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Urinary System

I. Introduction to the Urinary System

☞ *Concept:* The urinary system maintains the composition and properties of the body fluid that establishes the internal environment of the body cells. The end product of the urinary system is urine, which is voided from the body during micturition.

A. Multiple Choice Questions

- ___ 1. The body system that does *not* have an excretory function is
(a) the respiratory system. (d) the integumentary system.
(b) the lymphatic system. (e) the digestive system.
(c) the urinary system.
- ___ 2. Micturition is
(a) the voiding of urine from the urinary bladder.
(b) the filtration of urine from the blood.
(c) the concentration of urine within the nephrons.
(d) the storage of urine within the urinary bladder.
- ___ 3. During normal resting conditions, the kidneys receive approximately ___ of the cardiac output.
(a) 5%–7% (c) 20%–25%
(b) 15%–20% (d) 45%–50%

B. True–False Questions

- ___ 1. Urea and creatinine are toxic metabolic products excreted by the urinary system.
- ___ 2. Of all the organs of the urinary system, only the urinary bladder is unpaired.
- ___ 3. Every minute, the renal arteries transport approximately 1,200 ml of blood to the kidneys for filtration.

II. Kidneys

☞ *Concept:* The kidney consists of an outer renal cortex and an inner renal medulla that contains the renal pyramids. Urine is formed as a filtrate from the blood at the nephrons and collects in the calyces and renal pelvis before flowing from the kidney via the ureter.

A. Multiple Choice Questions

- ___ 1. Which of the following statements concerning the kidneys is *false*?
(a) They are retroperitoneal.
(b) They each contain 8 to 15 renal pyramids.
(c) They each have distinct cortical and medullary regions.
(d) They are positioned between the third and fifth lumbar vertebrae.

- _____ 2. Which of the following is *not* one of the three supportive layers surrounding the kidney?
 (a) parietal peritoneum (c) renal adipose capsule
 (b) renal capsule (d) renal fascia
- _____ 3. Which of the following is the correct sequence in which urine flows through kidney toward the urinary bladder?
 (a) the renal pelvis, major calyx, minor calyx, urinary tubule, and ureter.
 (b) the urinary tubule, minor calyx, major calyx, renal pelvis, and ureter.
 (c) the minor calyx, major calyx, urinary tubule, renal pelvis, and ureter.
 (d) the urinary tubule, major calyx, minor calyx, ureter, and renal pelvis.
- _____ 4. Blood vessels are at a capillary level within
 (a) the afferent arterioles. (d) the glomeruli.
 (b) the urinary tubule. (e) the nephron loops.
 (c) the interlobar vessels.
- _____ 5. Arterial blood flowing toward the nephron passes in sequence through
 (a) the renal artery, interlobar artery, arcuate artery, interlobular artery, afferent arteriole, and glomerulus.
 (b) the renal artery, arcuate artery, interlobar artery, interlobular artery, afferent arteriole, and glomerulus.
 (c) the renal artery, interlobular artery, interlobar artery, arcuate artery, afferent arteriole, and glomerulus.
 (d) the arcuate artery, renal artery, interlobar artery, interlobular artery, afferent arteriole, and glomerulus.
- _____ 6. All of the following structures are located within the renal cortex *except*
 (a) the glomerulus. (c) the proximal convoluted tubule.
 (b) the nephron loop. (d) the glomerular capsule.

B. True–False Questions

- _____ 1. The kidneys are yellowish in color due to the urine content.
- _____ 2. The kidneys are located within the peritoneal cavity at the level of the twelfth ribs.
- _____ 3. Renal ptosis is potentially dangerous because it may cause the ureter to kink.
- _____ 4. The glomerulus is considered the basic functional unit of the kidney.
- _____ 5. The convoluted tubules of the nephron are composed of simple squamous epithelium to facilitate molecular exchange.
- _____ 6. Juxtamedullary nephrons and cortical nephrons differ only with regard to their positions in the kidney.

III. Ureters, Urinary Bladder, and Urethra

☞ *Concept:* Urine is channeled from the kidneys to the urinary bladder by the ureters and expelled from the body through the urethra. The mucosa of the urinary bladder permits distension, and the muscles of the urinary bladder and urethra function in the control of micturition.

A. Multiple Choice Questions

- _____ 1. Which of the following statements concerning the ureters is *false*?
 (a) They are positioned within the peritoneal cavity.
 (b) They are composed of three tunics.
 (c) Muscular peristaltic waves move urine through the ureters.
 (d) The mucosa of each ureter is composed of transitional epithelium.

- _____ 2. Urine passing through the ureter comes in contact with
 (a) the muscularis. (c) the submucosa.
 (b) the mucosa. (d) the adventitia.
- _____ 3. A calculus, or renal stone, would most likely cause stagnation of urine in
 (a) the urinary bladder. (d) the renal pelvis.
 (b) the renal column. (e) the urethra.
 (c) the ureter.
- _____ 4. Distention of the urinary bladder is possible because of the presence of
 (a) the rugae. (d) the transitional epithelium.
 (b) the trigone. (e) both a and d.
 (c) the fibrous coat.
- _____ 5. Which of the following statements is *false* concerning the urethra of a male?
 (a) It serves both the urinary and reproductive systems.
 (b) It receives secretions from the bulbourethral glands.
 (c) It consists of three distinct regions.
 (d) It is approximately 20 cm long in an adult.
 (e) It contains a single urethral sphincter near the neck of the urinary bladder.
- _____ 6. The organ or structure that does *not* secrete or empty into the male urethra is
 (a) the urinary bladder. (d) the ejaculatory duct.
 (b) the seminal vesicle. (e) the bulbourethral gland.
 (c) the prostate.
- _____ 7. The micturition reflex center is located in
 (a) the kidney. (d) the hypothalamus.
 (b) the cerebrum. (e) the sacral segment of the spinal cord.
 (c) the urinary bladder.
- _____ 8. The voiding stage of micturition is initiated by
 (a) sympathetic impulses. (c) elastic recoiling of the fibrous coat.
 (b) peristaltic waves. (d) parasympathetic impulses.

B. True–False Questions

- _____ 1. The walls of the ureters and the urinary bladder consist of three layers, or tunics.
- _____ 2. The effect of gravity causes urine to move through the ureters to the urinary bladder.
- _____ 3. The arterial supply to the ureter is from branches of the renal, testicular (ovarian), and superior vesicular arteries.
- _____ 4. All of the organs of the urinary system are retroperitoneal.
- _____ 5. Two urethral sphincters regulate the flow of urine from the urinary bladder.
- _____ 6. The volume of urine produced by an adult averages about 500 ml per day.

IV. Developmental Exposition of the Urinary System

A. Multiple Choice Questions

- _____ 1. An organ or structure that is *not* a component of the urinary system is
(a) the urethra. (d) the adrenal gland.
(b) the urinary bladder. (e) the kidney.
(c) the ureter.
- _____ 2. The kidney in its final permanent form is called
(a) a metanephros kidney. (c) a mesonephros kidney.
(b) a pronephros kidney. (d) a urogenital kidney.
- _____ 3. The permanent kidney becomes functional in forming urine at
(a) birth. (c) 20 weeks.
(b) 9 weeks. (d) 30 weeks.
- _____ 4. The ureter and tubular channels within the kidney form from
(a) the urachus. (d) the metanephrogenic mass.
(b) the cloaca. (e) both c and d.
(c) the stalk of the ureteric bud.

B. True–False Questions

- _____ 1. Both the urinary and the reproductive system originate from an elevation of mesodermal tissue called the urogenital ridge.
- _____ 2. Urine is formed throughout fetal development and is expelled into the amniotic fluid.
- _____ 3. The urinary bladder and the ureter develop from the metanephrogenic mass.
- _____ 4. The urethra develops from the embryonic urachus.

V. Clinical Considerations

A. Multiple Choice Questions

- _____ 1. Which of the following is *not* a congenital malformation of the urinary system?
(a) renal agenesis (d) exstrophy of the urinary bladder
(b) epispadias (e) renal calculi
(c) renal ectopia
- _____ 2. Dysuria is
(a) painful urination.
(b) a symptom of a urinary tract infection.
(c) trauma to the urinary bladder.
(d) a scanty output of urine.
(e) both a and b.
- _____ 3. The inability to control micturition is
(a) oliguria. (d) dysuria.
(b) enuresis. (e) both b and c.
(c) incontinence.

B. True–False Questions

- ___ 1. Hypospadias is a congenital condition of the urethra that can occur only in males.
- ___ 2. Cystitis is an infection and inflammation of the urinary bladder.
- ___ 3. A renal output of less than 30 cc per hour may indicate renal failure.

VI. Chapter Review

A. Completion Questions

- 1. The urinary system is derived from the _____ germ layer.
- 2. The _____ is the developing kidney that is functional during the embryonic stage of development.
- 3. A patent _____ is a congenital anomaly in which there is a tubular connection from the urinary bladder to the umbilicus.
- 4. The renal vessels and the ureter attach to the kidney along the medial border at the depression called the _____.
- 5. If the kidneys drop in position due to loss of supporting adipose tissue and the effect of gravity, the condition is called renal _____.
- 6. The reddish brown renal _____ is superficial to the deeper and lighter renal _____.
- 7. The _____ is the functional unit of the kidney that is responsible for the formation of urine.
- 8. Afferent arterioles deliver blood into capillary networks called _____ that produce a blood filtrate that enters the urinary tubules.
- 9. A glomerular capsule and its associated glomerulus constitute a _____.
- 10. _____ nephrons originate in the inner one-third of the renal cortex and have longer nephron loops than the cortical nephrons.
- 11. A renal stone is also known as a _____.
- 12. The three smooth muscle layers of the urinary bladder are collectively referred to as the _____ muscle.
- 13. The transport of water by _____ occurs between the renal tubules and the vascular system.
- 14. _____ means inflammation of the kidney.