The Urinary System

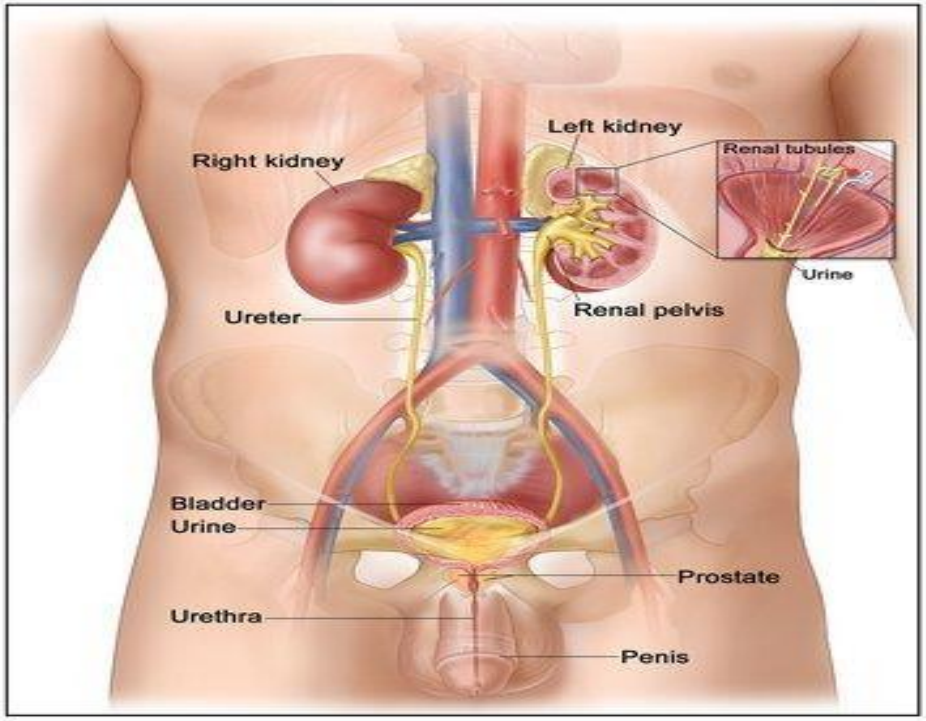
The Urinary system

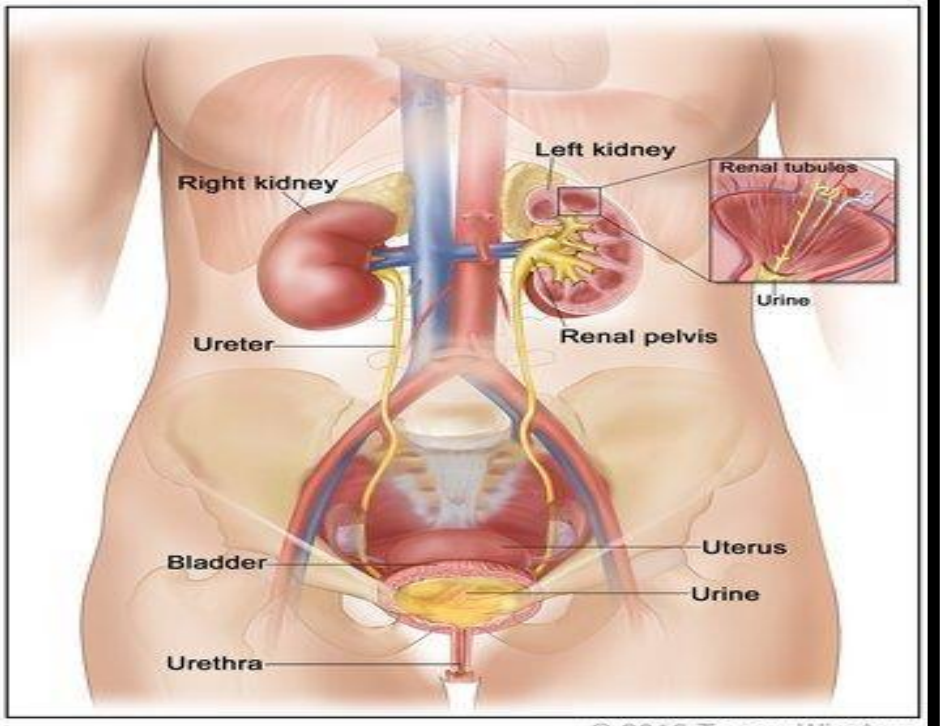
Organs of the urinary system

- Kidneys
- Ureters
- Urinary bladder
- Urethra

Functions of the Urinary System

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





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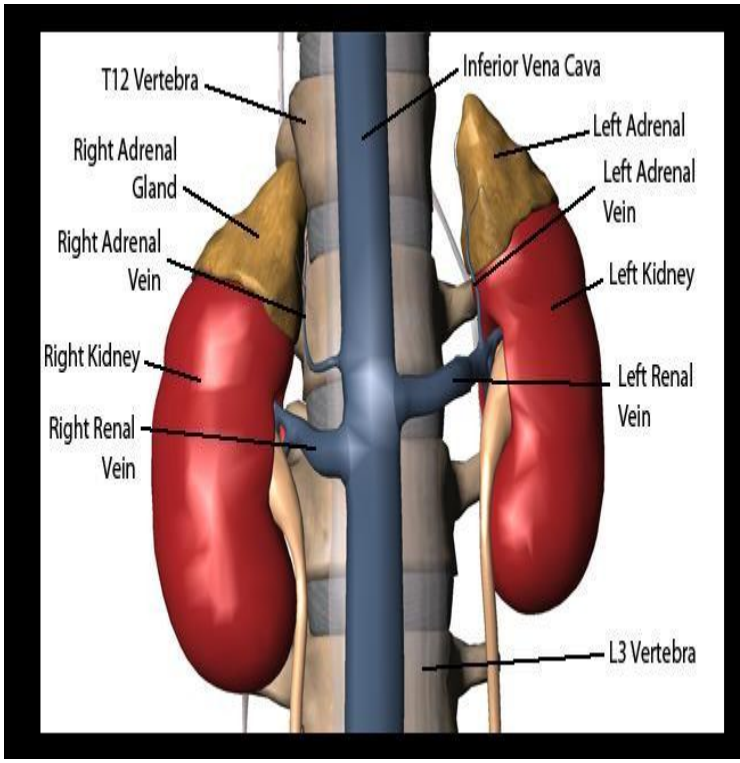
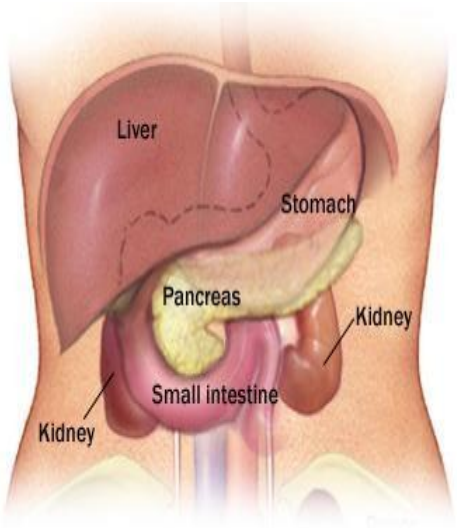
Location of the Kidneys

- 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:

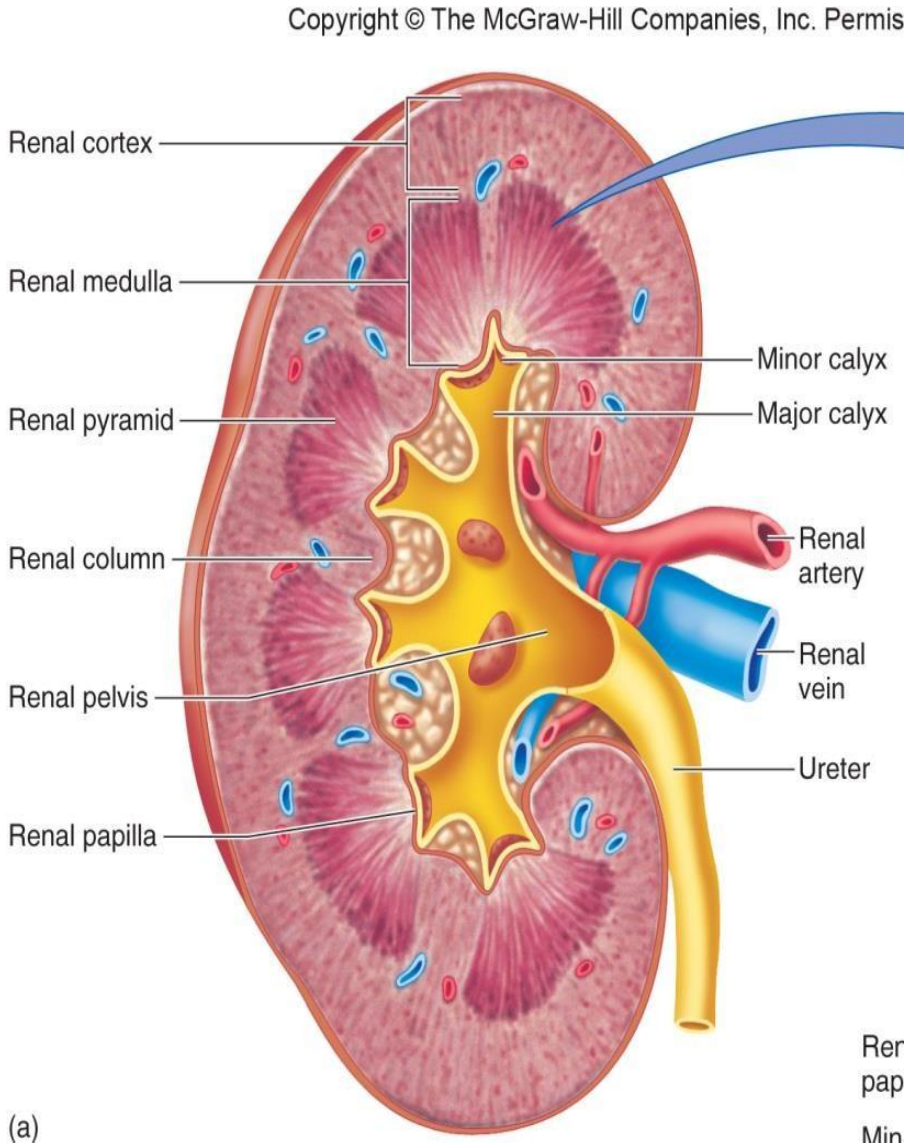
✓ Kidney flesh

✓ Renal Pelvis: inner collecting tube

Kidney Flesh

Renal cortex – outer region (light in color).

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



Regions of the Kidney

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

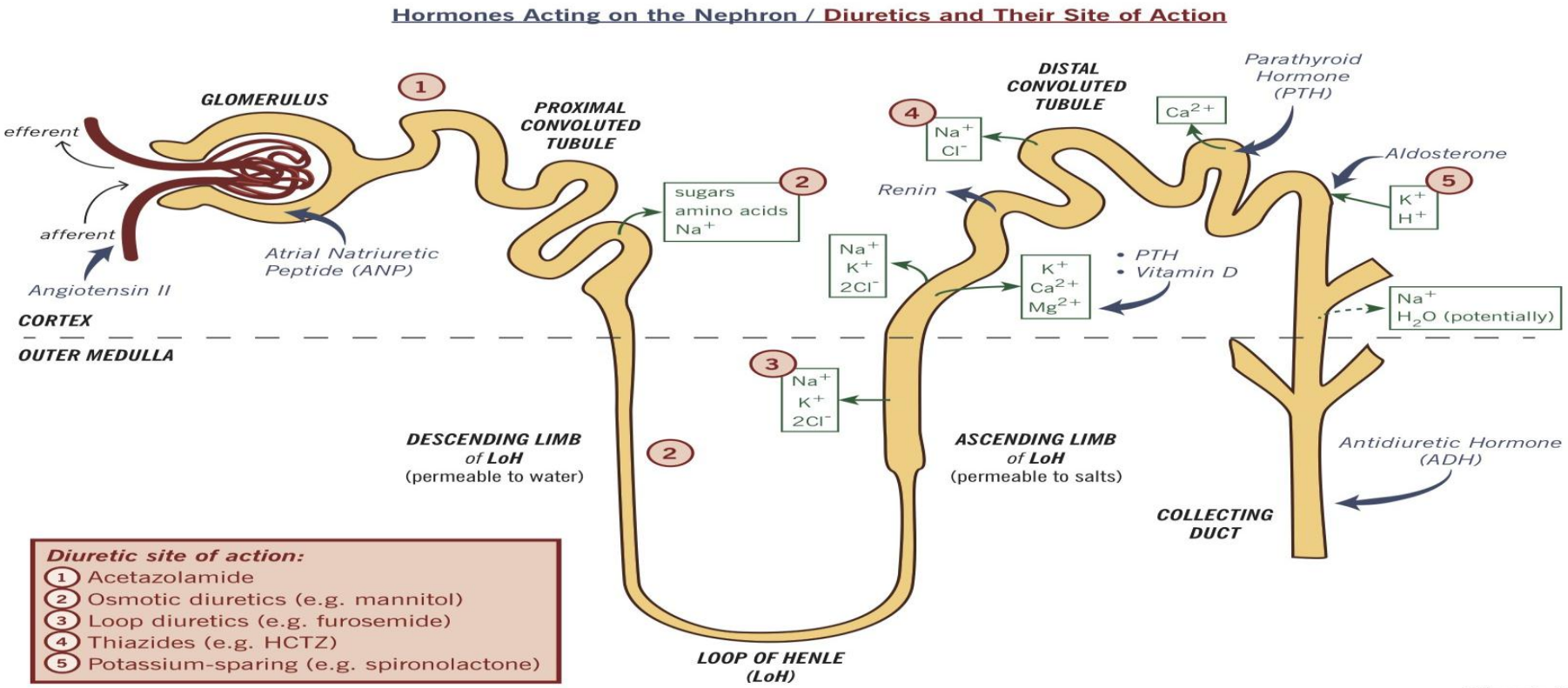
1. **Renal Cortex:** granular in appearance (many **capillaries**). Two parts: **outer layer** and a **continuation called renal column** penetrating between the medullary pyramids.
2. **Renal Medulla**: striped in appearance (**tubules** and blood **vessels**). The **medulla** is composed of triangular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

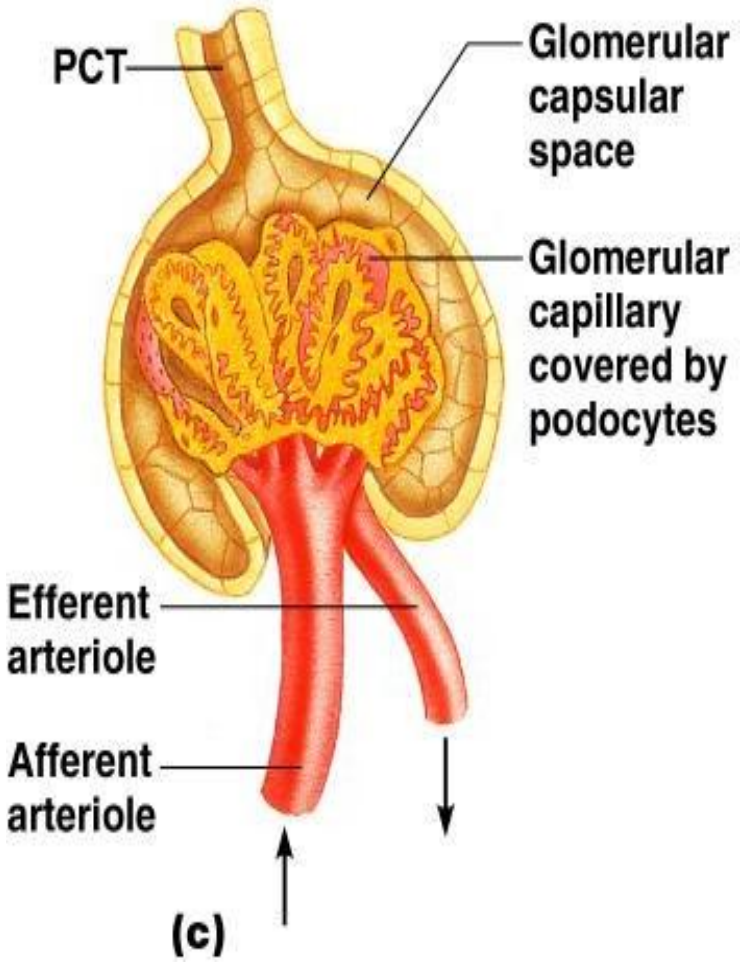
Nephrons

- 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.**



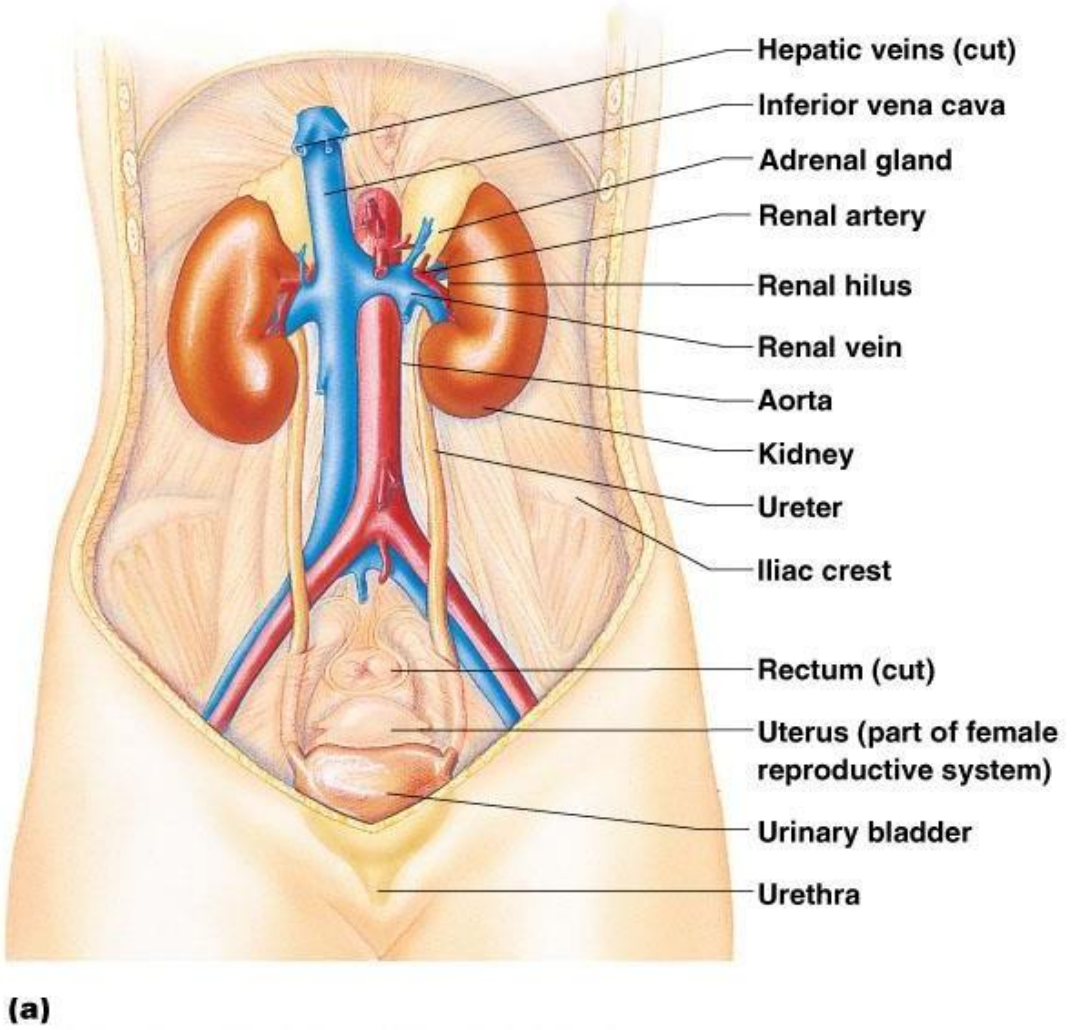
Glomerulus

- 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

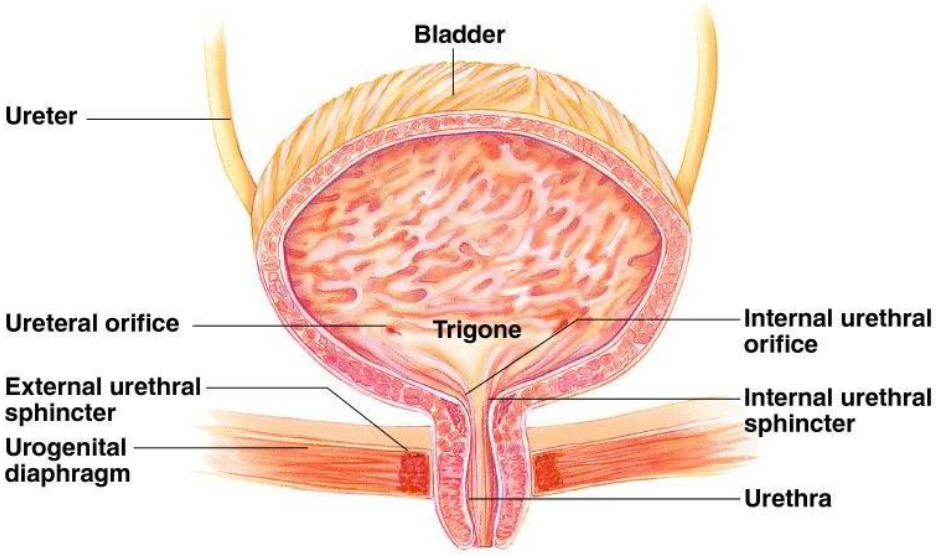
- Thin muscular tubes attaching the kidney to the bladder.
- binds between the renal pelvis and urinary bladder.
- Lined by transitional epithelium.



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: prostate urethra, membranous urethra, spongy urethra).
- **Function**
  - Females: only carries urine
  - Males: carries urine and is a passageway for sperm cells.

