

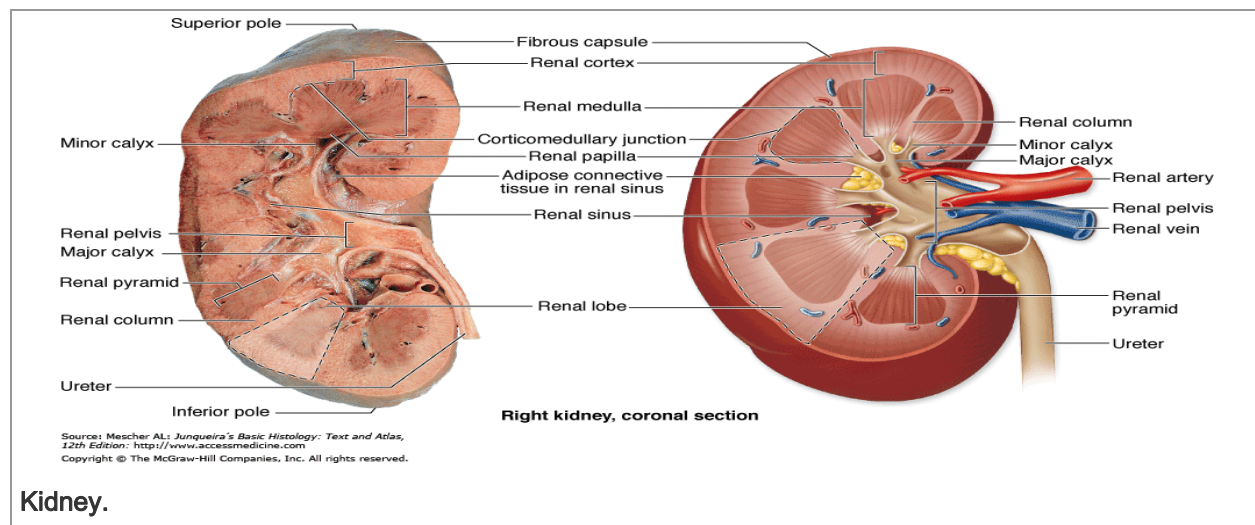
The Urinary System:

The urinary system consists of the paired kidneys and ureters, the bladder, and the urethra. This system helps maintain homeostasis by a complex combination of processes that involves the following:

- 1- Filtration of cellular wastes from blood.
- 2- Selective reabsorption of water and solutes.
- 3- Excretion of the wastes and excess water as urine.

Kidneys

Each kidney has a concave medial border, the **hilum**—where nerves enter, the ureter exits, and blood and lymph vessels enter and exit—and a convex lateral surface, both covered by a thin fibrous capsule. The expanded upper end of the ureter, called the **renal pelvis**, divides into two or three **major calyces**. Smaller branches, the **minor calyces**, arise from each major calyx. The area surrounding the calyces, called the **renal sinus**, usually contains considerable adipose tissue.





Each kidney contains 1–1.4 million functional units called **nephrons**

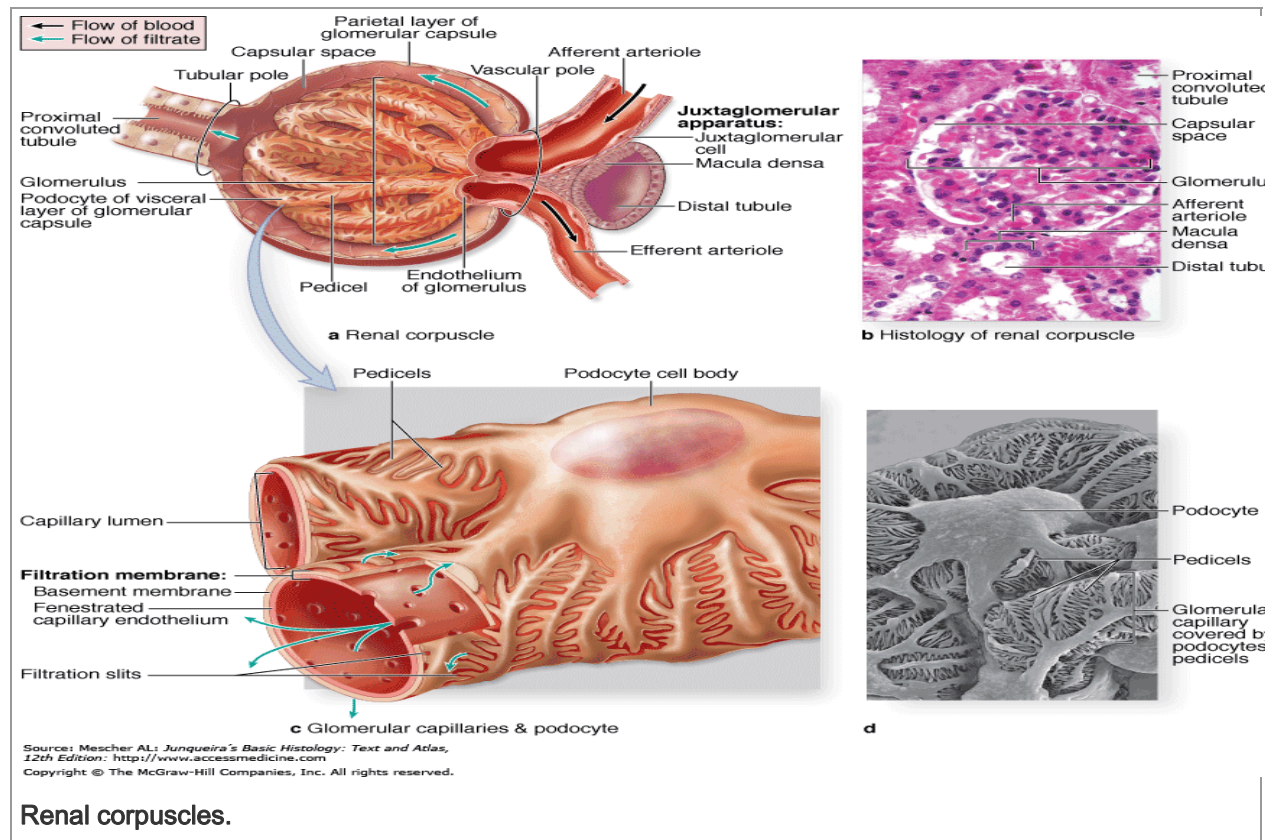
The major divisions of each nephron are:

- 1- **Renal corpuscle**, an initial dilated portion in the cortex.
- 2- **Proximal convoluted tubule**, located primarily in the cortex.
- 3- **Thin** and **thick limbs** of the **nephron loop** (loop of Henle) which descend into the medulla, then ascend back to the cortex.
- 4- **Distal convoluted tubule**.
- 5- **Collecting tubule**.

Renal Corpuscles & Blood Filtration:

At the beginning of each nephron is a renal corpuscle, about 200 μm in diameter and containing a loose knot of capillaries, the glomerulus, surrounded by a double-walled epithelial capsule called the **glomerular (Bowman's) capsule**. The internal layer (**visceral layer**) of the capsule closely envelops the glomerular capillaries. The external **parietal layer** forms the outer surface of the capsule. Between the two capsular layers is the urinary or **capsular space**, which receives the fluid filtered through the capillary wall and the visceral layer. Each renal corpuscle has a **vascular pole**, where the afferent arteriole enters and the efferent arteriole leaves, and a urinary or **tubular pole**, where the proximal convoluted tubule begins. After entering the renal corpuscle, the

afferent arteriole usually divides and subdivides into the two to five capillaries of the renal glomerulus.



The parietal layer of a glomerular capsule consists of a simple squamous epithelium supported externally by a basal lamina and a thin layer of reticular fibers. At the tubular pole, this epithelium changes to the simple cuboidal epithelium characteristic of the proximal tubule .

Ureters, Bladder, & Urethra

Urine is transported by the **ureters** to the **bladder** where it is stored until emptied during micturition via the **urethra**. The calyces, renal pelvis, ureter, and bladder have the same basic histologic structure, with the walls becoming gradually thicker closer to the bladder. The mucosa of these organs is lined by unique stratified **transitional epithelium** or **urothelium** . This is surrounded by a folded lamina propria and submucosa, followed by a dense sheath of interwoven smooth muscle layers and adventitia .Urine moves from the renal pelvises to the bladder by peristaltic contractions.

