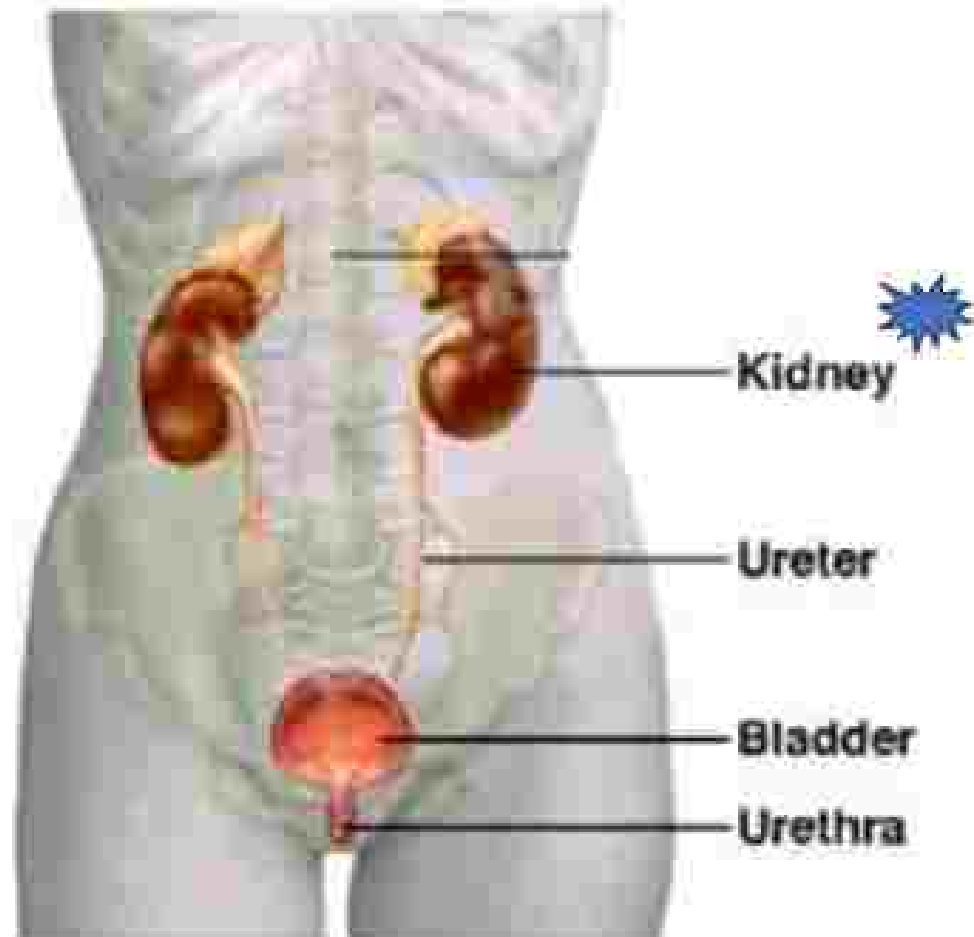


STRUCTURE &
FUNCTIONS OF
NEPHRON

Composition of the Urinary System



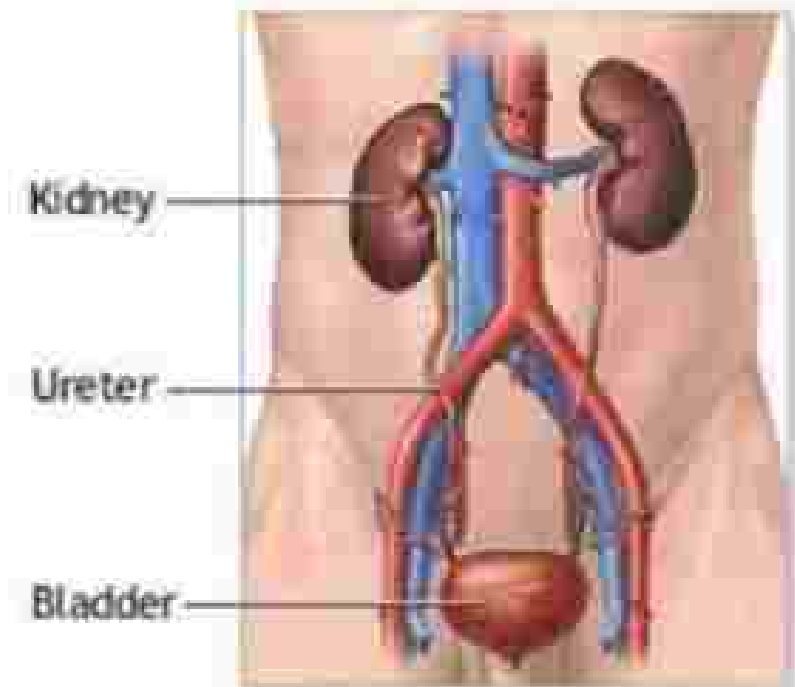


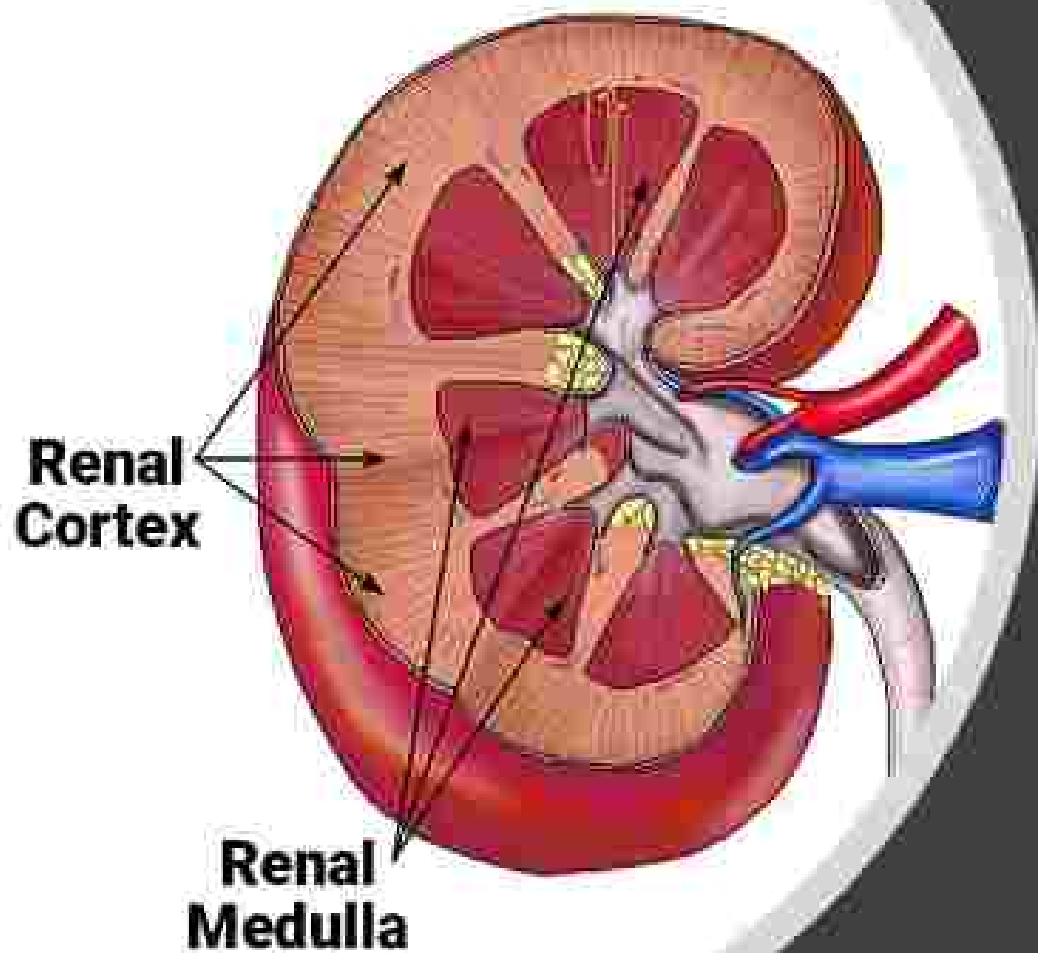
❖ There are three major regions of the kidney:

- Renal cortex
- Renal medulla
- Renal pelvis

The Human Kidneys

- ❖ concaved side having a depression where a renal artery enters, and a renal vein and a ureter exit the kidney.
- ❖ located in the upper rear region of the abdominal cavity just above the waistline.
- ❖ protected by the ribcage.
- ❖ The renal cortex, the renal medulla and the renal pelvis - major regions of the kidney.
- ❖ The left kidney lies slightly above the right kidney.





- **Renal Cortex**

- The kidneys are surrounded by a renal cortex, a layer of tissue that is also covered by renal fascia (connective tissue) and the renal capsule. The renal cortex is granular tissue due to the presence of nephrons—the functional unit of the kidney—that are located deeper within the kidney, within the renal pyramids of the medulla.

Renal Medulla

The medulla is the inner region of the parenchyma of the kidney.

The medulla consists of multiple pyramidal tissue masses, called the renal pyramids, which are triangle structures that contain a dense network of nephrons. At one end of each nephron, in the cortex of the kidney, is a cup-shaped structure called the Bowman's capsule. It surrounds a tuft of capillaries called the glomerulus that carries blood from the renal arteries into the nephron, where plasma is filtered through the capsule.

Renal Pelvis

The renal pelvis contains the hilum. The hilum is the concave part of the bean-shape where blood vessels and nerves enter and exit the kidney; it is also the point of exit for the ureters—the urine-bearing tubes that exit the kidney and empty into the urinary bladder. The renal pelvis connects the kidney to the rest of the body.

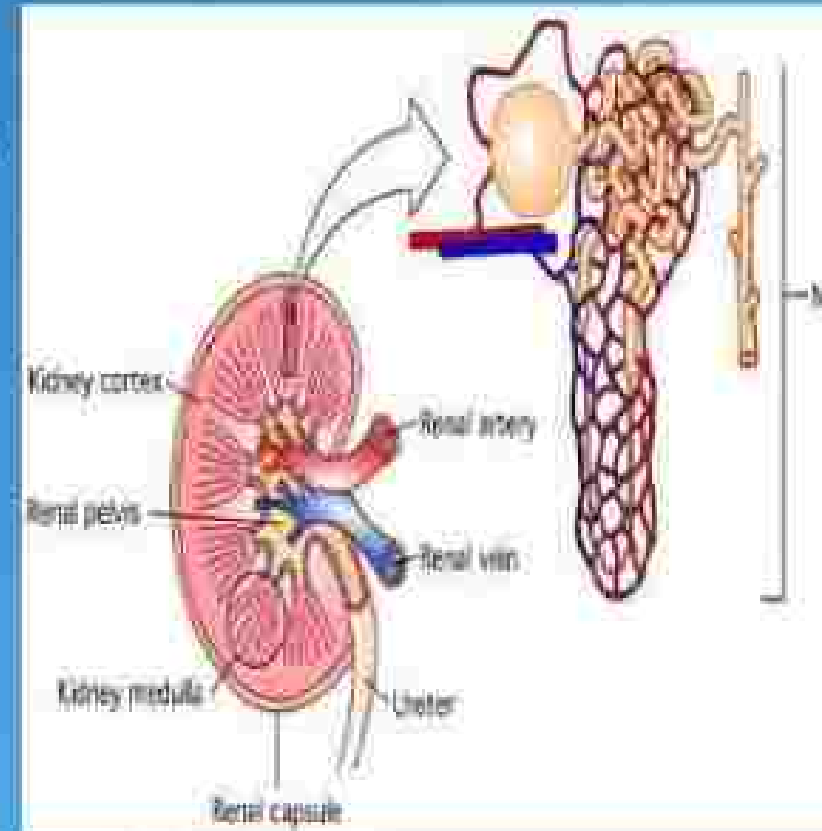
Kidneys and their structures

□ Nephron

- Most basic microscopic structures of the kidneys

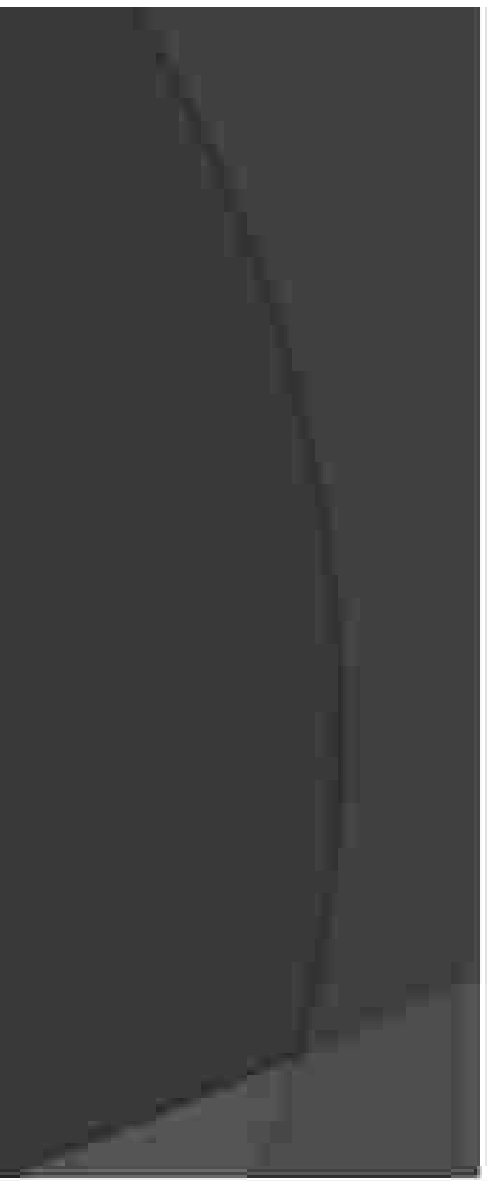
Inside each kidney, there are about 1 million nephrons

Physiological unit of the kidney used for filtration of blood, and reabsorption and secretion of materials



Nephron (Tubular component)

- Hollow, fluid-filled tube
 - single layer of epithelial cells
- **Components**
 - Bowman's capsule
 - Proximal convoluted tubule
 - Loop of Henle
 - Descending limb (thin)
 - Ascending limb (thin and thick part)
 - Distal convoluted tubule
 - Collecting duct or tubule



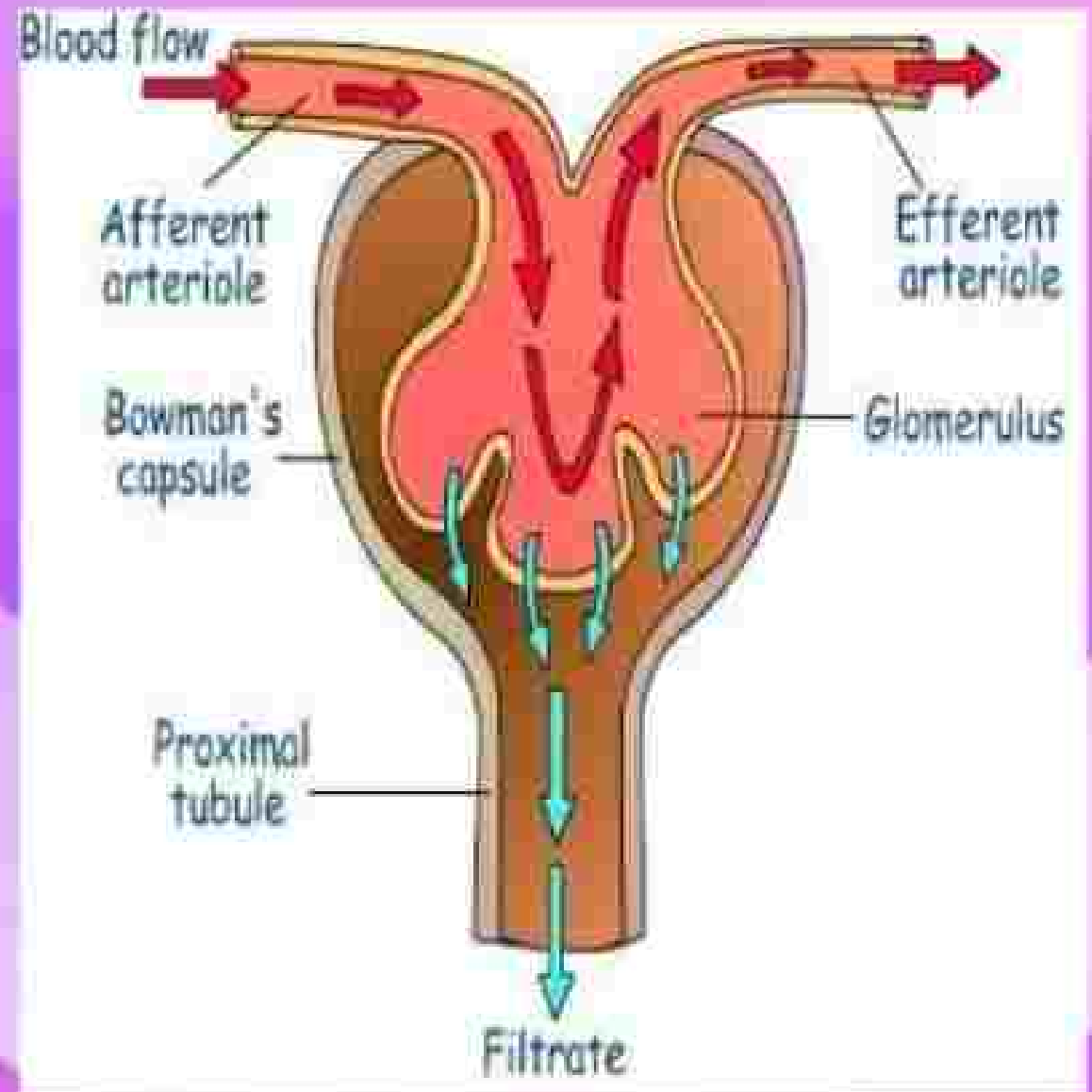
Glomerulus

- The site for blood filtration
- operates as a nonspecific filter - removes both useful and non-useful material

the product of the glomerulus - filtrate

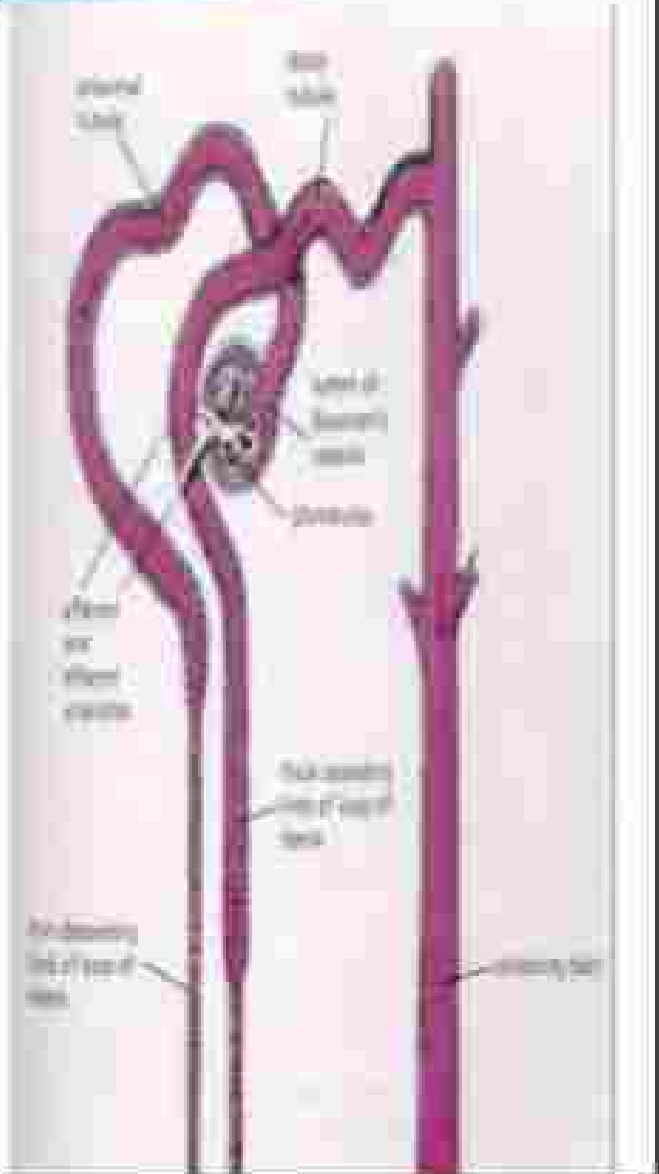
Bowman's Capsule

- A sac that encloses glomerulus
- transfers filtrate from the



THE LOOP OF HENLE

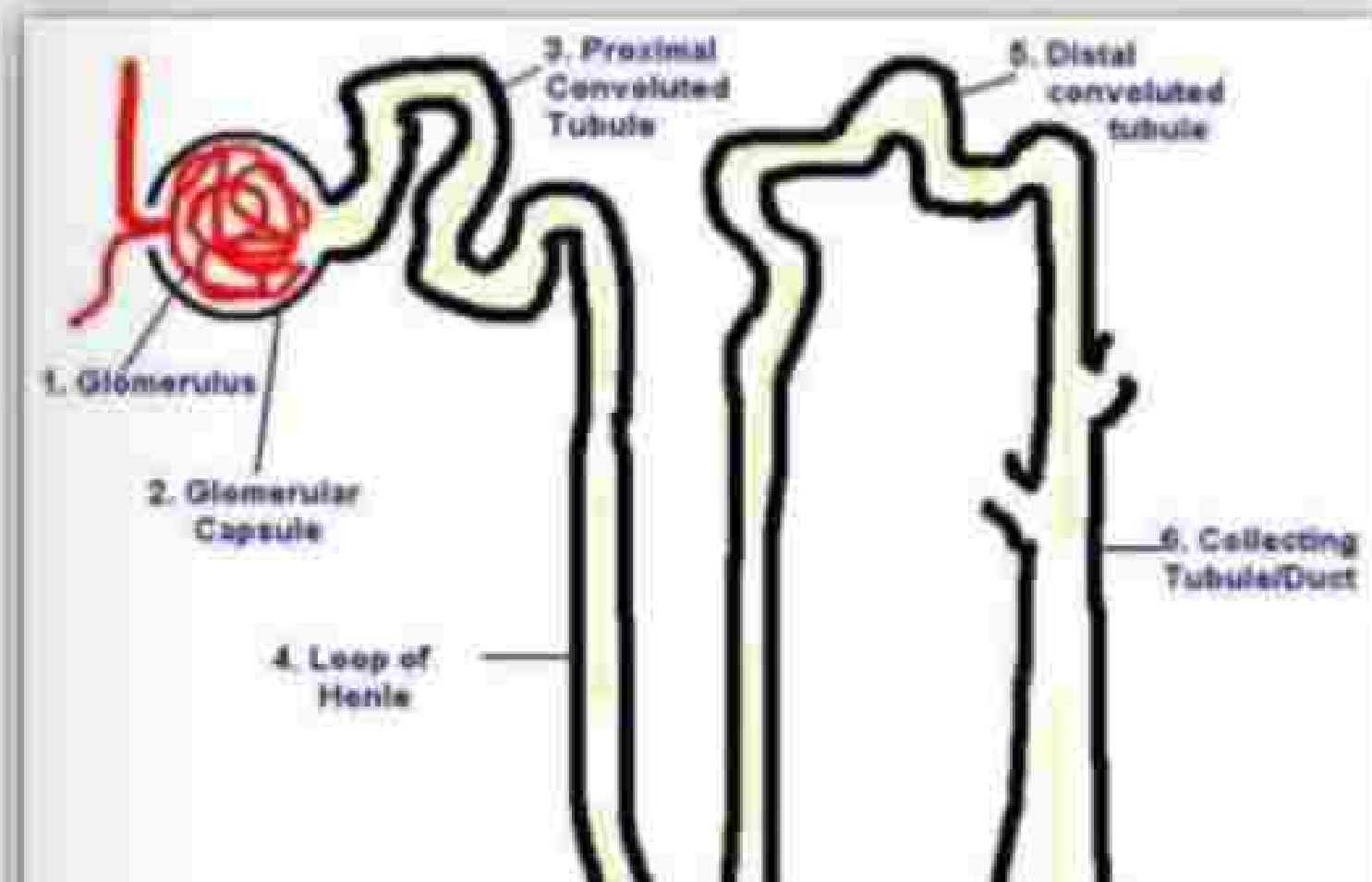
This hairpin-bend structure has a descending limb and an ascending limb and is found in the medulla of the kidney. The descending limb has thin walls permeable to water and penetrates deep into the medulla but the ascending limb has thicker, relatively impermeable walls that returns to the cortex. Surrounding the loop is a network of capillaries, one part of which has the same hairpin structure and is called the vasa recta.



Nephron structures and functions

□ Distal Convoluted Tubule (DCT)

- Variably active portion of the Nephron
- receives dilute fluid from the ascending limb of the loop of Henle



Collecting Ducts

Several DCT of several nephrons drain into a straight tube called CD, which passes through the medulla;

CD merge to form a **papillary duct** which will drain into the **minor calyx**.

Flow of glomerular filtrate:

– **glomerular capsule** → PCT → nephron loop
→ DCT → collecting duct → papillary duct →
minor calyx → major calyx → renal pelvis →
ureter → urinary bladder → urethra

Nephron

- Functional unit of the kidney
- 3 main jobs:
 - Filtration of water and solutes from blood
 - Reabsorption of water and molecules back into blood or interstitial fluid
 - Secretion of ions and other waste products from capillaries
- Remember: the idea is to concentrate the fluids (filtrate) in the tubes of the kidney to produce urine that has higher osmolarity than that of blood

