladder
   E) urethra

14) Which one of the following terms describes the location of the kidneys:
   A) suprarenal
   B) retroperineal
   C) adrenal
   D) intraperitoneal
   E) retroperitoneal

15) The kidneys are aided in the excretion of fluids by the:
   A) lungs
   B) skin
   C) hair
   D) lungs and skin
   E) skin and hair

16) The triangular regions of the kidneys that are striped in appearance and separated by the renal columns are:
   A) renal cortex
   B) renal medulla
   C) renal pyramids
   D) renal pelvis
   E) calyces

17) 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
18) The enlarged, cup-shaped closed end of the renal tubule that completely surrounds the glomerulus is called the:
   A) collecting duct
   B) proximal convoluted tubule
   C) loop of Henle
   D) Bowman's capsule
   E) distal convoluted tubule

19) Each kidney contains about:
   A) 100,000 nephrons
   B) 500,000 nephrons
   C) 1 million nephrons
   D) 2 million nephrons
   E) 3 million nephrons

20) Starting from the glomerular capsule, the correct order of the renal tubule regions is:
   A) proximal convoluted tubule, distal convoluted tubule, loop of Henle
   B) distal convoluted tubule, loop of Henle, proximal convoluted tubule
   C) loop of Henle, proximal convoluted tubule, distal convoluted tubule
   D) proximal convoluted tubule, loop of Henle, distal convoluted tubule
   E) distal convoluted tubule, proximal convoluted tubule, loop of Henle

21) The portion of the renal tubule that completely surrounds the glomerulus is the:
   A) collecting duct
   B) proximal convoluted tubule (PCT)
   C) glomerular (Bowman's) capsule
   D) distal convoluted tubule (DCT)
   E) loop of Henle

22) Most nephrons are located within the renal:
   A) pelvis
   B) calyces
   C) medulla
   D) pyramids
   E) cortex

23) The percentage of filtrate eventually reabsorbed into the bloodstream is closest to:
   A) 10%
   B) 25%
   C) 50%
   D) 80%
   E) 99%
24) 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

25) The peritubular capillaries arise from the ___________, which drains the glomerulus.
   A) afferent arteriole
   B) efferent arteriole
   C) Bowman's capsule
   D) loop of Henle
   E) glomerulus

26) The nonselective, passive process performed by the glomerulus that forms blood plasma without blood proteins is called:
   A) absorption
   B) secretion
   C) filtration
   D) tubular reabsorption
   E) glomerular reabsorption

27) Uric acid, a nitrogenous waste product, results from the metabolism of:
   A) creatinine
   B) nucleic acids
   C) proteins
   D) amino acids
   E) salt

28) 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
29) Which one of the following is NOT true of urine under normal healthy conditions:
   A) it is sterile
   B) it is slightly alkaline
   C) it is more dense than water
   D) it is slightly aromatic
   E) it typically contains ammonia

30) 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

31) The presence of pus in urine is called:
   A) glycosuria
   B) pyuria
   C) bilirubinuria
   D) hematuria
   E) proteinuria

32) Dilute urine would have a specific gravity closest to:
   A) 0.005
   B) 1.001
   C) 1.010
   D) 1.020
   E) 1.030

33) The tube connecting the renal hilus of the kidney to the bladder is the:
   A) urethra
   B) proximal convoluted tubule
   C) distal convoluted tubule
   D) ureter
   E) collecting duct

34) The noninvasive treatment for kidney stones that uses ultrasound waves to shatter calculi is called:
   A) lithotripsy
   B) lithiasis
   C) lithectomy
   D) lithotomy
   E) lithoscopy
35) The bladder is able to expand as urine accumulates within it due to the presence of:
   A) rugae
   B) transitional epithelium
   C) segmentation
   D) pseudostratified epithelium
   E) sphincters

36) Urine is transported from the bladder to the outside of the body by the:
   A) ureter
   B) trigone
   C) prostate gland
   D) urethra
   E) collecting duct

37) The average adult bladder is moderately full with _________ of urine within it.
   A) 100 mL
   B) 500 mL
   C) 1 liter
   D) 2 liters
   E) 1 gallon

38) 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

39) The process of emptying the bladder is referred to as voiding or:
   A) tubular secretion
   B) filtration
   C) tubular reabsorption
   D) incontinence
   E) micturition

40) Which one of the following is NOT true of incontinence:
   A) it occurs when we are unable to voluntarily control the external sphincter
   B) it is normal in children 2 years old or younger
   C) it is normal in older children who sleep soundly
   D) it can result from pressure on the bladder
   E) it is never considered normal
41) Enlargement of the prostate that surrounds the neck of the bladder in adult men is called __________, which may cause voiding difficulty.
   A) atrophy
   B) dystrophy
   C) hyperplasia
   D) hypoplasia
   E) eutrophy

42) 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

43) In contrasting urine and filtrate by the time it reaches the collecting ducts, it could be said that:
   A) they contain essentially the same concentration of nutrients
   B) they contain essentially the same amount of water
   C) filtrate contains almost everything that blood plasma does
   D) urine contains almost everything that blood plasma does
   E) filtrate contains more unnecessary substances than urine

44) 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

45) In a healthy young adult female, water accounts for:
   A) one-quarter of body weight
   B) less than one-half of body weight
   C) approximately one-half of body weight
   D) three-quarters of body weight
   E) 99% of body weight
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

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

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) bladder

A simple rule concerning water and electrolyte regulation is:
A) salt passively follows water
B) salt actively follows water
C) potassium passively follows sodium
D) water passively follows salt
E) water actively follows salt

The results of the renin-angiotensin mechanism mediated by the juxtaglomerular apparatus of the renal tubules include all of the following EXCEPT:
A) vasoconstriction
B) increased peripheral resistance
C) blood volume increase
D) blood pressure increase
E) suppression of aldosterone
51) The proper pH for the blood is:
   A) 6.8-6.9
   B) 7.0-7.35
   C) 7.35-7.45
   D) 7.5-8.0
   E) 6.5-8.0

52) 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

53) The chemically buffered combination of strong acids that dissociate completely in water with weak bases such as hydroxides leads to a:
   A) weak acid and a salt
   B) weak acid and a strong base
   C) strong base and a salt
   D) weak base and water
   E) weak base and salt

54) When carbon dioxide enters the blood from tissue cells, it is converted to ________ for transport within blood plasma.
   A) sodium hydroxide
   B) ammonia
   C) carbonic anhydrase
   D) bicarbonate ion
   E) sodium bicarbonate

55) 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
56) The most potent of all mechanisms and substances that the body uses to regulate blood pH are:
   A) the respiratory system controls
   B) the kidneys
   C) hormones
   D) the buffer system
   E) enzymes

57) Functional kidneys develop within the womb by the third month after conception from the ________ set of tubule systems.
   A) first
   B) second
   C) third
   D) fourth
   E) fifth

58) The degenerative condition in which blister-like 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

59) 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

60) The average output of urine for a normal healthy adult is:
   A) 500 mL/day
   B) 1000 mL/day
   C) 1500 mL/day
   D) 2000 mL/day
   E) 2500 mL/day
61) 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

62) 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

True/False

63) The medial indentation of the kidney where several structures such as the ureters,
    renal blood vessels, and nerves enter and exit the kidney is called the hilus.

64) The tiny filtering structures of the kidneys are called nephrons

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

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

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

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

69) Tubular reabsorption begins in the glomerulus.

70) Nitrogenous waste products such as urea, uric acid, and creatinine are excreted from
    the body in urine rather than reabsorbed.

71) The pigment that gives urine its characteristic yellow color is urochrome.

72) The specific gravity of urine is typically lower than the specific gravity of pure water.
73) Tubular secretion, which seems to be important for removal of substances not already in the filtrate, is essentially reabsorption in reverse.

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

75) The internal urethral sphincter is involuntary.

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

77) Following the micturition reflex, it is impossible to postpone bladder emptying.

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

79) The movement of water from one fluid compartment to another has no effect on blood volume and blood pressure.

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

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

82) A person with arterial blood pH above 7.45 is said to have acidosis.

83) The kidneys help maintain acid-base balance of the blood by excreting bicarbonate ions.

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

85) Sexually transmitted diseases (STDs) are primarily infections of the reproductive tracts but may also cause urinary tract infections.

86) Incontinence is often the final outcome of the urinary system during the aging process.
Matching
Identify the substances within the urine and their possible causes with the name of the associated condition:

_____ 87) RBCs in the urine due to trauma or infection
A) proteinuria
B) uremia
C) dysuria
D) hemoglobinuria
E) hematuria
F) bilirubinuria
G) anuria
H) glycosuria
I) pyuria

_____ 88) Hemoglobin in the urine due to hemolytic anemia or a transfusion reaction

_____ 89) Glucose in the urine due to diabetes mellitus

_____ 90) Bile pigment in the urine due to hepatitis

_____ 91) Pus containing WBCs and bacteria in the urine due to urinary tract infection

_____ 92) Proteins in the urine due to pregnancy or excessive exercise

Identify the urinary structure with its associated description:

_____ 93) Cup-shaped extensions of the pelvis
A) pyramids
B) calyces
C) renal cortex
D) renal columns
E) renal pelvis
F) renal vein
G) renal artery
H) renal medulla
I) renal pyramids

_____ 94) Outer, lighter region of the kidney

_____ 95) Vessels supplying each kidney with blood to be filtered

_____ 96) Cortex-like extensions that separate the pyramids

_____ 97) Darker, reddish-brown internal area of the kidney

_____ 98) Triangular regions with a striped appearance

_____ 99) Flat, basin-like cavity medial to the hilus of the kidney

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

_____ 100) Tube that drains urine from the kidney to the bladder
A) bladder
B) ureter
C) urethra

_____ 101) Muscular sac suitable for temporary urine storage

_____ 102) Transports urine and sperm in males

_____ 103) In males, this organ is surrounded by the prostate

_____ 104) Contains an area called the trigone formed by the openings of the ureters and urethra

_____ 105) Inflammation of this organ is called cystitis