

Structure of the Kidney

Laboratory Exercise 56

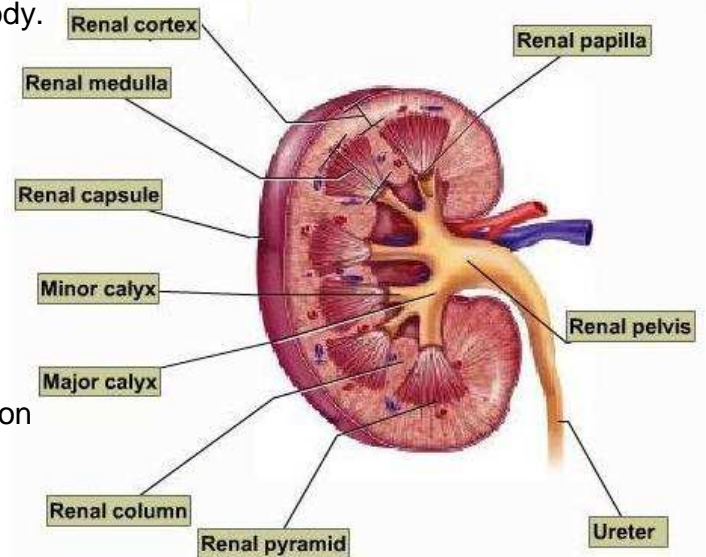
Background

The two kidneys are the primary organs of the urinary system. They are located in the upper quadrants of the abdominal cavity, against the posterior wall and behind the parietal peritoneum. They perform a variety of complex activities that lead to the production of urine.

The other organs of the urinary system include the ureters, which transport urine away from the kidneys; the urinary bladder, which stores urine; and the urethra, which conveys urine to the outside of the body.

Materials Needed

Textbook
Human torso model
Kidney model
Animal kidney (pig)
Dissecting tray
Dissecting instruments
Compound light microscope
Prepared microscope slide of a kidney section



Purpose of the Exercise

Review the structure of the kidney, dissect a kidney, and observe the major structures of a nephron microscopically.

Procedure A – Kidney Structure

1. Label figures 56.1 and 56.2.
2. Examine the human torso and the kidney model to locate the following features: **kidneys, ureters, urinary bladder, urethra, renal sinus, renal pelvis, renal papillae, renal medulla, renal cortex, nephrons.**
3. Complete Part A of the laboratory report.
4. To observe the structure of a kidney, follow these steps:
 - a. Obtain a pig kidney and rinse it with water.
 - b. Carefully remove any adipose tissue from the surface of the specimen.
 - c. Locate the following features: **renal capsule, hilum, renal artery, renal vein, ureter.**

- d. Use a scalpel to cut the kidney in half longitudinally along the coronal plane, beginning on the convex border.
- e. Rinse the interior of the kidney with water and locate the following: **renal cortex, renal medulla, renal columns, renal pyramids, renal pelvis, major calyces, minor calyces.**

Procedure B – The Renal Blood Vessels and Nephrons

1. Label figure 56.3.
2. Complete Part B of the laboratory report.
3. Obtain a prepared microscope slide of a kidney section and examine it, using low-power magnification. Locate the *renal capsule*, the *renal cortex* (which appears somewhat granular and may be more darkly stained than the other renal tissues), and the *renal medulla*.
4. Examine the renal cortex, using high-power magnification. Locate the *renal corpuscle*. These structures appear as isolated circular areas. Identify the *glomerulus*, which is the capillary cluster inside the corpuscle, and the *glomerular capsule*, which appears as a clear area surrounding the glomerulus. Also note the numerous sections of renal tubules that occupy the spaces between renal corpuscles. (Figure 56.4)
5. Prepare a labeled sketch of a representative section of renal cortex in Part C of the laboratory report.
6. Examine the renal medulla, using high-power magnification. Identify longitudinal and cross sections of various collecting ducts. Note that these ducts are lined with simple epithelial cells, which vary in shape from squamous to cuboidal. (Figure 56.5)
7. Prepare a labeled sketch of a representative section of renal medulla in Part D of the laboratory report.

Figure 56.1 Label the major features of the urinary system.

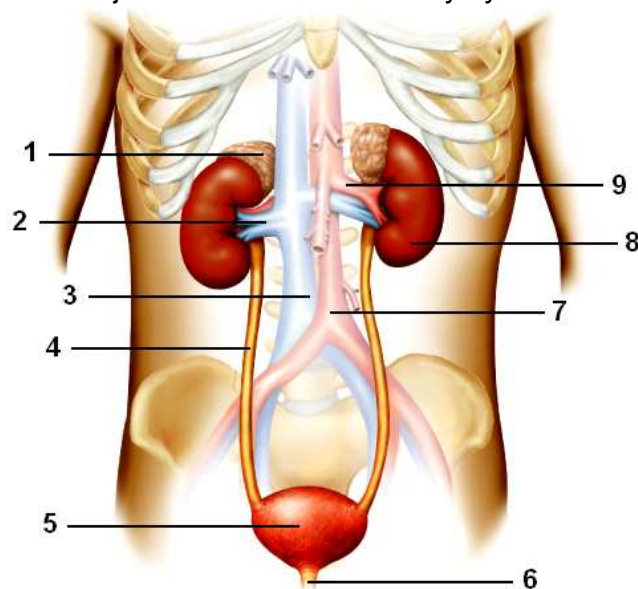


Figure 56.2 Label the major structures in the longitudinal section of a kidney.

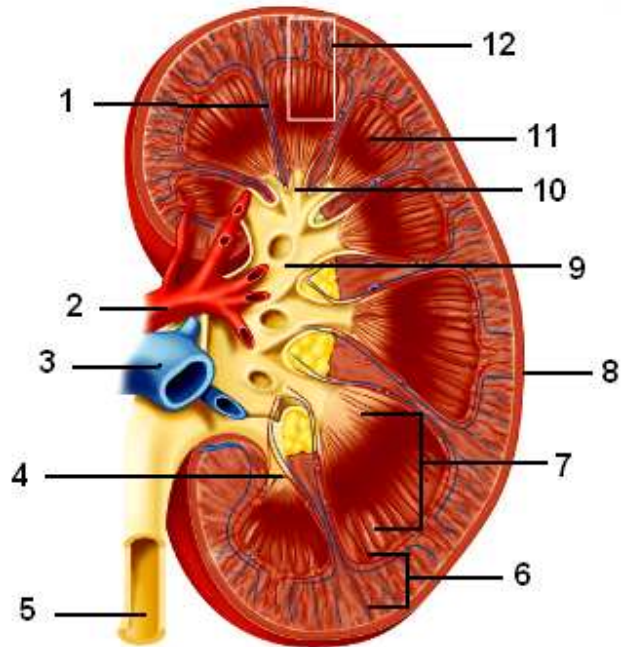


Figure 56.3 Label the major structures of the nephron and the blood vessels associated with it.

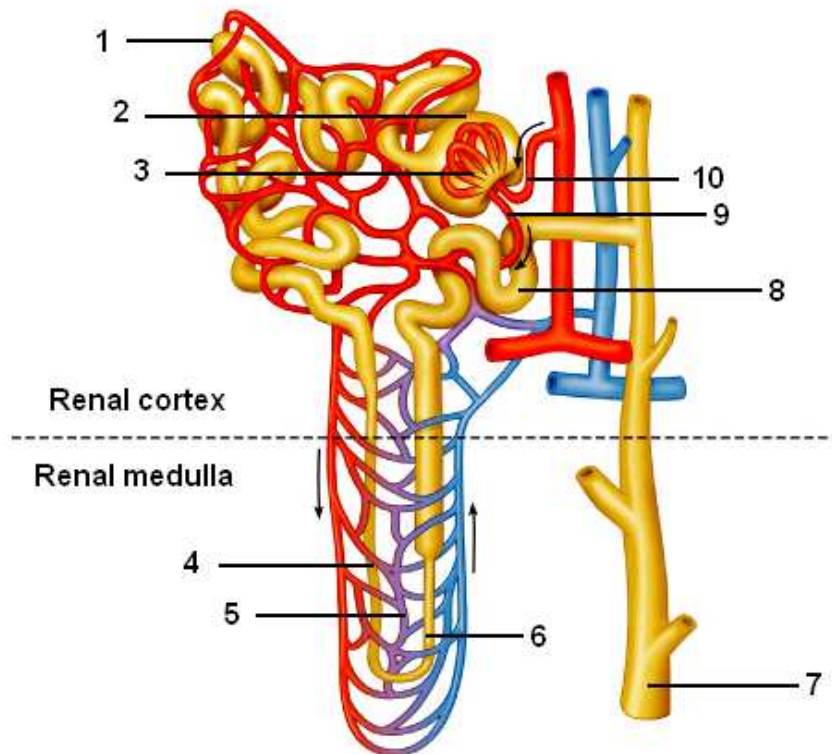


Figure 56.4 Micrograph of a section of the renal cortex (220x).

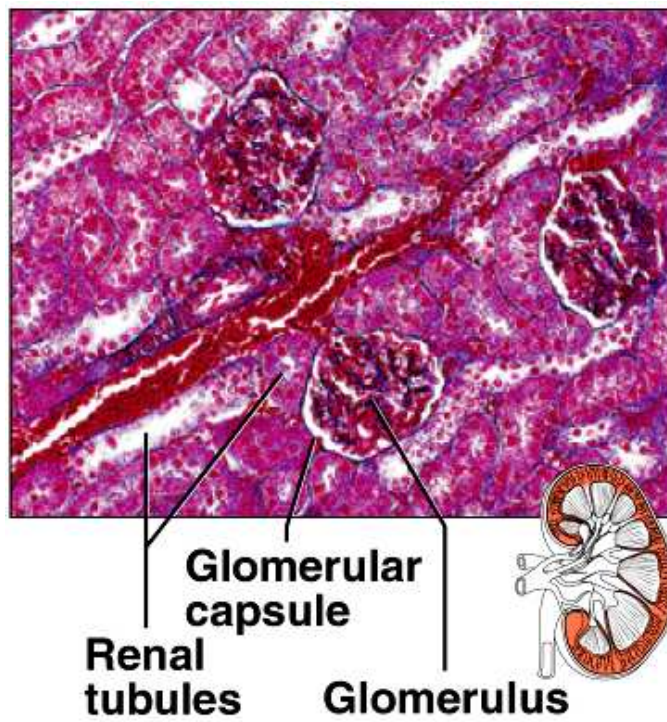
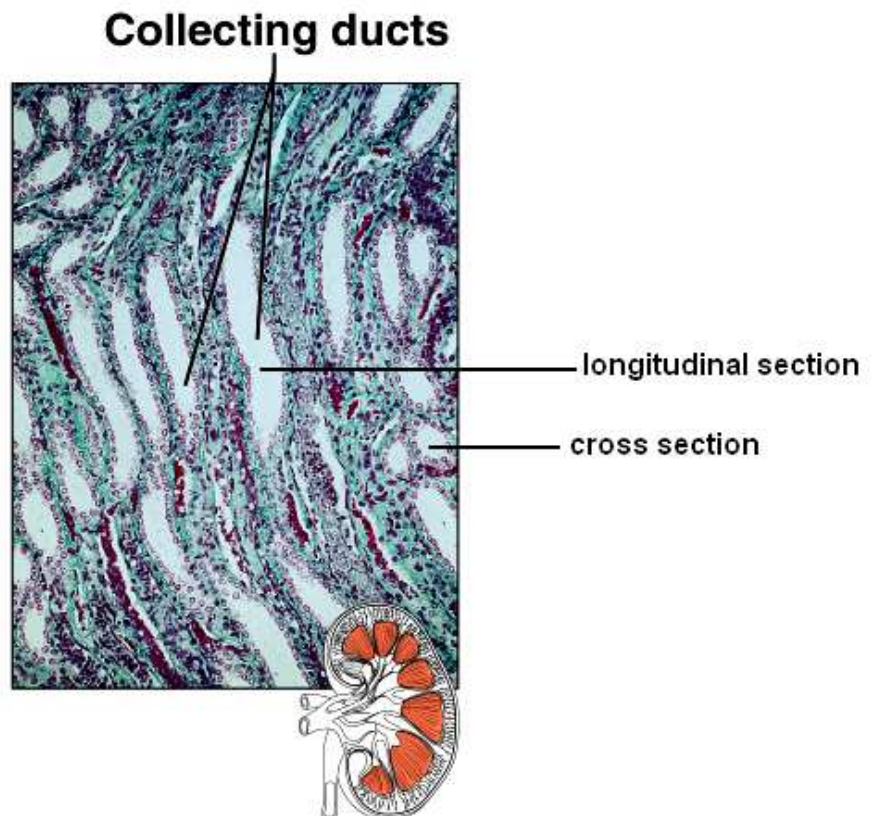


Figure 56.5 Micrograph of a section of the renal medulla (80x micrograph enlarged 200x).



Part A

Match the structures in column B with the descriptions in column A. Place the letter of your choice in the space provided.

Column A	Column B
___ 1. Shell around the renal medulla	a. Calyces
___ 2. Branches of renal pelvis to renal papillae	b. Hilum
___ 3. Conical mass of tissue within renal medulla	c. Nephron
___ 4. Projection with tiny openings into a minor calyx	d. Renal column
___ 5. Hollow chamber within kidney	e. Renal cortex
___ 6. Microscopic functional unit of kidney	f. Renal papilla
___ 7. Cortical tissue between renal pyramids	g. Renal pelvis
___ 8. Superior end of ureter inside the renal sinus	h. Renal pyramid
___ 9. Medial depression for blood vessels and ureter to enter kidney chamber	i. Renal sinus

Part B

1. Distinguish between a renal corpuscle and a renal tubule.

2. Number the following structures to indicate their respective positions in relation to the nephron. Assign the number 1 to the structure attached to the glomerular capsule.

___ Ascending limb of nephron loop	___ Distal convoluted tubule
___ Collecting duct	___ Proximal convoluted tubule
___ Descending limb of nephron loop	___ Renal papilla

3. Number the following structures to indicate their respective positions in the blood pathway within the kidney. Assign the number 1 to the vessel nearest the renal artery.

____ Afferent arteriole

____ Efferent arteriole

____ Glomerulus

____ Peritubular capillary

____ Renal vein

Part C

Prepare a sketch of a representative section of **renal cortex**. Label the *glomerulus*, *glomerular capsule*, and sections of *renal tubules*.

Part D

Prepare a sketch of a representative section of **renal medulla**. Label a longitudinal section and cross section of a *collecting duct*.