

The Urinary System

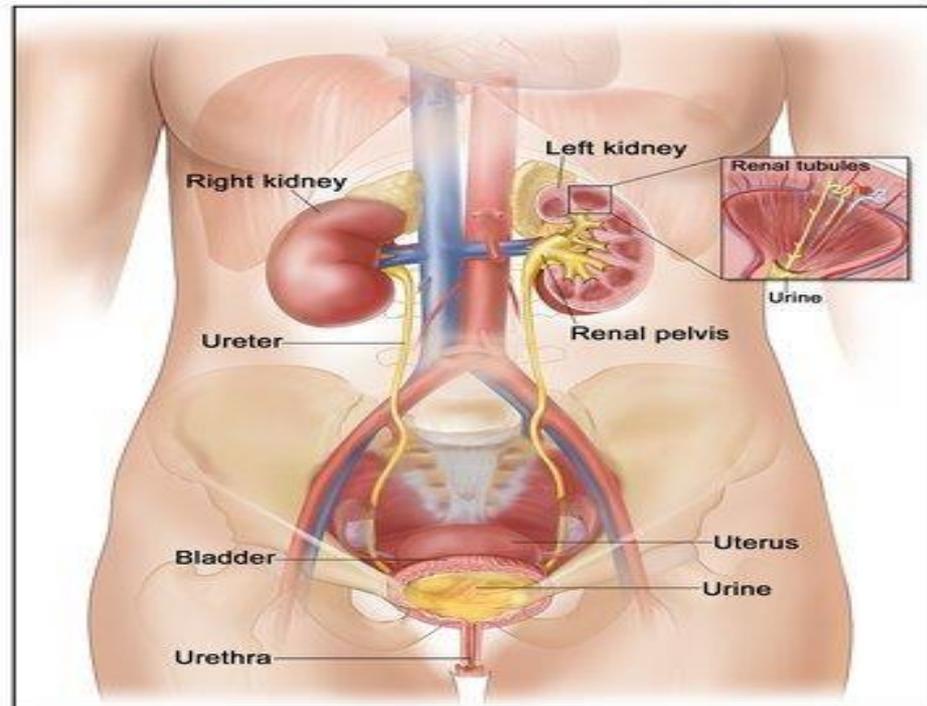
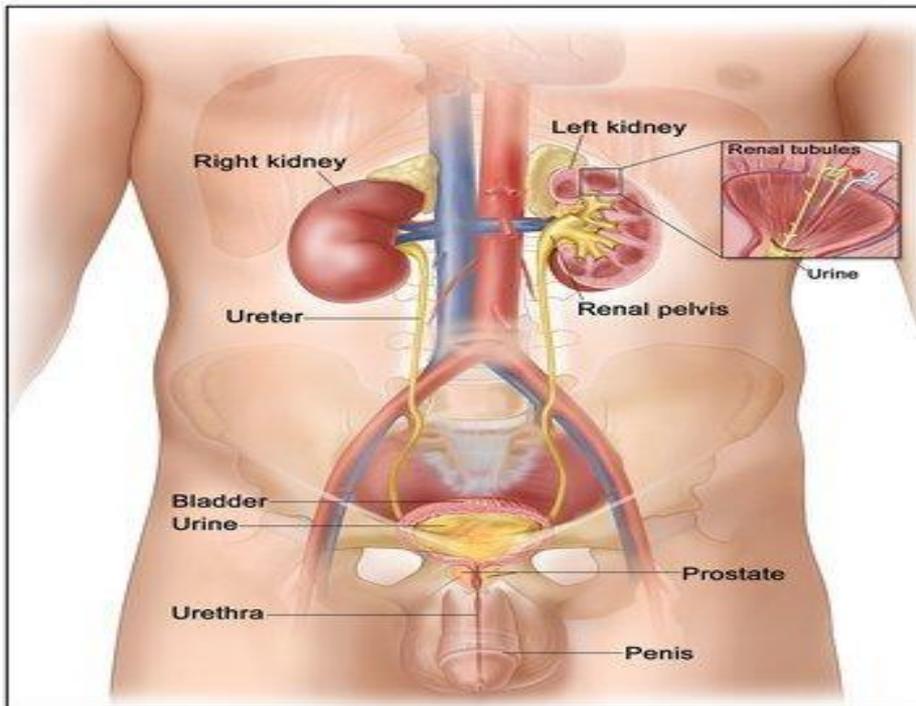
The Urinary system

Organs of the urinary system

- Kidneys
- Ureters
- Urinary bladder
- Urethra

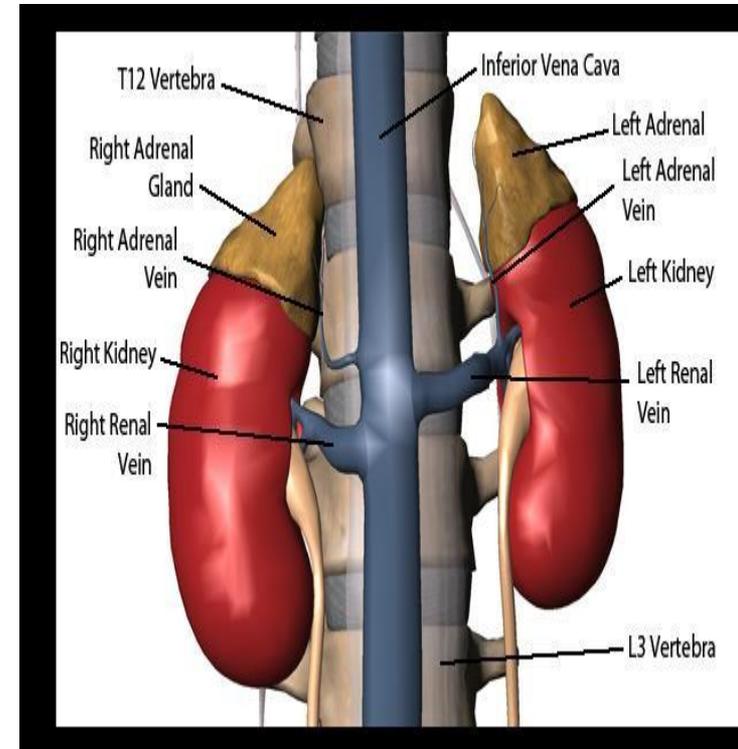
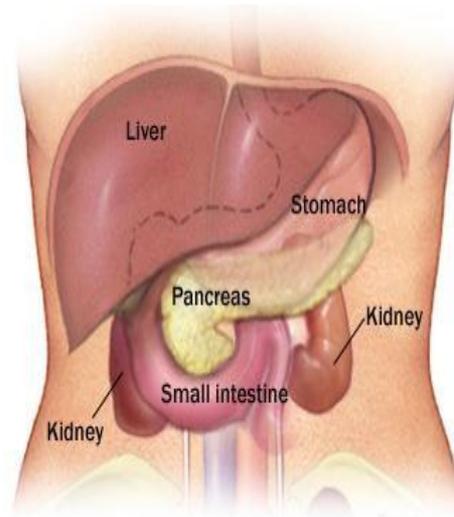
Functions of the Urinary System

- Elimination of waste products
- Removal of excess substances from blood
- Produces hormones and enzymes



Location of the Kidneys

- Located in the posterior wall of the abdomen
- On top of each kidney is the adrenal gland (suprarenal gland).
- Right kidney is under the liver (right kidney is slightly lower than the left), left kidney is under the spleen.



Regions of the Kidney

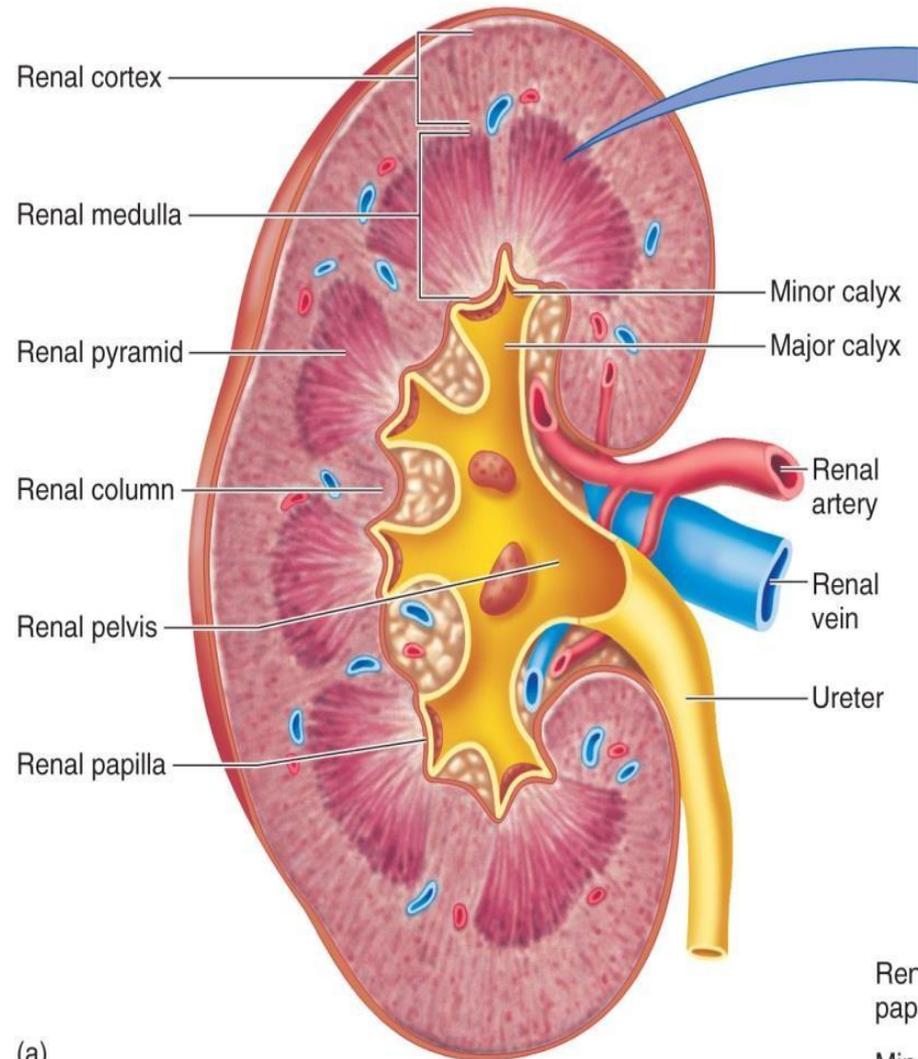
- Medial side of each kidney has a concaved area called **renal hilus** through which nerves, ureter, renal artery and renal vein pass.
- The Kidney is composed of:
 - ✓ Kidney flesh
 - ✓ Renal Pelvis: inner collecting tube

Kidney Flesh

Renal cortex – outer region (light in color).

Renal medulla – deeper area of kidney flesh, (reddish-brown area).

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(a)

Renal papilla
Minor calyx

Regions of the Kidney

❑ **The Kidney flesh** contains **two regions**:

1. **Renal Cortex**: granular in appearance (many **capillaries**). Two parts: **outer layer** and a **continuation called renal column** penetrating between the medullary pyramids.
2. **Renal Medulla**: striped in appearance (**tubules** and blood **vessels**). The **medulla** is composed of triangular regions called **renal or medullary pyramids**.

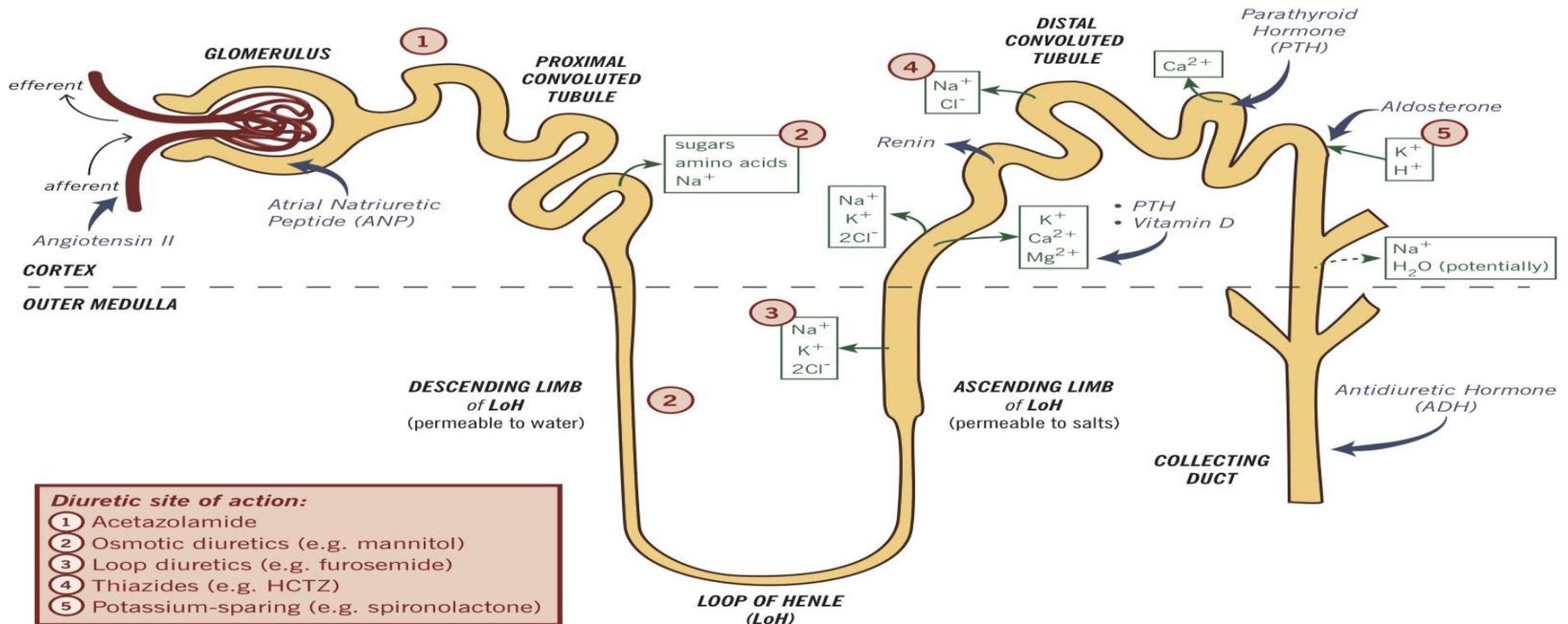
❑ **Renal pelvis** collects urine and transports it to the ureters.

- **Calyces**— cup-shaped structures that funnel urine towards the renal pelvis.
- Urine formed by nephrons collects into **minor calyces** (singular: calyx).
- Several minor calyces unite to form a **major calyx**.
- The major calyces then join to form the **renal pelvis**.

Nephrons

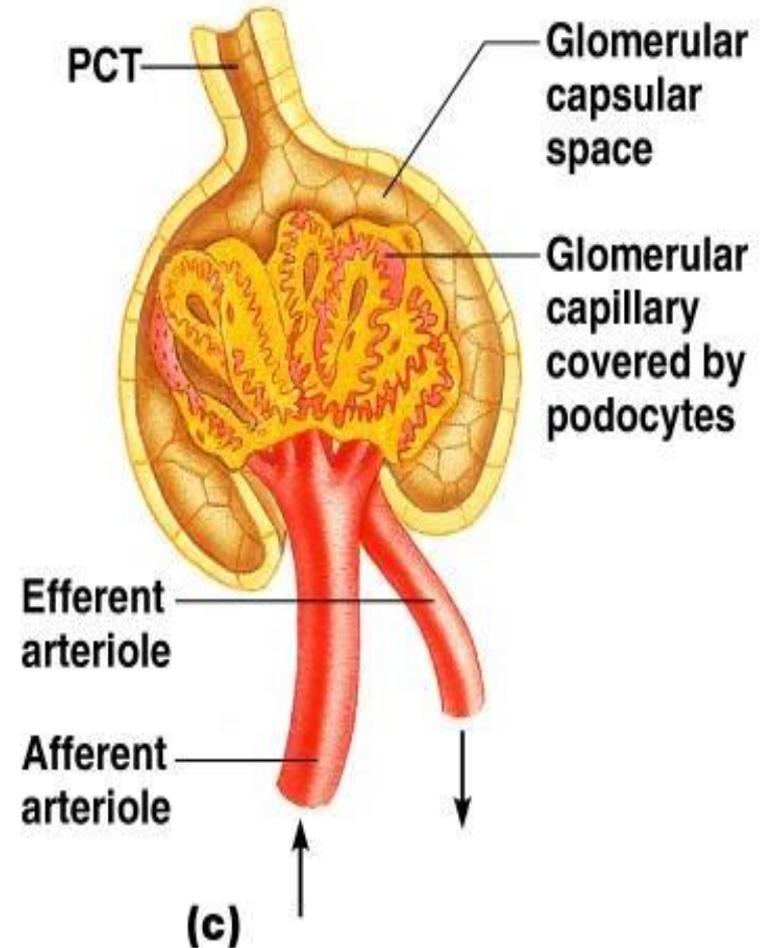
- The **structural and functional units** of the kidneys
- Responsible for forming urine.
 - **Vascular part:** made up of blood vessels; two capillary beds in each nephron: the **Glomerulus** and the **peritubular capillary bed**, the **afferent arteriole** and the **efferent arteriole**.
 - **Tubular part (Renal tubule):** **Bowman's capsule/Glomerular capsule**, **proximal convoluted tubule**, **descending limb of the loop of Henle**, **ascending limb of the loop of Henle**, **distal convoluted tubule**, **collecting tube**.

Hormones Acting on the Nephron / Diuretics and Their Site of Action



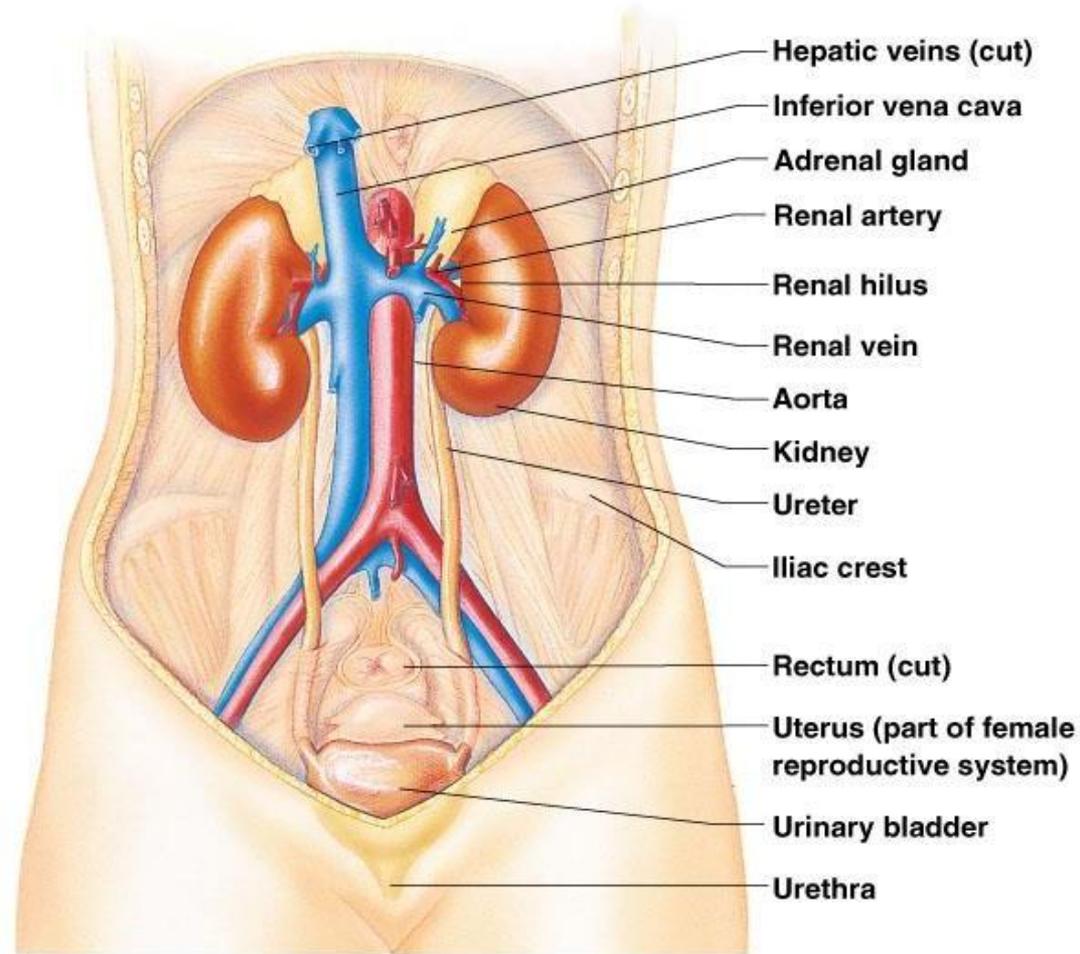
Glomerulus

- The Glomerulus is a specialized capillary bed
- The Glomerulus is attached to arterioles on both sides
- afferent arteriole
- efferent arteriole
- The glomerulus sits within a **glomerular capsule (Bowman's capsule)**.
- The **glomerulus** and the **glomerular/bowman's capsule** form the **renal corpuscle**.



Ureters

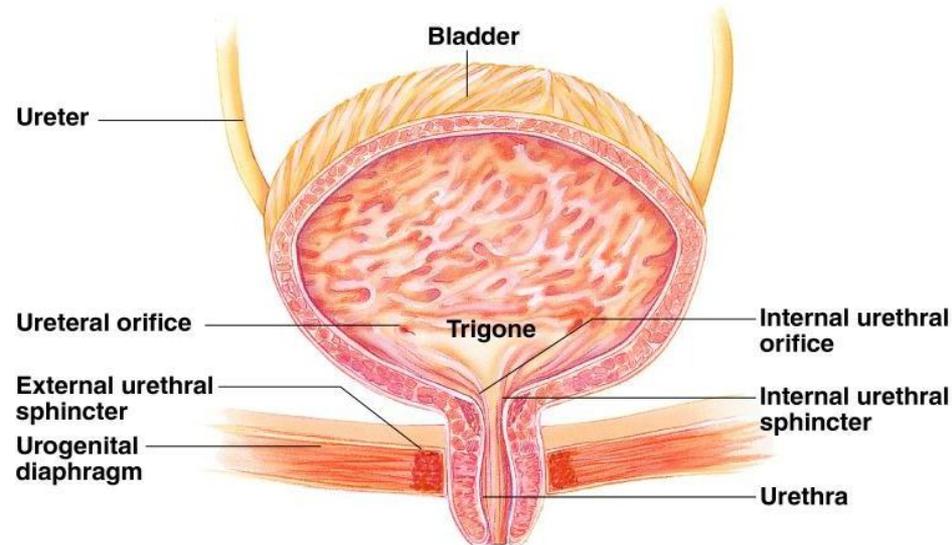
- Thin muscular tubes attaching the kidney to the bladder.
- binds between the renal pelvis and urinary bladder.
- Lined by transitional epithelium.



(a)

Urinary Bladder

- A hollow muscular sac (three layers of smooth muscle collectively called the **detrusor muscle**).
- Temporarily stores urine.
- Mucosa made of transitional epithelium
- Female urinary bladder is smaller than male urinary bladder.
- In the interior of the urinary bladder three opening can be seen: the two ureter openings (**ureteral orifices**) and a single opening of the urethra (the **internal urethral orifice**) which drains the bladder.
- The smooth triangular region of the bladder base outlined by these three openings is called the **trigone**.



Urethra

- Thin-walled tube that carries urine from the bladder to the outside of the body.
- At the bladder-urethral junction, a thickening of smooth muscle forms the **internal urethral sphincter** (involuntary sphincter muscle).
- An **external urethral sphincter** is formed by skeletal muscle as the urethra passes through the pelvic floor.

Urethra Gender Differences

• Length

- Females: 4 cm
- Males: 20 cm

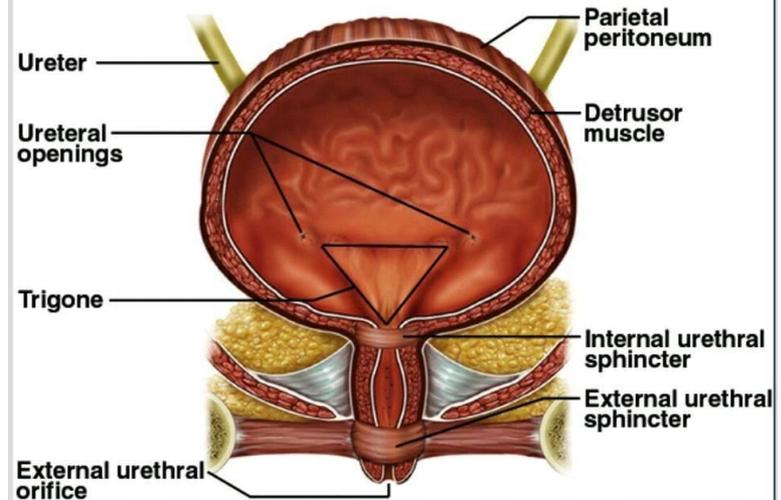
• Location

- Females: vertical and lies anteriorly to the vaginal opening
- Males: s-shaped and through the prostate and penis, has three parts: prostatic urethra, membranous urethra, spongy urethra).

• Function

- Females: only carries urine
- Males: carries urine and is a passageway for sperm cells.

Urinary Bladder and Urethra, Female



Urinary Bladder and Urethra, Male

