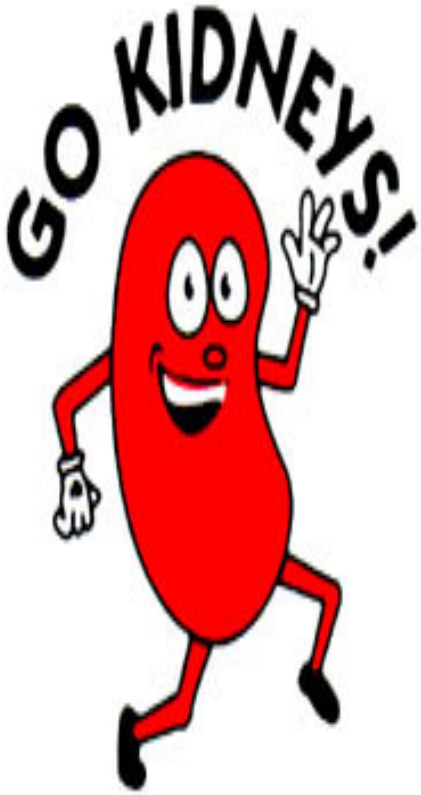
Kidney Histology

Renal Block

Objectives:

1- Microscopic Structure of Renal cortex & Medulla.
2-Histology of Renal Corpuscle, proximal & distal tubules, loop of henle and collecting tubules.
3- Histological Structure of Juxtamedullary Appartus
4- Functional Structures of different parts of the Kidney.



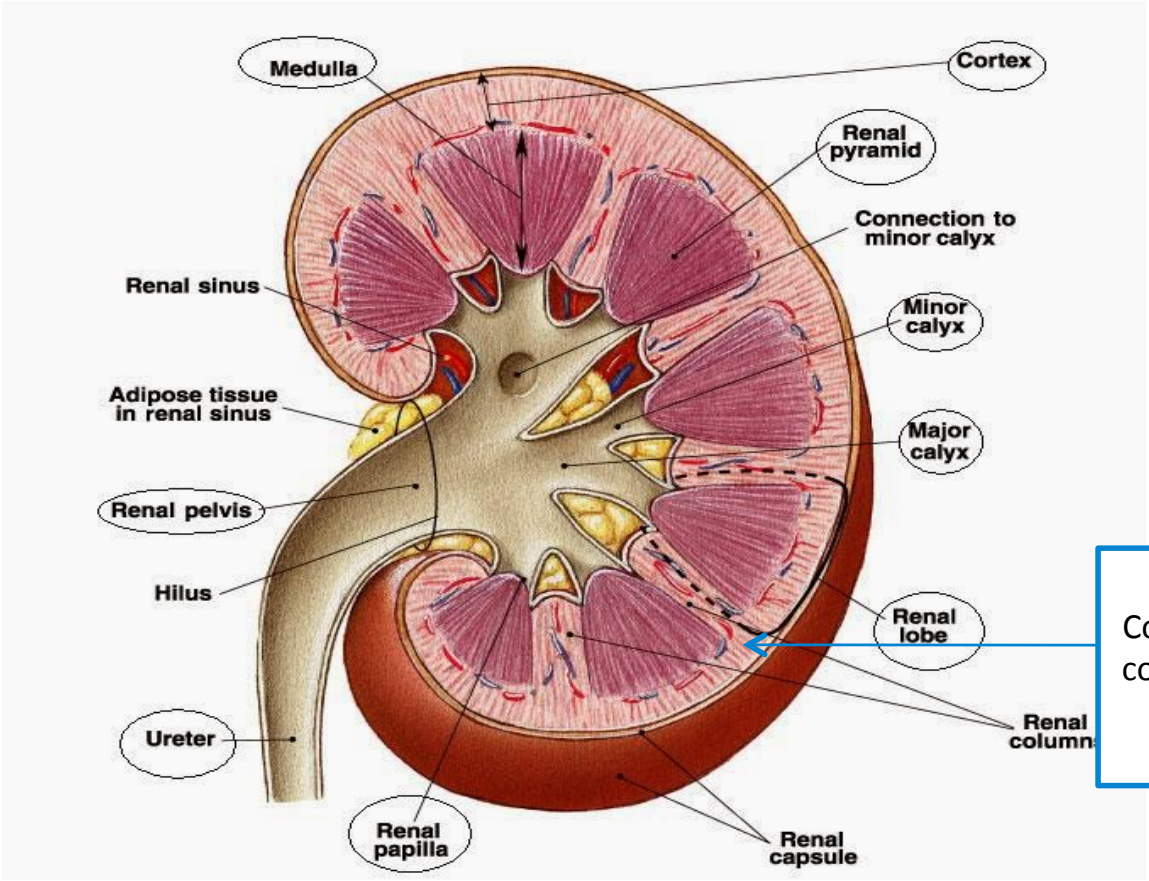
جامعة الملك سعود
King Saud University

MED 434 ICINE

HISTOLOGY 434

Kidney

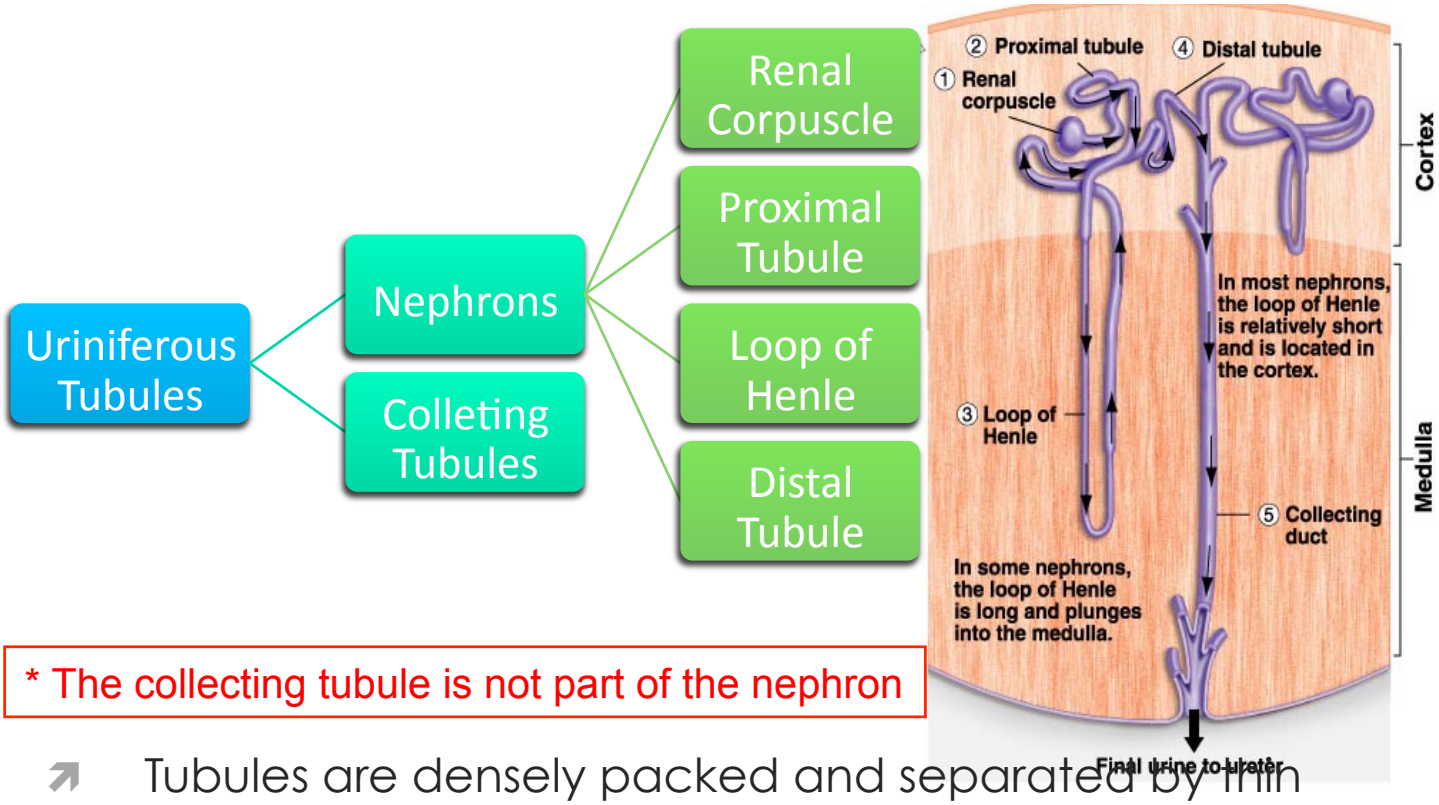
- **Cortex:** Dark brown and granular.
- **Medulla:** 6-12 pyramid-shape regions (renal pyramids)
  - ✓ base of pyramid is toward the cortex "cortico-medullary border"
  - ✓ Apex "renal papilla" toward the hilum, it is perforated by 12 openings of the **ducts of Bellini** in region called area cribrosa . The apex is surrounded by a minor calyx.
  - ✓ 3 or 4 minor calyces join to form 3 or 4 major calyces that form renal pelvis " upper part of ureter"
  - ✓ Pyramids are separated by cortical columns of **Bertin.**



Medullary rays: Collecting ducts that connect the medulla to the cortex

Uriniferous Tubule

- Uriniferous Tubule is the functional unit of the kidney

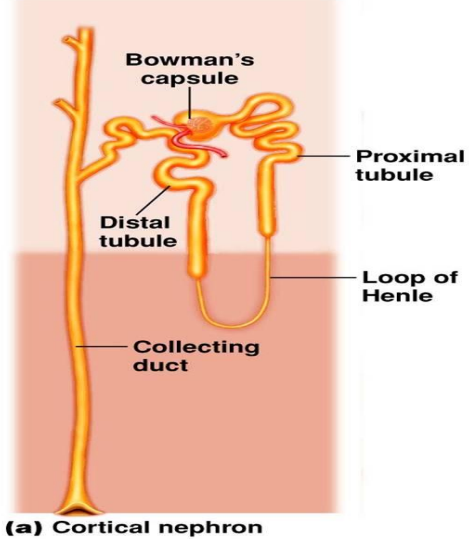


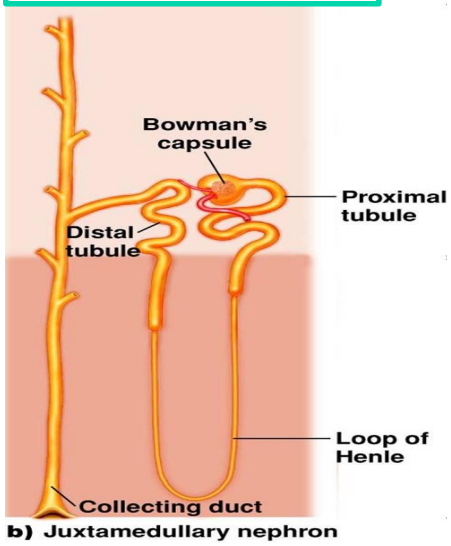
* The collecting tubule is not part of the nephron

- Tubules are densely packed and separated by thin stroma and basal lamina.

Nephron

Cortical Nephron ⟵ **Types** ⟶ **Juxtamedullary Nephron**





Nephron

1- Renal Corpuscle

Glomerulus

tuft of fenestrated capillaries "without diaphragm"

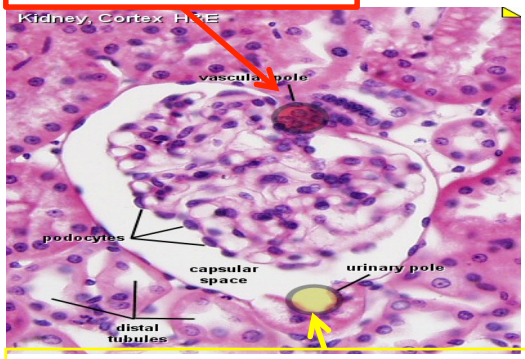
Bowman's Capsule

Parietal layer, urinary space and visceral layer or podocytes

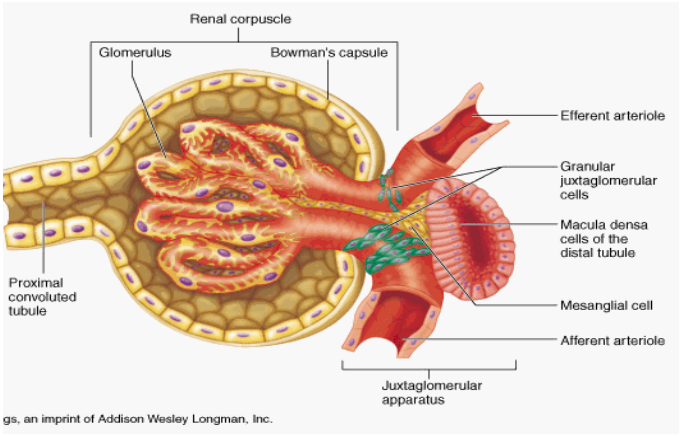
Mesangial Cells

intra-glomerular cells

Afferent entering

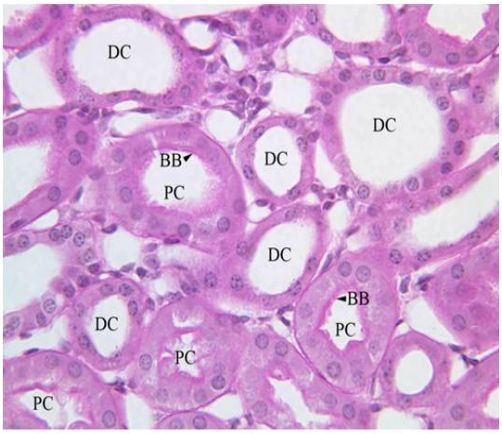


Beginning of the proximal tubule



2- Proximal Convoluted Tubules

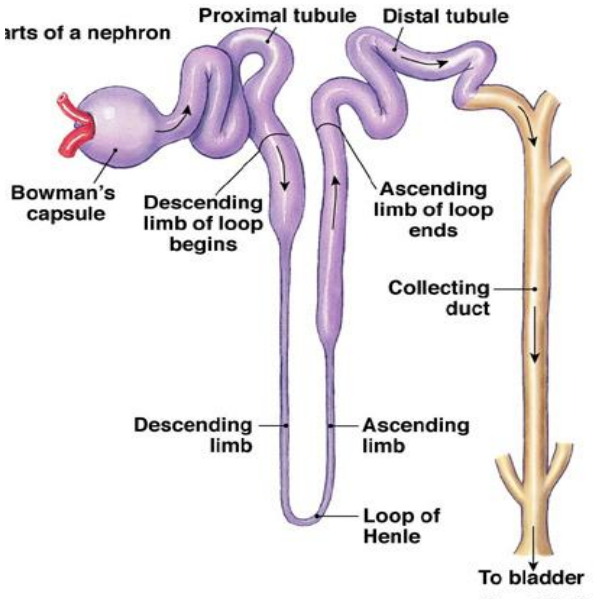
- It is composed of simple cuboidal epithelialum with acidophilic cytoplasm. The cells have striated or brush border and lateral inter-digitations.
- They have well-defined basal lamina



DC - distal convoluted tubule PC - proximal convoluted tubule BB - brush border

3- Thin Limbs of Henele's Loop

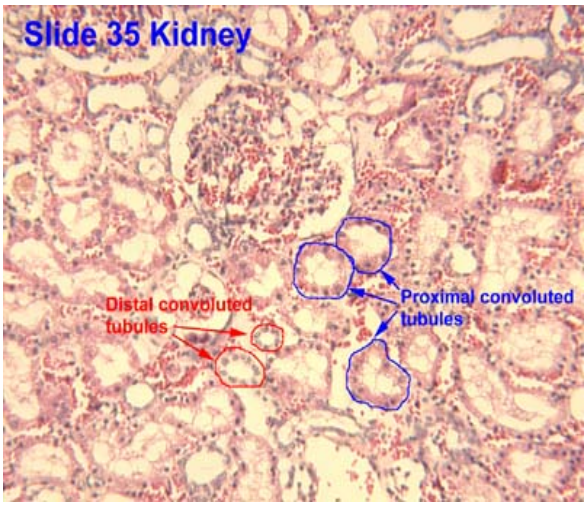
- Composed of Simple Squamous Epithelium.
- It is **longer** in Juxta-medullary nephron than cortical.



Regions		
Descending Thin Limb	Crest of Henle's Loop	Ascending Thin Limb

4- Distal Convoluted Tubule

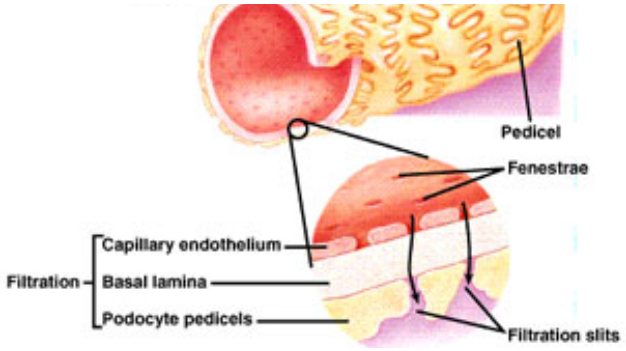
- Starts at Macula Densa "tall Columnar & Narrow Cells"
- Formed of low Cuboidal Epithelium.
- Proximal conoluted tubules are much **longer** than Distal, therefore, any section of renal cortex presents many more sections of proximal convoluted tubules
- Drain into collecting tubule



Glomerular Filtration Barrier

GFB

- Endothelial wall of glomerular capillaries
- Glomerular basal lamina
- Podocyte pedicles



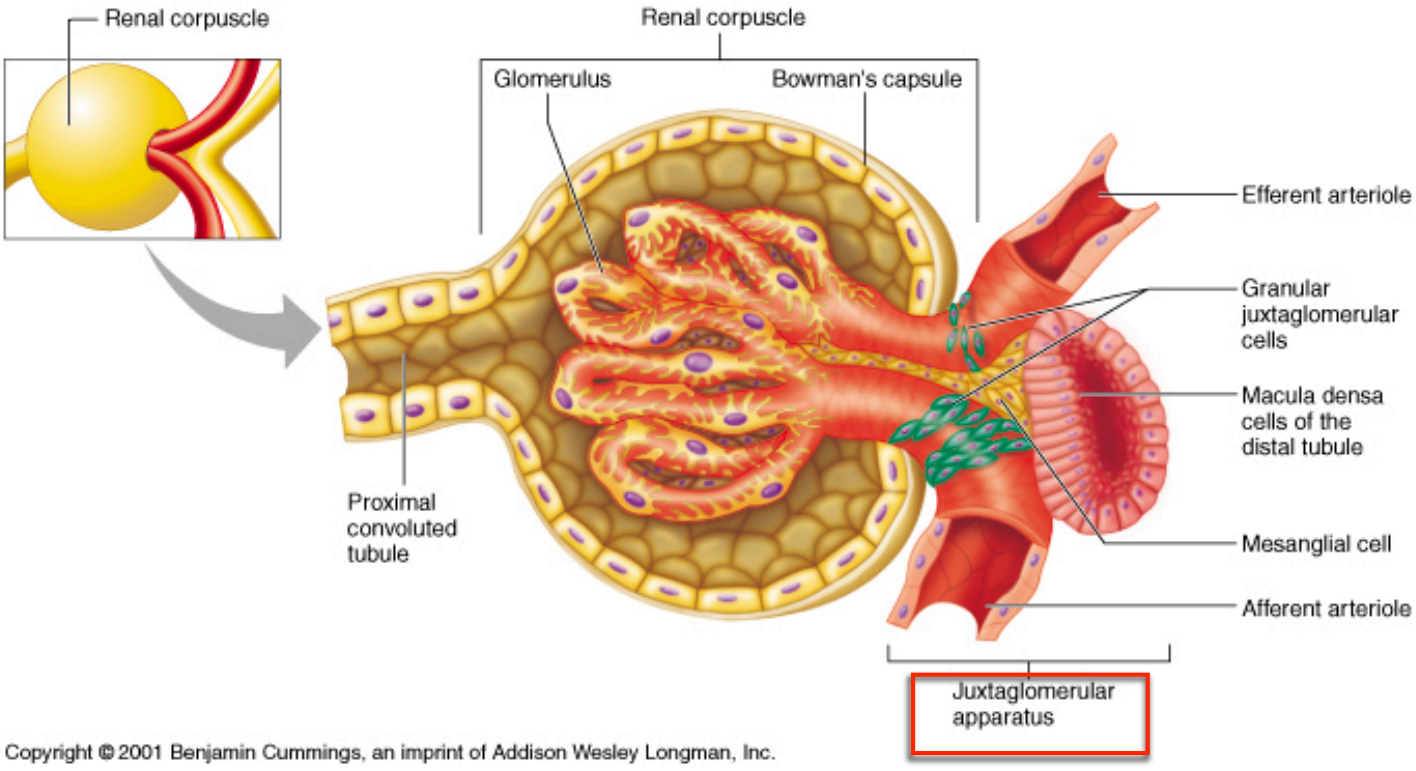
Glomerular basal lamina → inner and outer laminae rarae and middle lamina densa

Podocyte pedicles →

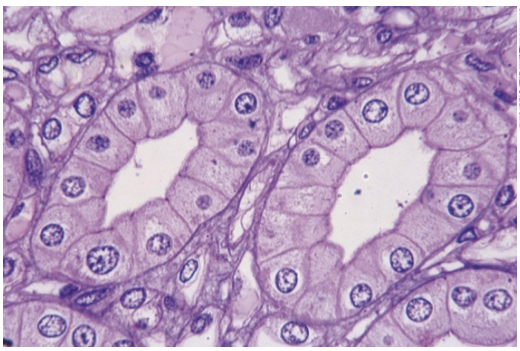
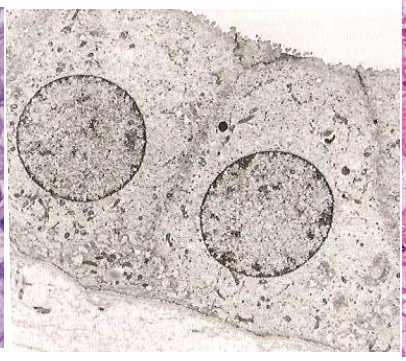
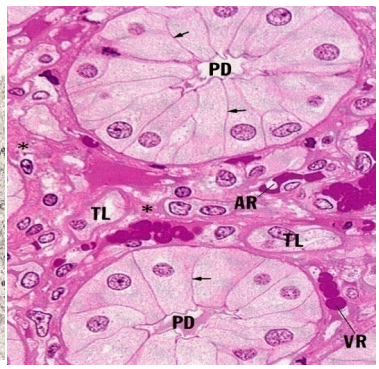
- Podocytes: Visceral layer of Bowman's capsule
- Podocytes have primary (major) processes and secondary (minor) processes (pedicles).
- Between pedicles (on the surface of capillaries) there are filtration slits that have filtration slit diaphragms.*

*Notice that filtration slits have diaphragms but the fenestrated wall of glomerular capillaries doesn't have diaphragms

Juxtaglomerular Apparatus



Collecting Tubules

- composed of simple cuboidal epithelium.
- NOT part of the nephron.
- They have 3 regions:

1-Cortical — 2-Medullary — 3-Papillary ducts

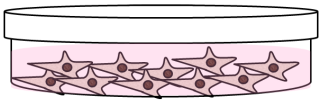
S. Cuboidal epithelium

Papillary ducts also known as ducts of billini open in area cribrosa.
*They are impermeable to water except in presence of ADH.

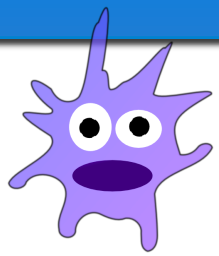
Renal Interstitium

It is a very flimsy (weak), scant (little) amount of loose CT that contains:

Fibroblasts



Macrophages



Interstitial cells

They secrete medullipin I, which is converted in the liver into medullipin II, that lowers blood pressure

Summary 1

Name	Structure	Function
Cortex	Dark brown and granular	Contains the renal corpuscles and the renal tubules except for parts of the loop of Henle.
Medulla	6-12 Renal pyramids	It is the innermost part of the kidney, which is split up into a number of sections called the renal pyramids.
Renal pyramids	Base of pyramid is toward the cortex. Apex toward the hilum surrounded by a minor calyx. Perforated by 12 openings of the ducts of Bellini in cribrosa.	Consist of tubules that transport urine from the cortical part of the kidney, where urine is produced, to the calyces.
Renal pelvis	3 or 4 minor calyces join to form 3 or 4 major calyces forming the pelvis.	Acts as a funnel for urine flowing to the ureter.
Uriniferous tubule	Nephron and Collecting tubule	Functional unit of the kidney.
Nephron	Renal corpuscle, Proximal tubules, Thin limbs of Henle's loop, Distal tubule	The basic structural and functional unit of the kidney. Chief function is to regulate the concentration of water and soluble substances.
Renal corpuscle	-*Glomerulus*: fenestrated capillaries. -*Bowman's capsule*: Parietal layer, urinary space and visceral layer. -*Mesangial cells*: intra-glomerular cells	The initial blood-filtering component of a nephron.
Glomerular Filtration Barrier	-*Endothelial wall of the glomerular capillaries*. -*The glomerular basal lamina* -*Visceral layer of Bowman's capsule* (podocytes) which have primary processes and secondary processes (pedicles). Between Pedicles there are filtration slits that have filtration slit diaphragms.	Plays a role in the permeability and selectivity of the filtration.

Summary 2

Name	Structure	Function
Renal tubules	Proximal convoluted tubule, Loop of Henle's, distal convoluted tubule, and the collecting duct.	Filtrate is modified into urine.
Proximal convoluted tubule	Simple cuboidal epithelium, with acidophilic cytoplasm and they have striated or brush border and lateral inter-digitations and a well-defined basal lamina.	The proximal tubule regulates the pH of the filtrate.
Thin limbs of Henle's loop	Composed of simple squamous epithelium. And has three parts:- *-Descending thin limb*. *-Crest of Henle's loop*. *-Ascending thin limb*.	Create a concentration gradient in the medulla of the kidney.
Distal convoluted tubule	Starts at the macula densa, tall columnar narrow cells. Distal convoluted tubules are formed by low cuboidal epithelium.	Distal tubules drain into collecting tubules.
Juxtaglomerular apparatus	Found between renal corpuscle and the returning distal convoluted tubule of the same nephron.	Regulating renal blood flow and glomerular filtration rate.
Collecting tubule	Composed of simple cuboidal epithelium, they aren't part of nephron. *-Cortical*: Simple cuboid epithelium. *-Medullary*: Simple cuboid epithelium. *-Papillary ducts (Bellini)*: Simple columnar epithelium.	They open in area cribrosa and they are impermeable to water except in the presence of ADH (antidiuretic hormone).

MCQs

1-Which of the following is not a component of the kidneys cortex?

A.Renal corpuscle.
B.Thin limbs of loop of Henley.
C.Juxtaglomerular.
D.Convoluted tubules.

2-Pyramids are separated by?

A.Major Calyces.

B.Basal lamina.

C.Thin stoma.

D.Cortical columns of Bretin.

3-What is the functional Unit of the kidney?

A.Collecting tubule.

B.Nephron.

C.Uriniferous tubule.

D.Ducts of Bellini.

4-One of the following is not a part of the renal corpuscle?

A.Glomerulus.

B.Distal tubule.

C.Mesangial cells.

D.Bowman's capsule.

Answers:

1- B
2- D
3- C
4- B
5- False
6- True
7- True

TRUE OR FALSE:

5-Glomerulus is a tuft of fenestrated capillaries with diaphragm.

6-The proximal convoluted cells have Brush borders and lateral inter-digitations.

7-The thin limbs of Henley's loop are longer in the Juxtamedullary nephron than in the cortical nephron.

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قال رسول الله صلى الله عليه و سلم: (من لقى أخاه المسلم بما يحب، يسره بذلك سرّه الله عز و جل يوم القيامة)

Thank you for checking our work

For any correction, suggestion or any useful information do not hesitate to contact us: Histology434@gmail.com