

NAME _____ LAB TIME/DATE _____

REVIEW SHEET
exercise

Anatomy of the Urinary System

40

Gross Anatomy of the Human Urinary System

1. Complete the following statements:

The kidney is referred to as an excretory organ because it excretes 1 wastes. It is also a major homeostatic organ because it maintains the electrolyte, 2, and 3 balance of the blood.

Urine is continuously formed by the 4 and is routed down the 5 by the mechanism of 6 to a storage organ called the 7. Eventually, the urine is conducted to the body 8 by the urethra. In the male, the urethra is 9 centimeters long and transports both urine and 10. The female urethra is 11 centimeters long and transports only urine.

Voiding or emptying the bladder is called 12. Voiding has both voluntary and involuntary components. The voluntary sphincter is the 13 sphincter. An inability to control this sphincter is referred to as 14.

1. nitrogenous
2. water
3. acid-base
4. kidneys
5. ureters
6. peristalsis
7. urinary bladder
8. exterior
9. 8
10. semen
11. 1.5
12. micturition
13. external urethral
14. incontinence

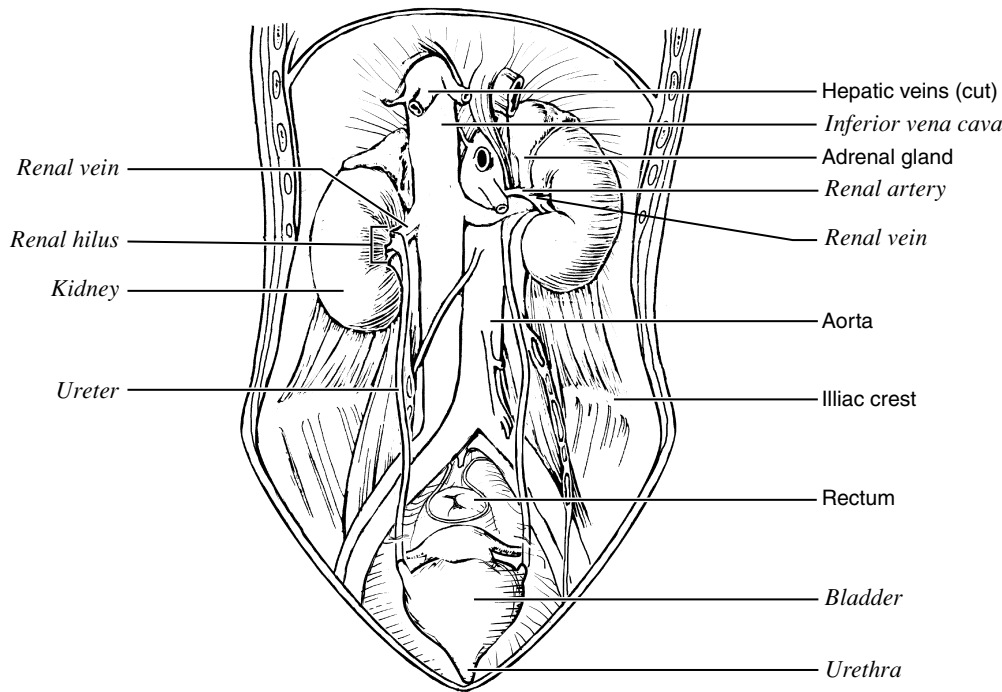
2. What is the function of the fat cushion that surrounds the kidneys in life? Helps to anchor the kidneys to the dorsal body wall.

3. Define ptosis: Dropping of the kidney(s) to a more inferior position in the abdominal cavity.

4. Why is incontinence a normal phenomenon in the child under 1½ to 2 years old? Muscular control over the voluntary sphincter has not yet been achieved.

What events may lead to its occurrence in the adult? Emotional problems; bladder irritability (as in infection); increased pressure on the bladder (as in pregnancy); nerve or spinal cord injury; and others.

5. Complete the labeling of the diagram to correctly identify the urinary system organs.



Gross Internal Anatomy of the Pig or Sheep Kidney

6. Match the appropriate structure in column B to its description in column A.

Column A

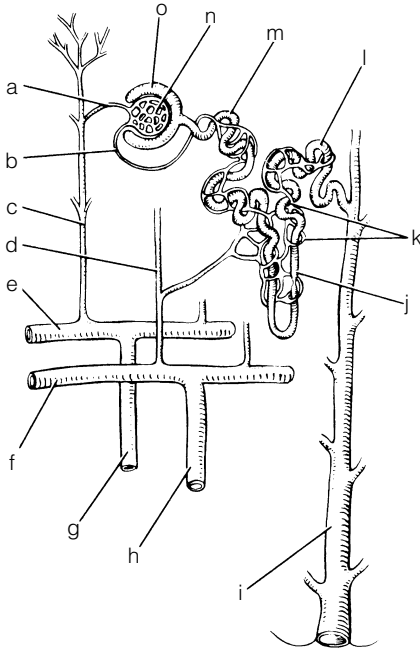
- d 1. smooth membrane, tightly adherent to the kidney surface
- b 2. portion of the kidney containing mostly collecting ducts
- a 3. portion of the kidney containing the bulk of the nephron structures
- a 4. superficial region of kidney tissue
- f 5. basinlike area of the kidney, continuous with the ureter
- c 6. a cup-shaped extension of the pelvis that encircles the apex of a pyramid
- e 7. area of cortical tissue running between the medullary pyramids

Column B

- a. cortex
- b. medulla
- c. minor calyx
- d. renal capsule
- e. renal column
- f. renal pelvis

Functional Microscopic Anatomy of the Kidney and Bladder

7. Use the key letters to identify the diagram of the nephron (and associated renal blood supply) on the left.



- e _____ 1. arcuate artery
- f _____ 2. arcuate vein
- a _____ 3. afferent arteriole
- i _____ 4. collecting duct
- l _____ 5. distal convoluted tubule
- b _____ 6. efferent arteriole
- o _____ 7. glomerular capsule
- n _____ 8. glomerulus
- g _____ 9. interlobular artery
- d _____ 10. interlobular vein
- c _____ 11. interlobular artery
- d _____ 12. interlobular vein
- j _____ 13. loop of Henle
- k _____ 14. peritubular capillaries
- m _____ 15. proximal convoluted tubule

8. Using the terms provided in item 7, identify the following:

- glomerulus (n) _____ 1. site of filtrate formation
- proximal convoluted tubule (m) _____ 2. primary site of tubular reabsorption
- distal convoluted tubule (l) _____ 3. secondarily important site of tubular reabsorption
- collecting duct (i) _____ 4. structure that conveys the processed filtrate (urine) to the renal pelvis
- peritubular capillaries (k) _____ 5. blood supply that directly receives substances from the tubular cells
- glomerular capsule (o) _____ 6. its inner (visceral) membrane forms part of the filtration membrane

9. Explain why the glomerulus is such a high-pressure capillary bed. It is both fed and drained by arterioles (which are high-pressure vessels compared to venules), and the afferent arteriole has a larger diameter than the efferent arteriole.

How does its high-pressure condition aid its function of filtrate formation? The higher the capillary pressure, the more filtrate will be formed.

10. What structural modification of certain tubule cells enhances their ability to reabsorb substances from the filtrate?

Their possession of dense microvilli (especially the PCT cells).

11. Explain the mechanism of tubular secretion and explain its importance in the urine formation process. Tubular secretion is the process of moving substances from the tubule cells or from the peritubular capillary blood into the tubule filtrate. It is important for adjusting pH and eliminating substances not already in the filtrate.

12. Compare and contrast the composition of blood plasma and glomerular filtrate. Glomerular filtrate = blood plasma without most of the blood proteins.

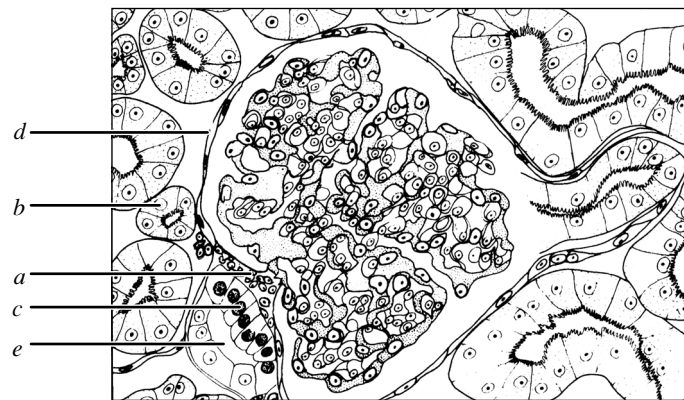
13. Trace a drop of blood from the time it enters the kidney in the renal artery until it leaves the kidney through the renal vein.
Renal artery → segmental A. → lobar A. → interlobar A. → arcuate A. → interlobular A. → afferent arteriole glomerulus → efferent arteriole → peritubular capillary bed → interlobular V. → arcuate V. → interlobar V.

_____ → renal vein

14. Define *juxtaglomerular apparatus*: Macula densa cells of the DCT and granular juxtaglomerular cells of the afferent arteriole that play a role in regulating the rate of filtrate formation and systemic blood pressure.

15. Label the figure using the key letters of the correct terms.

- Key:
- a. juxtaglomerular cells
 - b. cuboidal epithelium
 - c. macula densa
 - d. glomerular capsule (parietal layer)
 - e. distal convoluted tubule



16. Trace the anatomical pathway of a molecule of creatinine (metabolic waste) from the glomerular capsule to the urethra. Note each microscopic and/or gross structure it passes through in its travels. Name the subdivisions of the renal tubule.

Glomerular capsule → proximal convoluted tubule → loop of Henle → distal convoluted tubule → collecting tubule → papillary duct

→ minor calyx → major calyx → renal pelvis → ureter → bladder

_____ → urethra

17. What is important functionally about the specialized epithelium (transitional epithelium) in the bladder?

The cells have the ability to move over one another as the bladder fills, thus decreasing the bladder wall thickness and increasing the internal bladder volume.