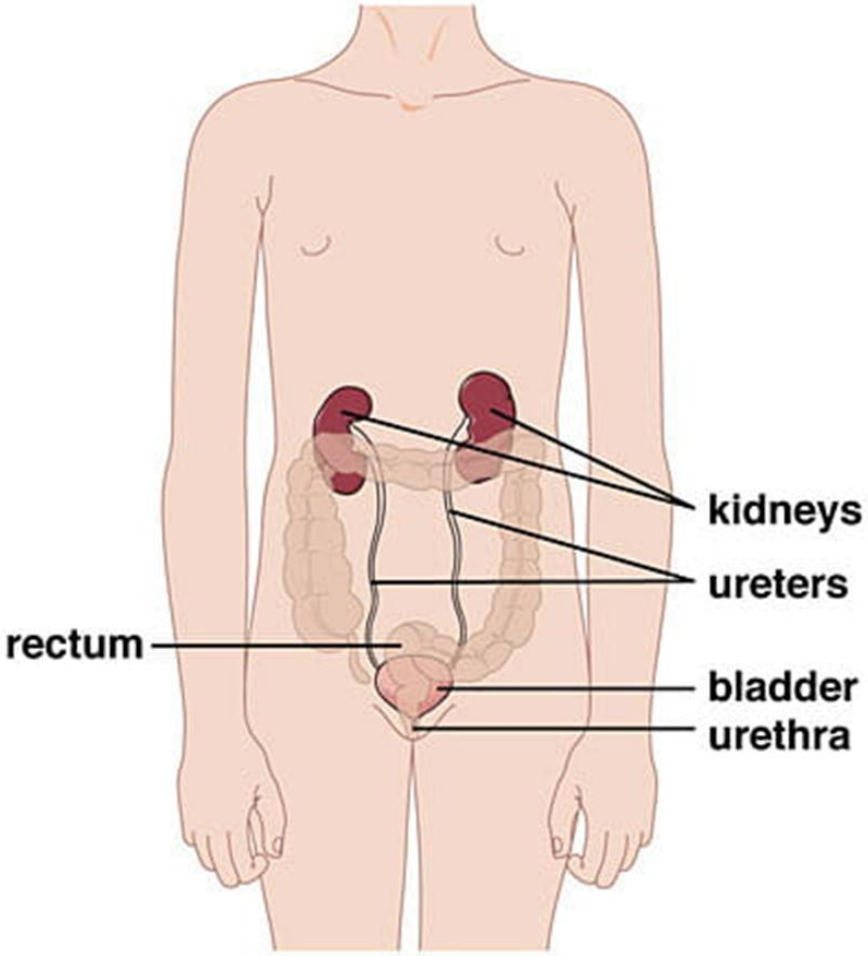
URINARY SYSTEM

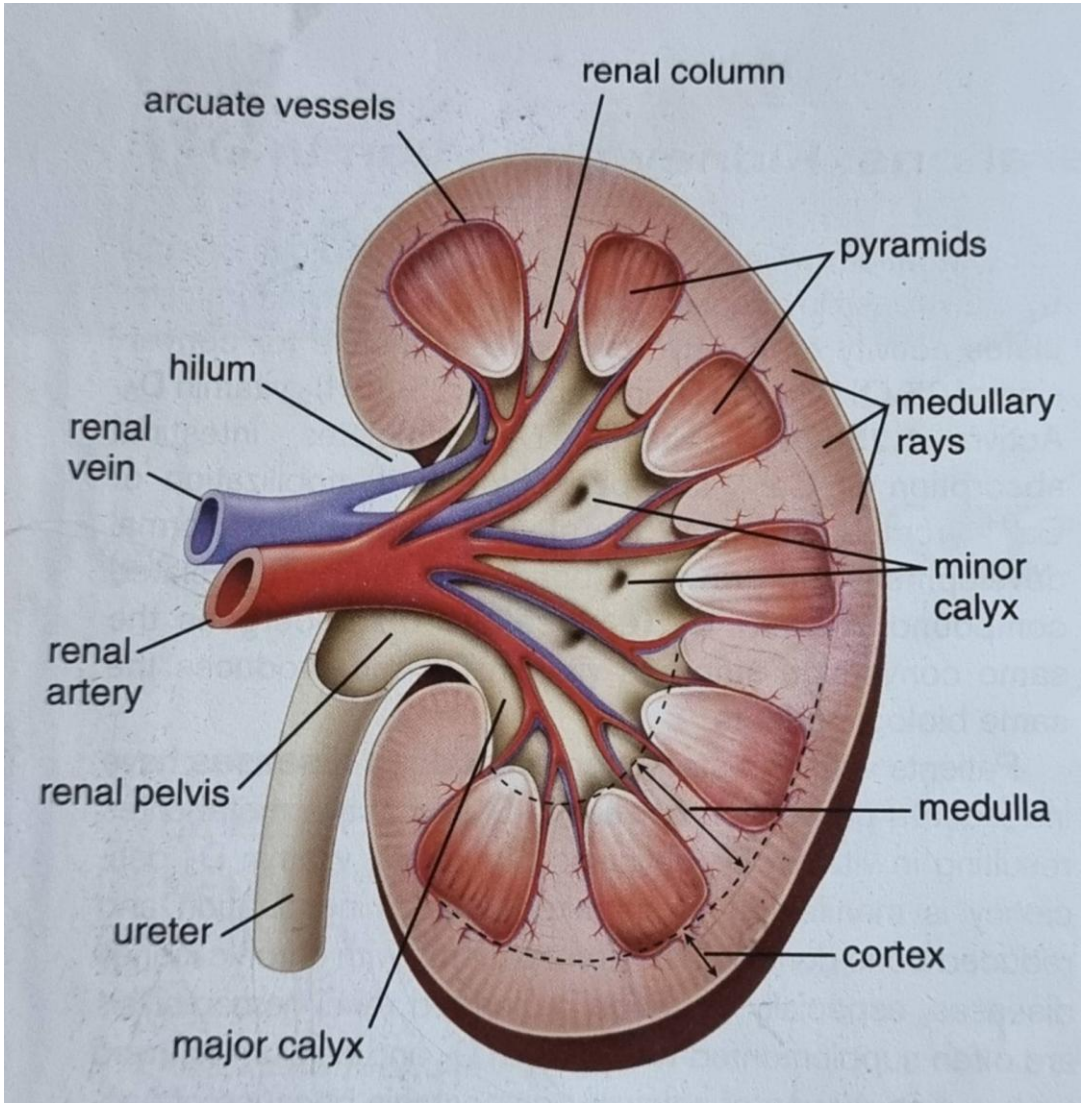
FUNCTIONS OF THE URINARY SYSTEM

- REGULATION AND MAINTENANCE THE COMPOSITION AND VOLUME OF THE EXTRACELLULAR MATRIX
- MAINTENANCE ACID-BASE BALANCE EXCRETING HYDROGEN IONS
- BALANCE OF MINERALS
- ENDOCRINE FUNCTION (PRODUCTION OF ERYTHROPOIETIN)
- CONTROL BLOOD PRESSURE (SYNTHESIZING RENIN)
- EXCRETION OF WASTE SUBSTANCES
- ACTIVATION OF VITAMIN D



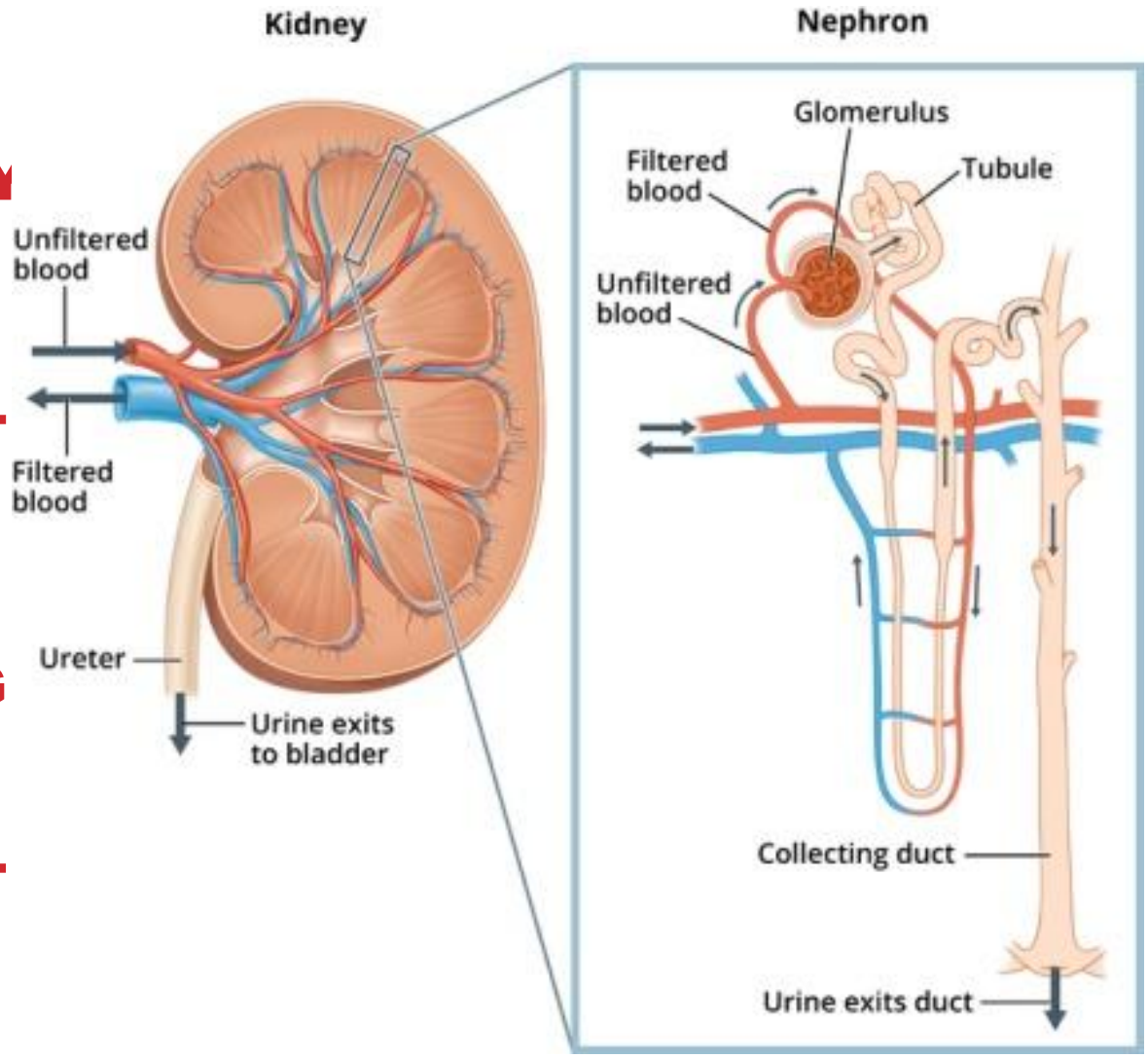
STRUCTURE OF THE KIDNEY

REDDISH, BEAN-SHAPED ORGANS LOCATED IN THE RETROPERITONEAL SPACE OF THE POSTERIOR ABDOMINAL CAVITY



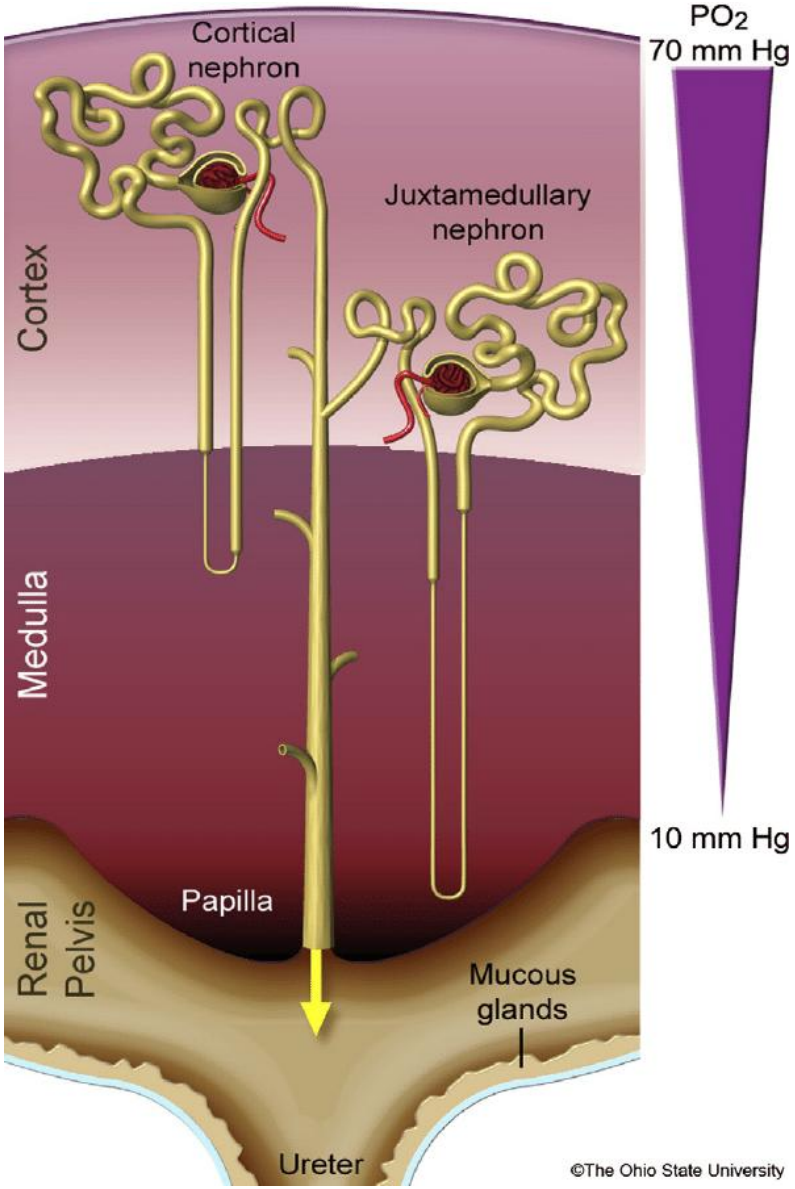
NEPHRON-*STRUCTURAL AND FUNCTIONAL UNIT OF THE KIDNEY*

- THE CAPILLARY GLOMERULUS SURROUNDED BY BOWMAN'S CAPSULE
- THE PROXIMAL THICK SEGMENT
- THE THIN SEGMENT (DESCENDING AND ASCENDING PART)
- THE DISTAL THICK SEGMENT



TYPES OF NEPHRONS

1) CORTICAL (80%)
-THE SHORT
-THE INTERMEDIATE
2) JUXTAGLOMERULARRY (20%)



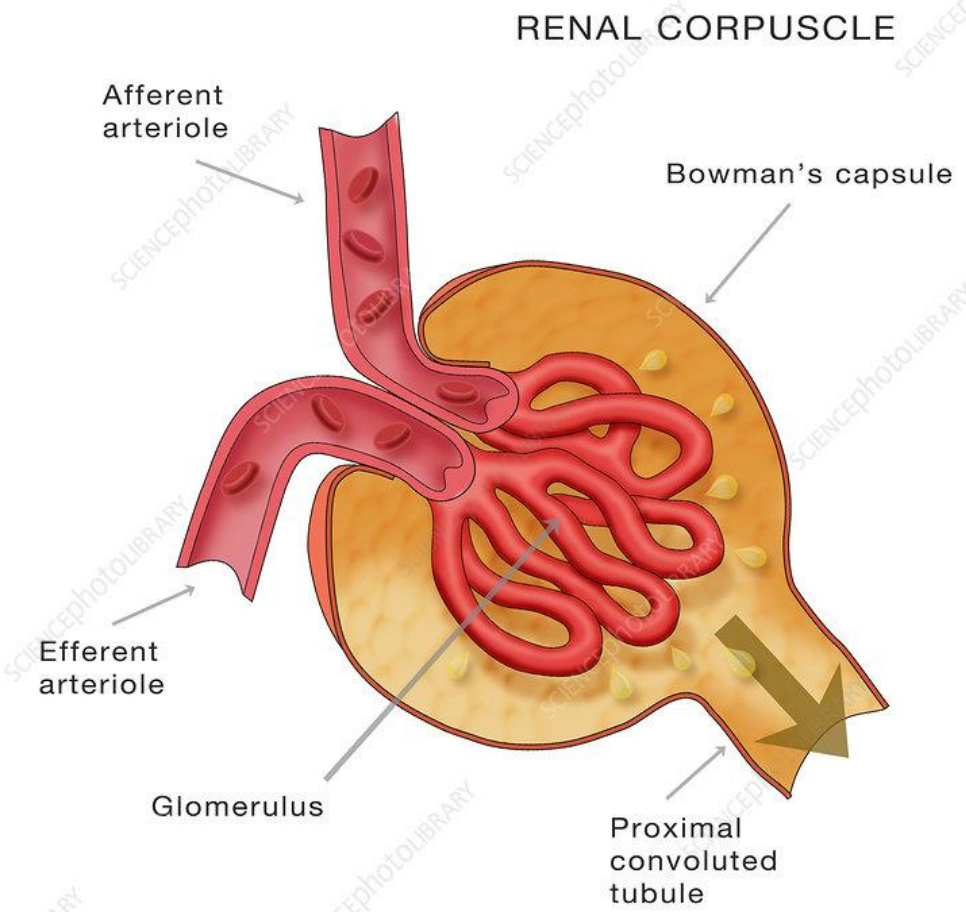
RENAL CORPUSCLE (MALPIGHIAN CORPUSCLE)
=CAPILLARY GLOMERULUS + BOWMAN'S CAPSULE

1. THE GLOMERULUS (AFFERENT ARTERIOLE, SINUSOIDAL CAPILLARIES, EFFERENT ARTERIOLE)

2. BOWMAN'S CAPSULE- DOUBLE-LAYERED EPITHELIUM CAP

- VISCERAL LAYER – FIBROBLASTS (PODOCYTES) + COLLAGEN FIBERS

- PARIETAL LAYERS - MYOFIBROBLASTS



FORMATION OF URINE

I FILTRATION (RENAL CORPUSCLE)

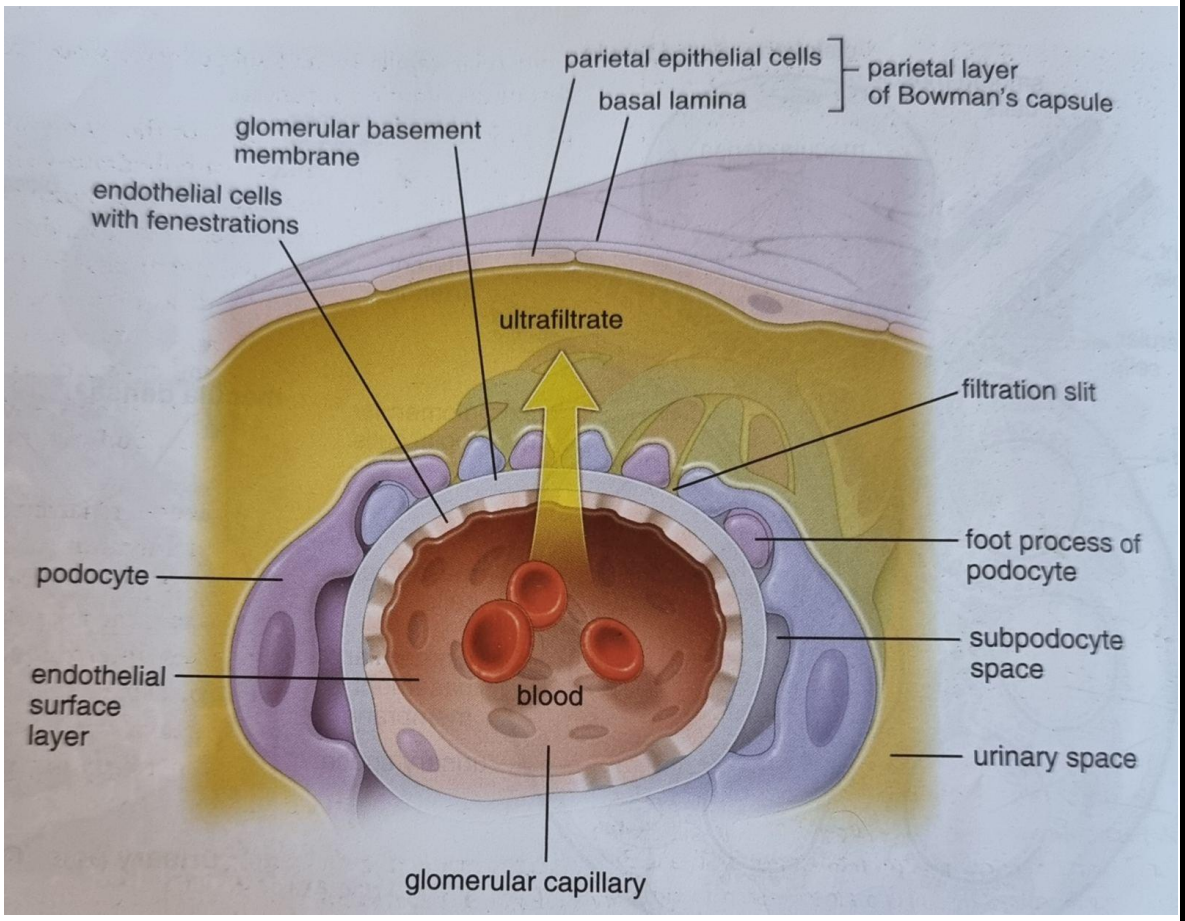
II REABSORPTION *(NEPHRONAL* TUBULES)

III SECRETION (COLLECTING DUCTS AND TUBULES)

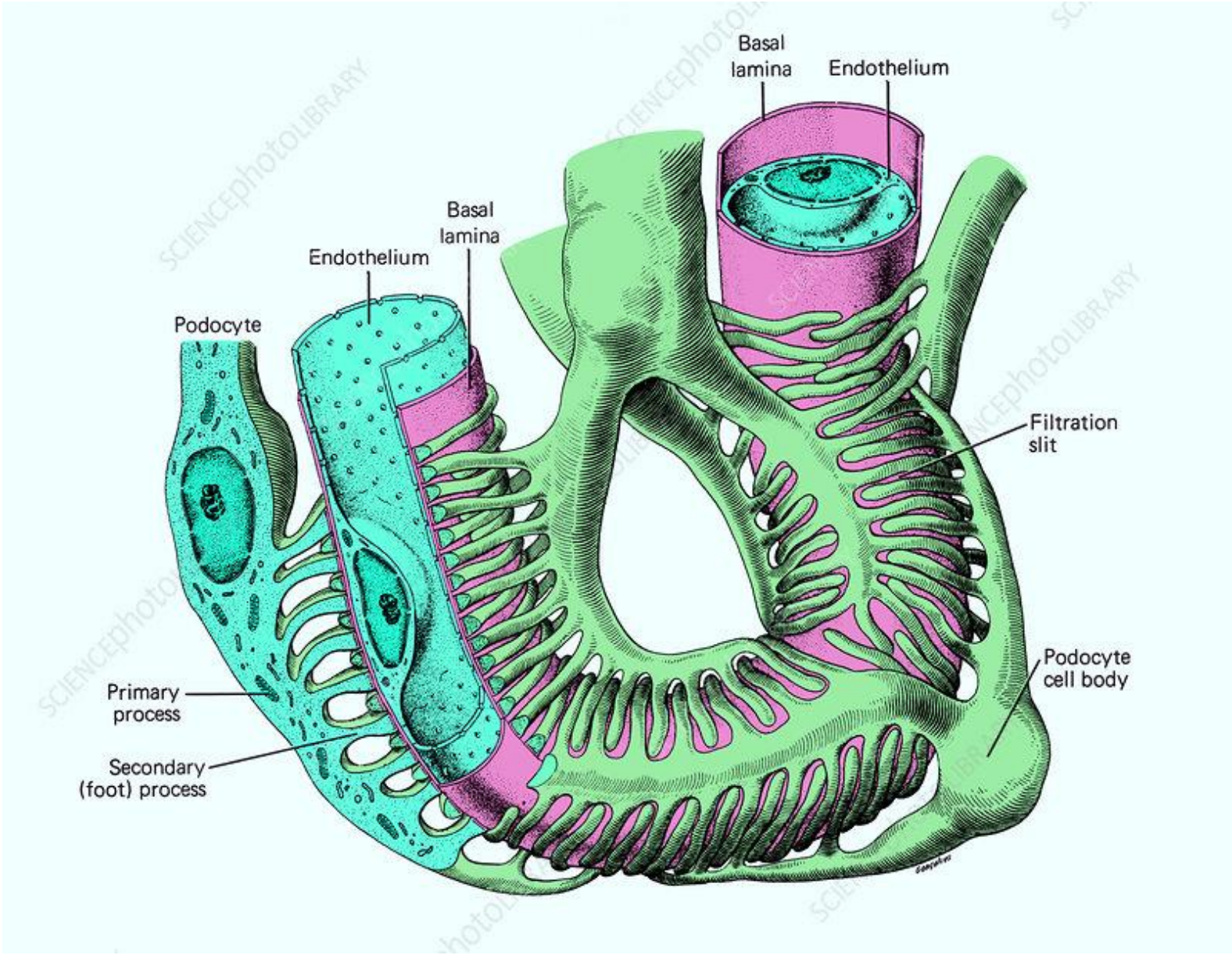
I FILTRATION- IS THE FIRST STEP IN MAKING URINE. IT IS THE PROCESS THAT KIDNEYS USE TO FILTER EXCESS FLUID AND WASTE PRODUCTS OUT OF THE BLOOD INTO THE COLLECTING TUBULES OF THE KIDNEY

Components of the filter barrier:

1. **Endothelium of the glomerular fenestrated capillaries**
2. **Underlaying basement membrane. It consists of three layers: two of them are electron- lucent and the middle one is electron-dense**
3. **Visceral layer of Bowman's capsule consists of podocytes with cytotrabeculae and cytopodia**



PODOCYTES


Basal lamina
Endothelium
Basal lamina
Endothelium
Podocyte
Filtration slit
Podocyte cell body
Primary process
Secondary (foot) process

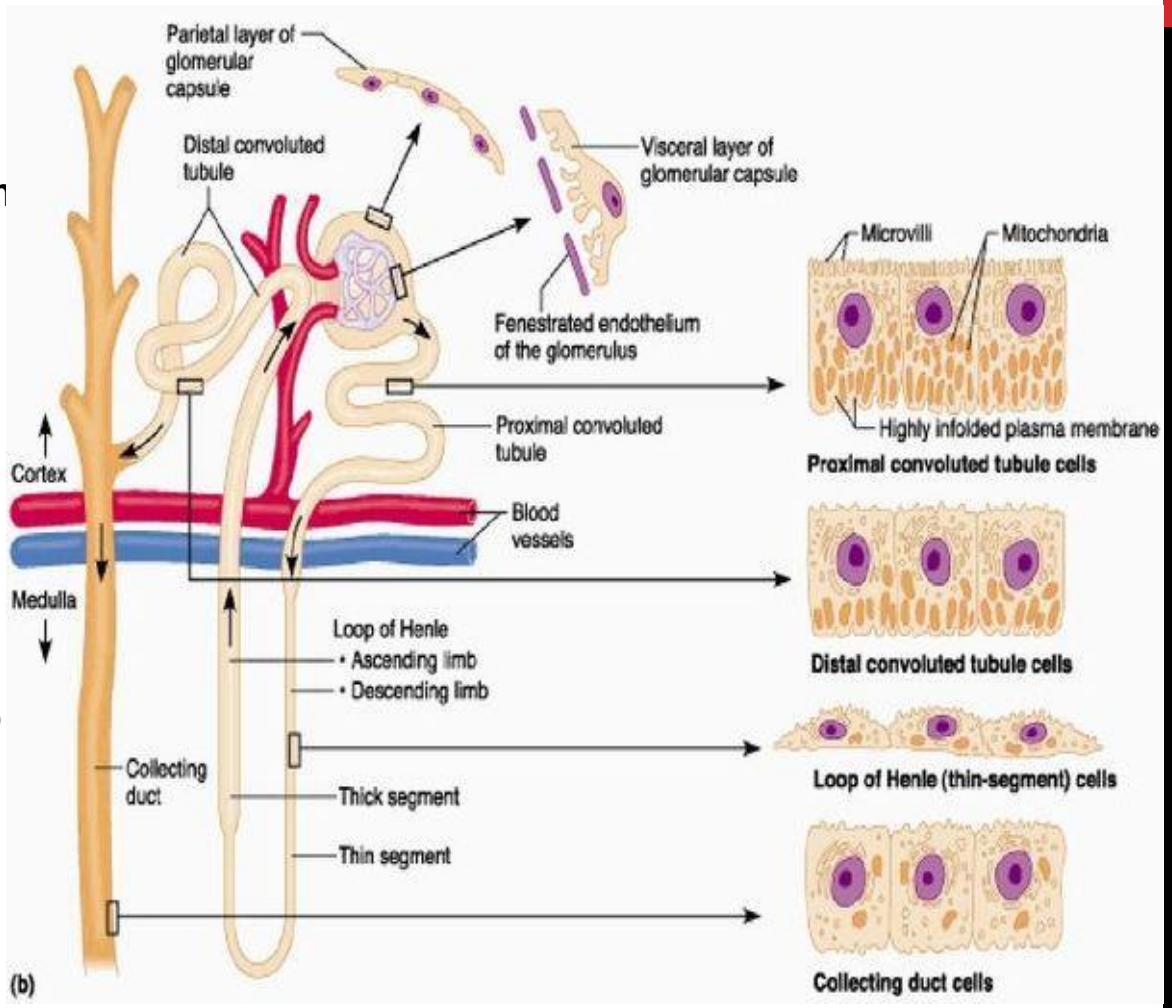
II REABSORPTION- MOVING OF GLUCOSE, ELECTROLYTES, PROTEINS AND WATER BACK INTO THE BLOODSTREAM. STARTS WITH THE PROXIMAL TUBULES.

Proximal tubules:

1. **Proximal convoluted tubules**

- Simple cuboidal epithelium with brush border
- Reabsorption of glucose is provided by glycocalyx with alkaline phoshatase
- Reabsorption of proteins is provided by pinocytosis
- Reabsorption of electrolytes is provided by mitochondria that contain succinate dehydrogenase
- Reabsorption of water is due to passive reabsorption

2. **Proximal straight tubules**



THIN SEGMENT:

- SIMPLE SQUAMOS EPITHELIUM
- REABSORPTION OF WATER DUE TO HIGH CONCENTRATIONS OF SODIUM CHLORIDE IN THE INTERSTITIUM

DISTAL TUBULES:

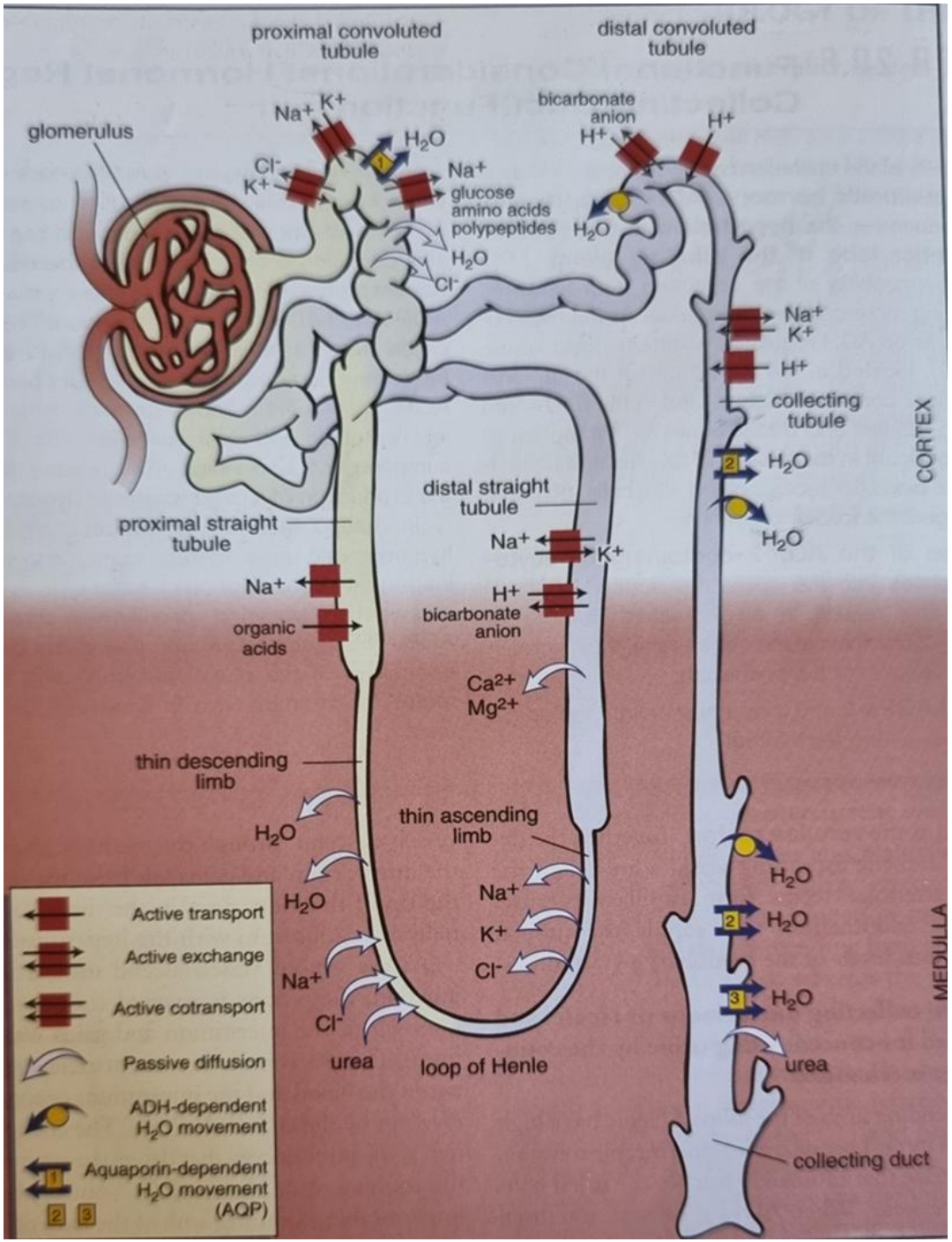
1. DISTAL CONVOLUTED TUBULES

- SIMPLE CUBOIDAL EPITHELIUM
- PASSIVE REABSORPTION OF WATER

1. DISTAL STRAIGHT TUBULES

- SIMPLE CUBOIDAL EPITHELIUM

III SECRETION -EXCRETION OF CHLORIDE IONS BY DARK CELLS OF THE COLLECTING TUBULES AND ACIDATION OF THE URINE



ENDOCRINE FUNCTION OF THE KIDNEY

Juxtaglomerular apparatus:

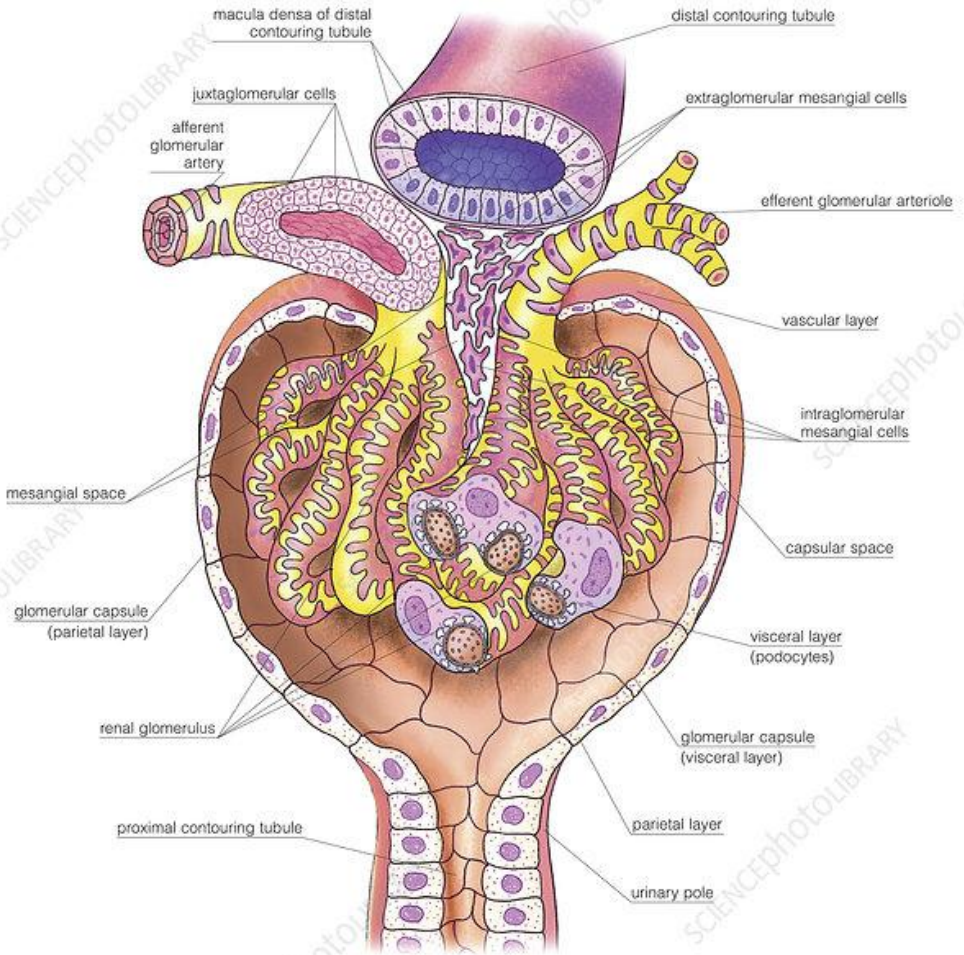
1. juxtaglomerular cells- production of renin

2. cells of macula densa

3. juxtavascular cells (Gorrmaghtigh's)

4. mesangial cells

Prostaglandin apparatus



URINARY TRUCTS:

- **Renal calyces and renal pelvis**
- **Ureter**
- **Urinary bladder**
- **Urethra**

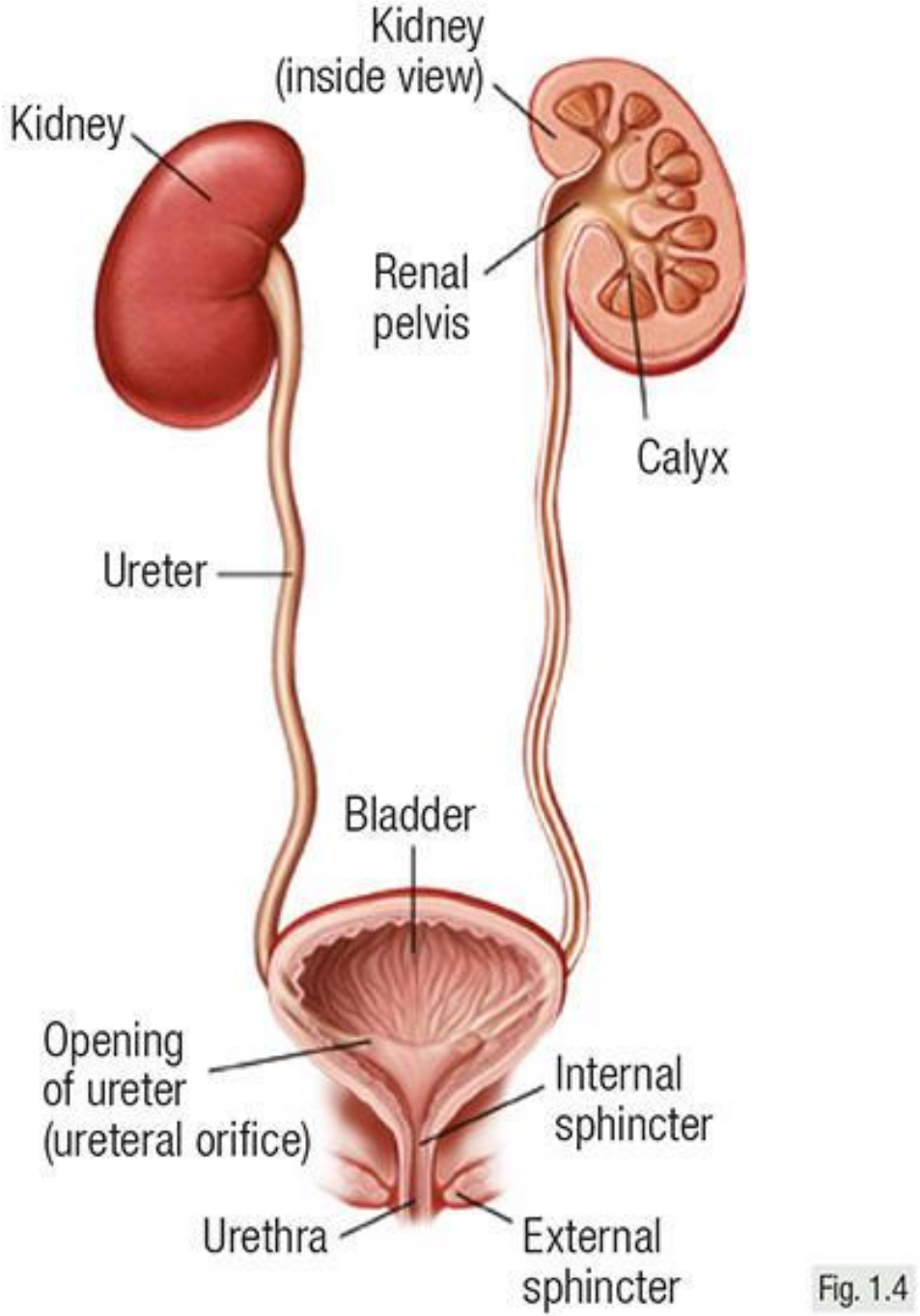


Fig. 1.4

URETER

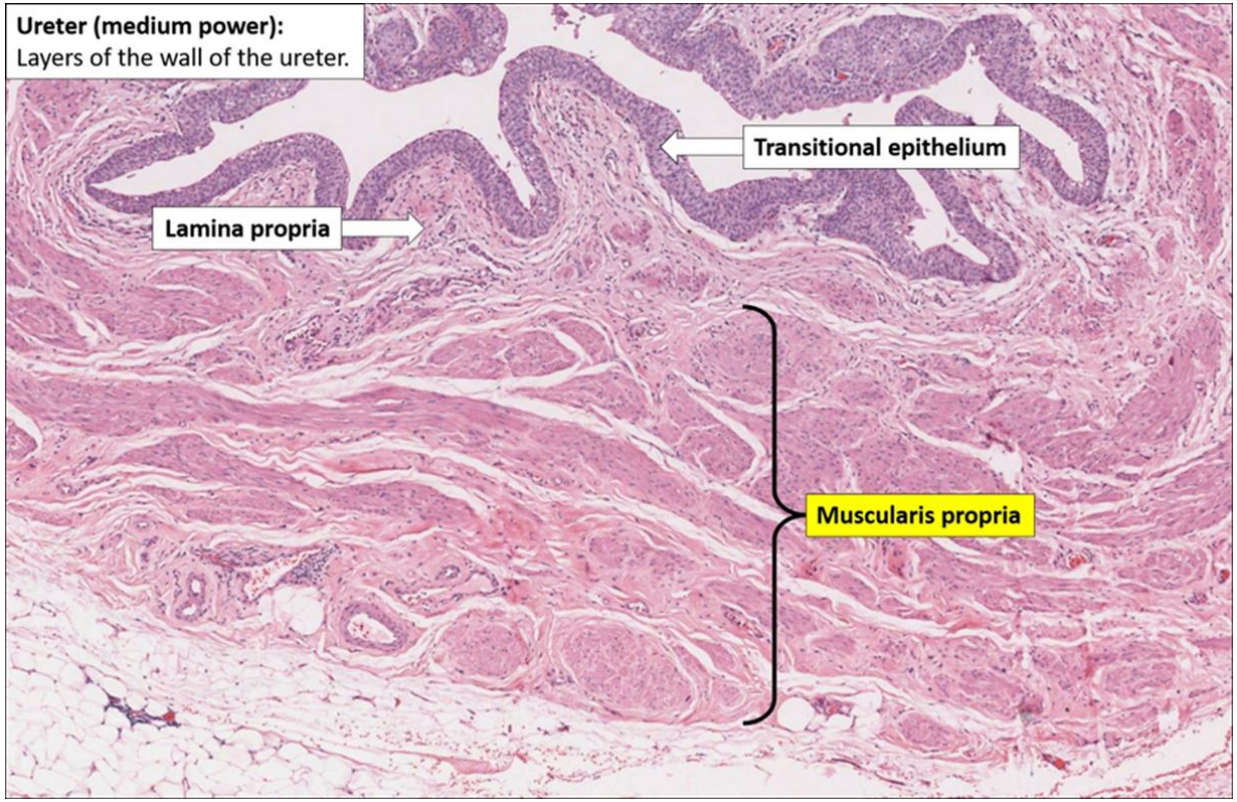
I Mucosa

- **Transitional epithelium**
- **Lamina propria- loose connective tissue**

II Submucosa -loose connective tissue + tubuloalveolar glands

III Muscularis – 2 layers of smooth muscle cells

IV Adventitia-loose connective tissue



URINARY BLADDER

I Mucosa

Transitional epithelium

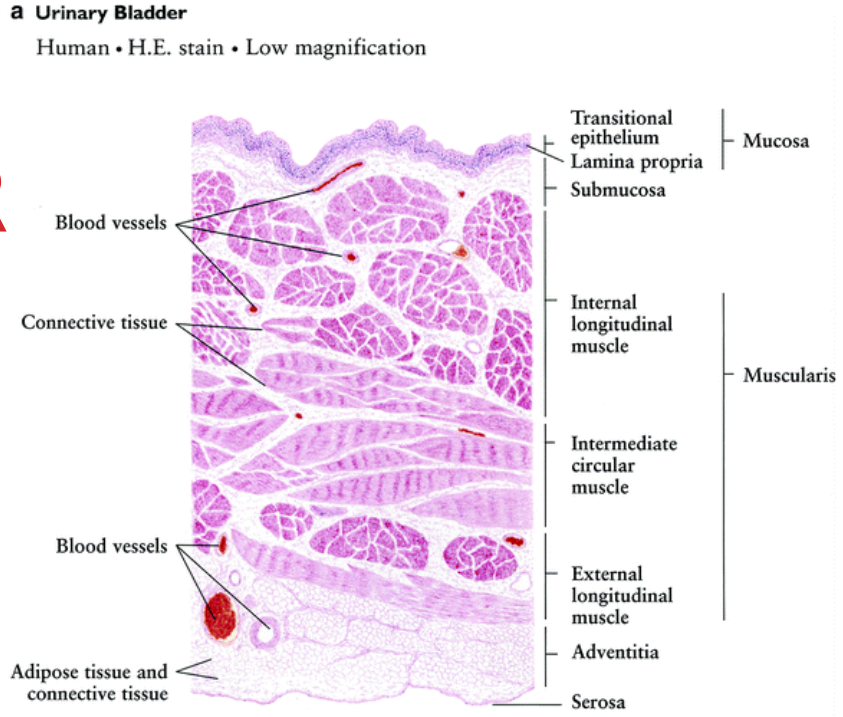
Lamina propria- loose connective tissue

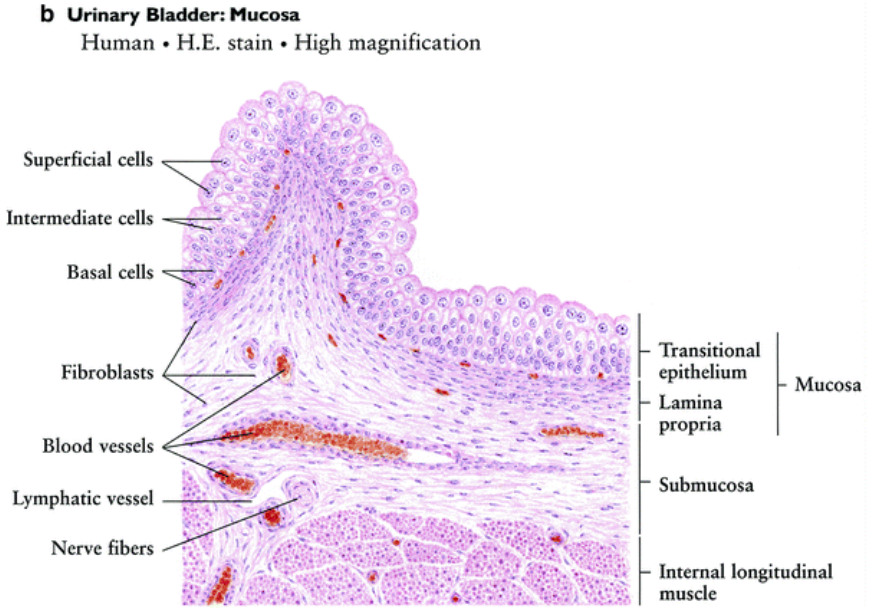
II Submucosa -loose connective tissue + tubulo-alveolar glands (absent in the trigonum)

III Muscularis – 3 layers of smooth muscle cells

- Outer and inner longitudinal
- Middle- circular

IV Adventitia





URINARY BLADDER

Urinary bladder