

EXCRETORY SYSTEM

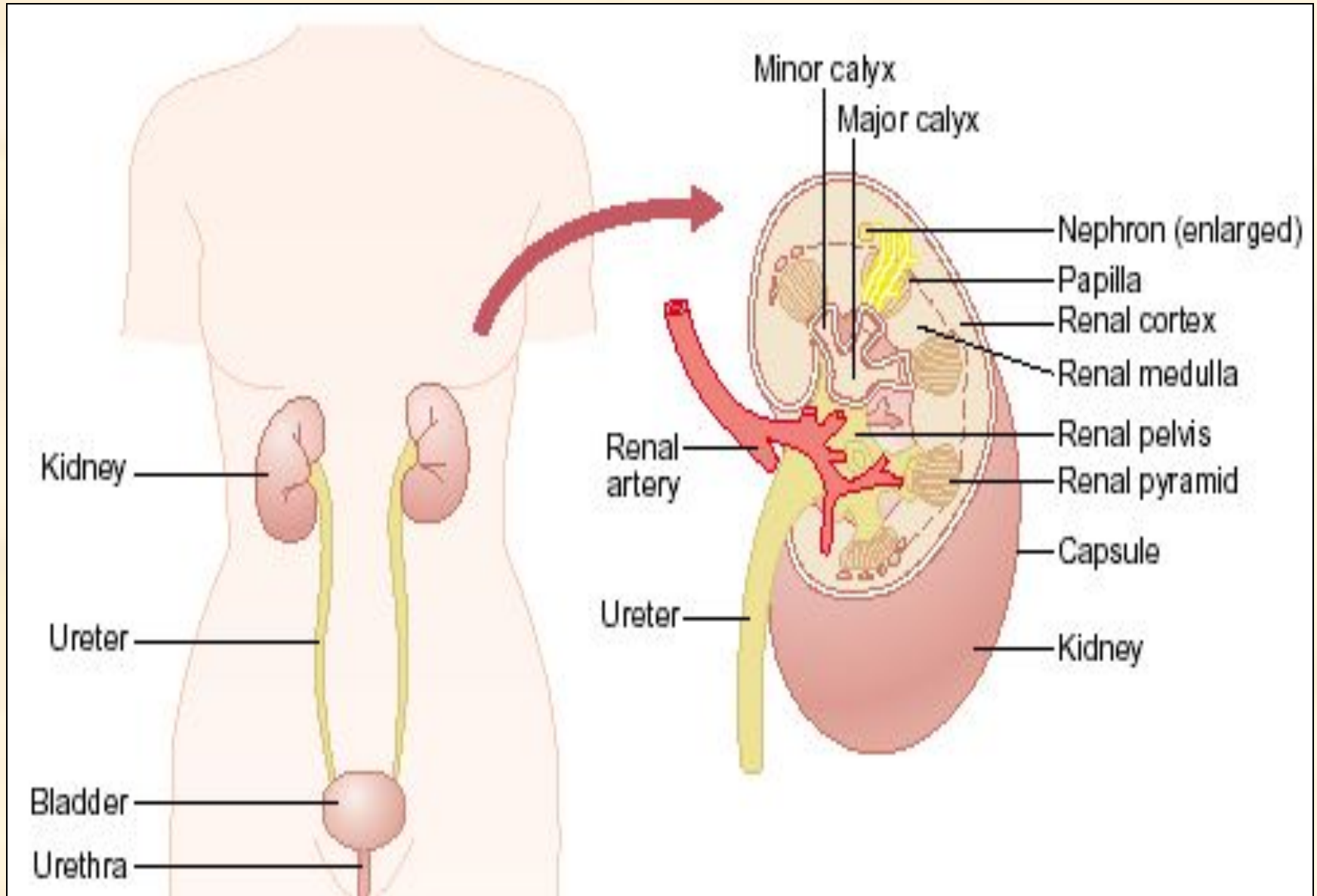
- Function –

- Removal of unwanted substances & metabolic waste products from the body.

- RENAL SYSTEM

- i) A pair of kidneys
- ii) Ureters
- iii) Urinary bladder
- iv) Urethra

Physiologic anatomy of the kidney



- **Excretory systems**

i) Digestive system

ii) Respiratory system

iii) Skin

iv) Liver

FUNCTIONS OF KIDNEYS

1. Excretory function.

- Removal of waste products like urea, uric acid, creatinine, end products of Hb breakdown, metabolites of various hormones etc.
- Removal of toxins, heavy metals, drugs & chemicals.

NON EXCRETORY FUNCTIONS

2.Regulation of water balance.

- Input -----Excretion (output)

Homeostasis.

3. Regulation of electrolyte balance.

4. Regulation of body fluid osmolarity & blood volume.

5.Regulation of Acid – base balance.

- Kidneys, lungs, blood buffers.

- Metabolic strong acids like sulfuric acid & phosphoric acid are removed only by kidneys.

- **6. Hemopoietic function.**

- i) Secretion of erythropoietin ----- stimulate erythropoiesis.

- ii) Secretion of Thrombopoietin ----- stimulate thrombopoiesis.

- **7. Endocrine function.**

- i) Erythropoietin

- ii) Thrombopoietin

- iii) Renin

- iv) 1,25 Dihydroxy cholecalciferol.

- v) Prostaglandins.

8. Regulation of blood pressure.

- i) By excretion of variable amount of Na^+ & water.
- ii) Renin - Angiotensin mechanism.

9) Regulation of blood Ca^+ level.

- Formation of 1,25 cholecalciferol.



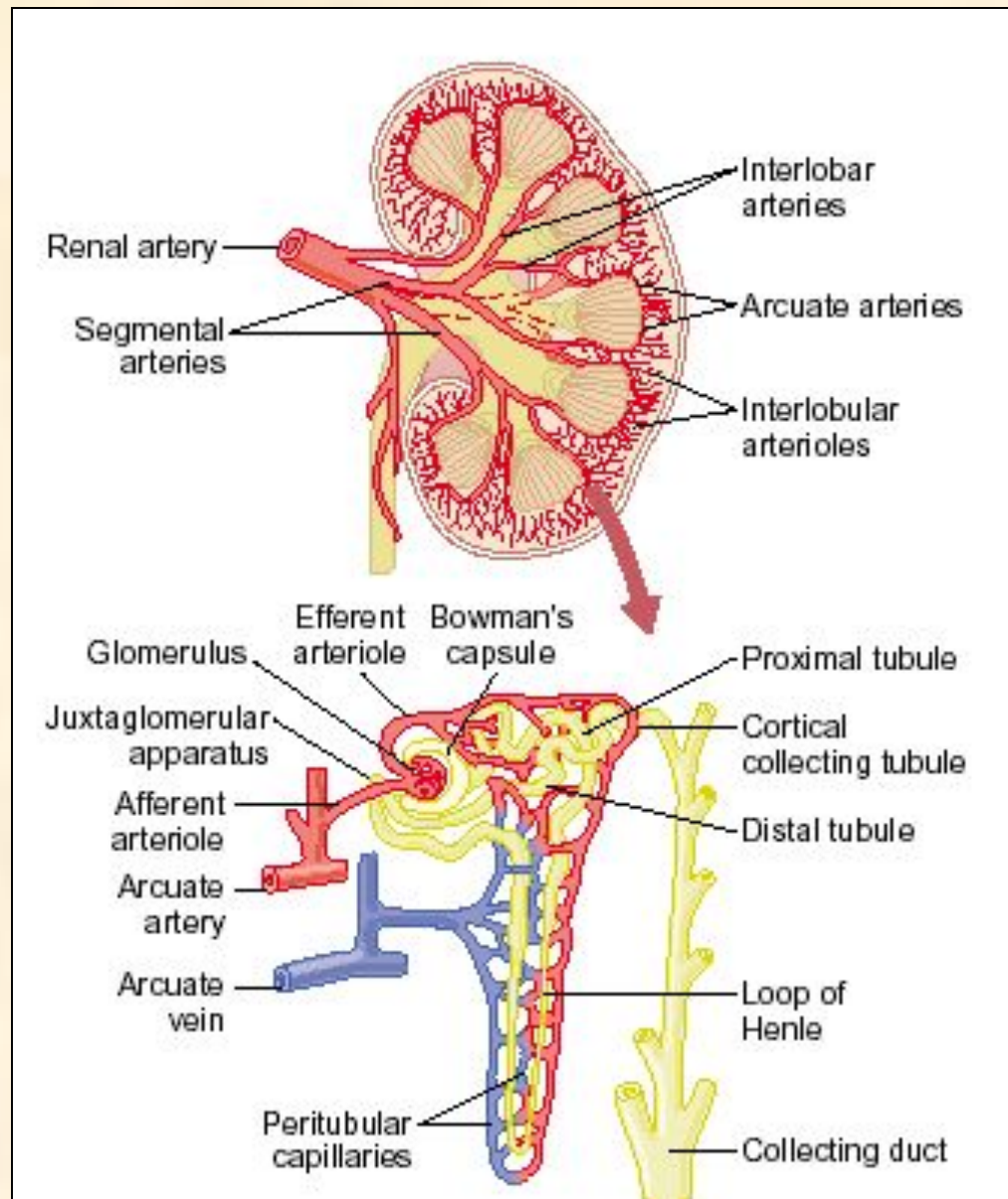
- i) Absorption of Ca^+ from the intestine.
- ii) Ca^+ deposition in bone.

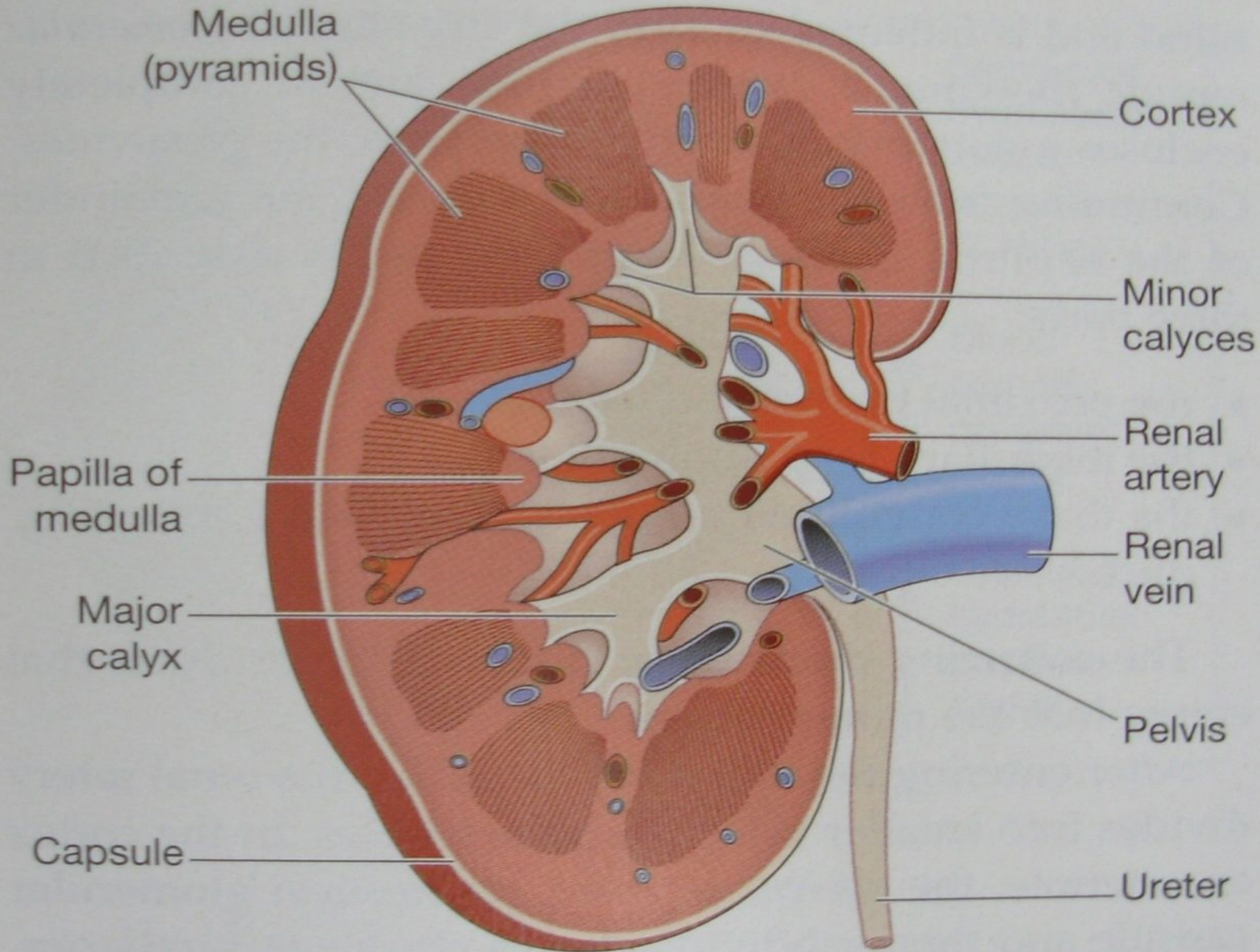
10) Gluconeogenesis.

Section of the kidney

- Cortex – outer part
- Medulla – renal pyramids
- Renal sinus

minor calyces
major calyces
renal pelvis
ureter





NEPHRON

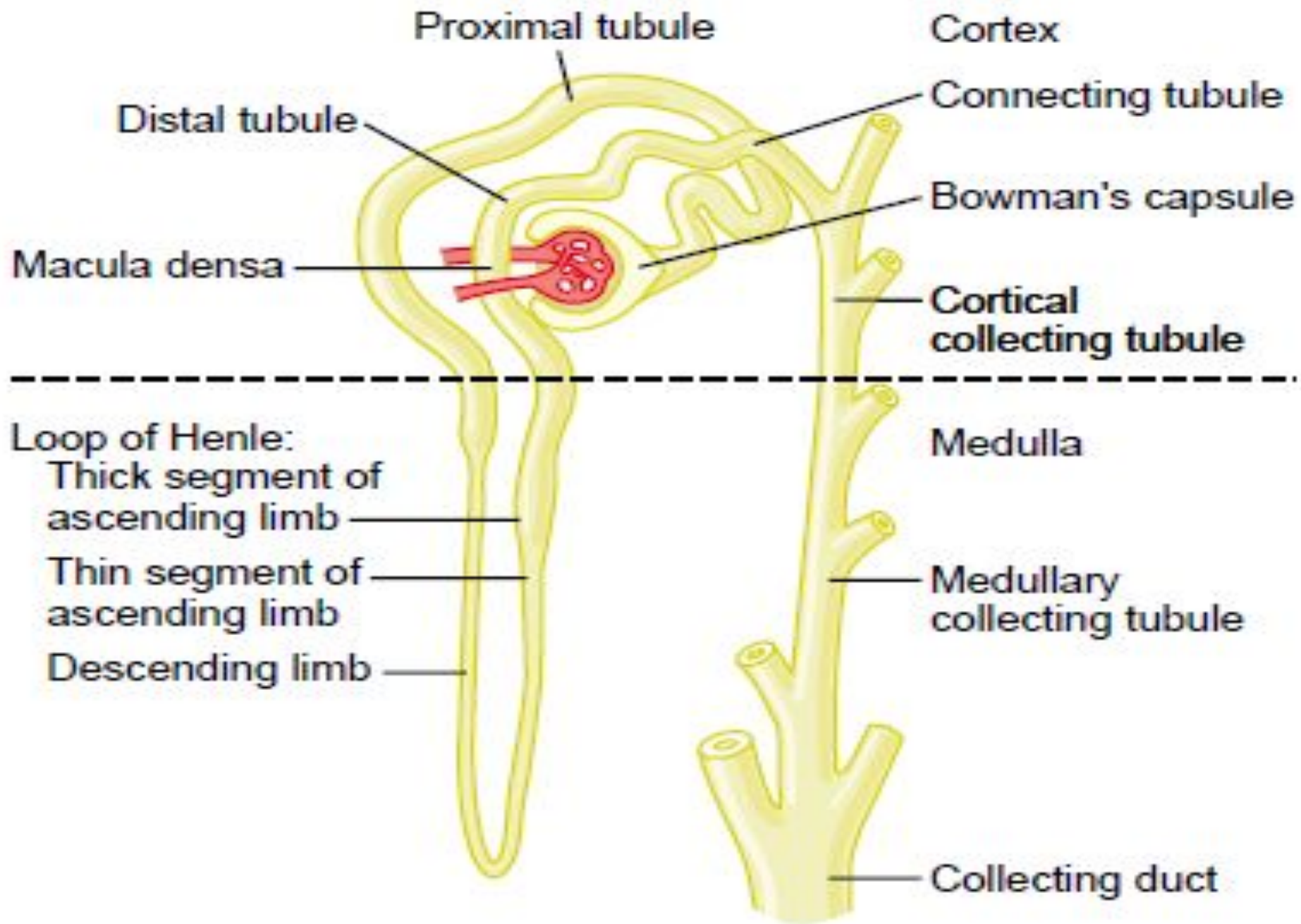
- It is the structural & functional unit of kidneys.
- Two parts.

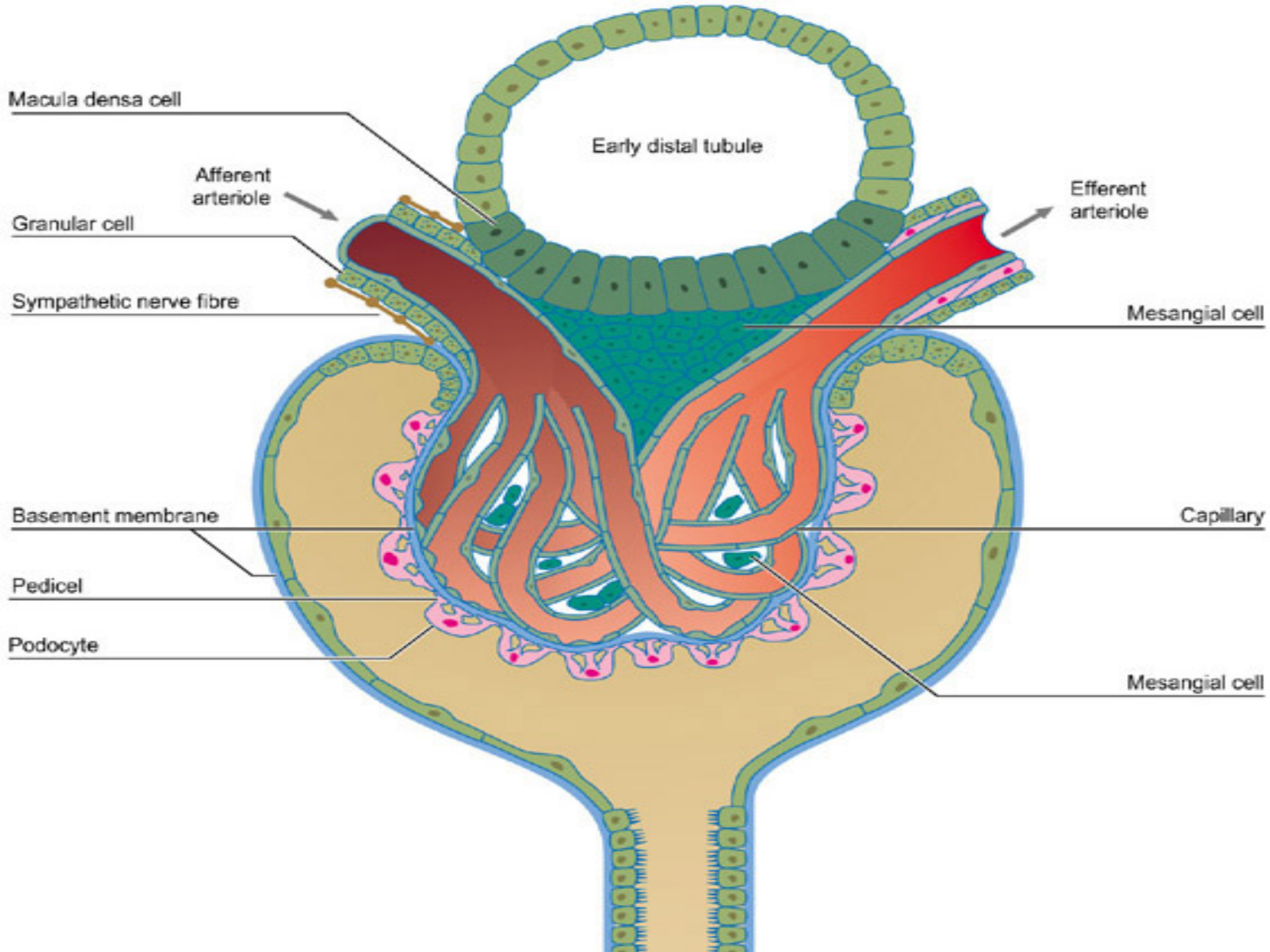
1. Renal corpuscle, Malpighian corpuscle

- i) Glomeruli
- ii) Bowman's capsule

2. Renal tubules

- i) PCT
- II) Loop of Henle – Thick descending limb
 - Thin descending limb
 - Hair – pin band of the loop
 - Thin ascending limb
 - Thick ascending limb





iii) Distal convoluted tubule (DCT)

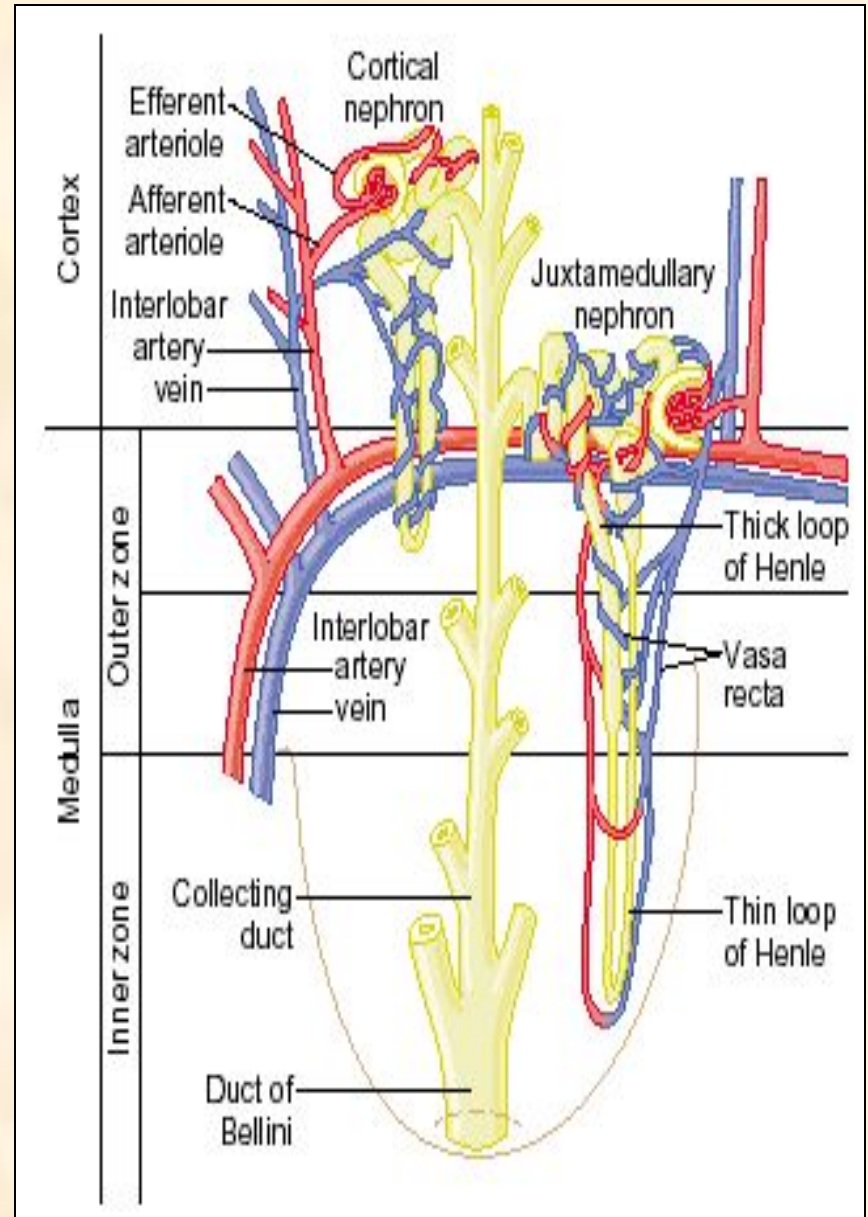
iv) Collecting tubule (CT)

v) Collecting duct

Type of nephron

1. Cortical nephron

2. Juxtamedullary nephron



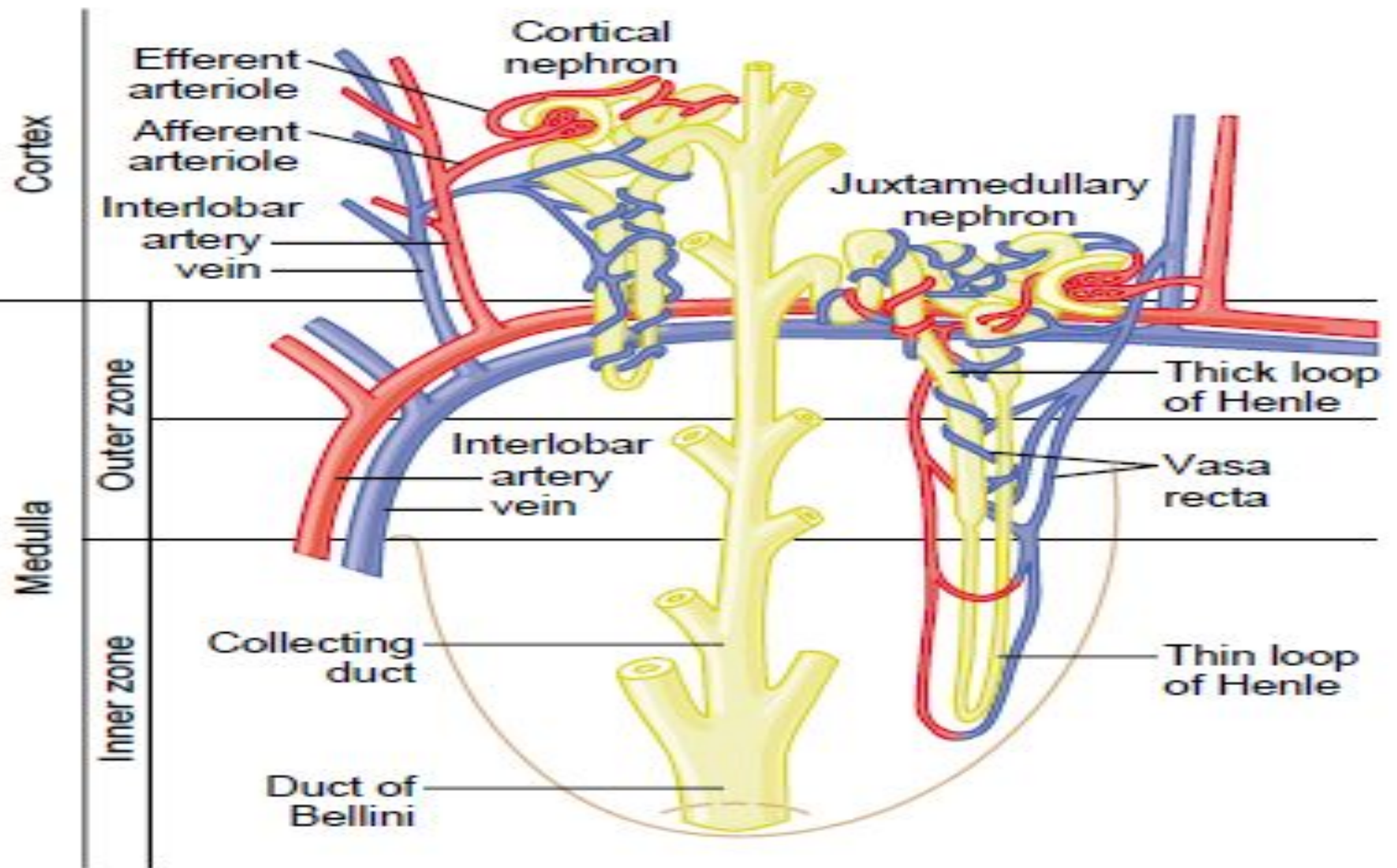


Figure 26–5

Schematic of relations between blood vessels and tubular structures and differences between cortical and juxtamedullary nephrons.

Cortical & Juxtamedullary nephrons

	CORTICAL NEPHRONS	JUXTAMEDULLARY NEPHRONS
1. Situation of corpuscle	Outer cortex ,near the periphery	Inner cortex near medulla <u>or</u> at the junction between cortex & medulla,
2. Size of glomeruli & %	, smaller size of glomeruli, 85%	larger size of glomeruli, 15%
3. Rate of filtration	Slow	High

<p>4. Loop of Henle</p>	<ul style="list-style-type: none"> i) Short ii) Hair pin bend passes only up to outer medulla iii) The descending limb has a thin segment & ascending limb has a thick segment. 	<ul style="list-style-type: none"> i) Long ii) Passes deep into the medulla, sometimes up to tip of renal papillae. iii) Both limbs contain thin segment.
<p>5. Blood supply of loop of Henle</p>	<p>Peritubular capillaries</p>	<p>Vasa recta</p>

	<u>Cortical</u>	<u>Juxtamedullary</u>
6.Function	Formation of urine.	Concentration of urine ---- counter current mechanism.

Peculiarities of Renal blood flow

1. RBF is very high as compared to other organs.

- 26% of cardiac output.

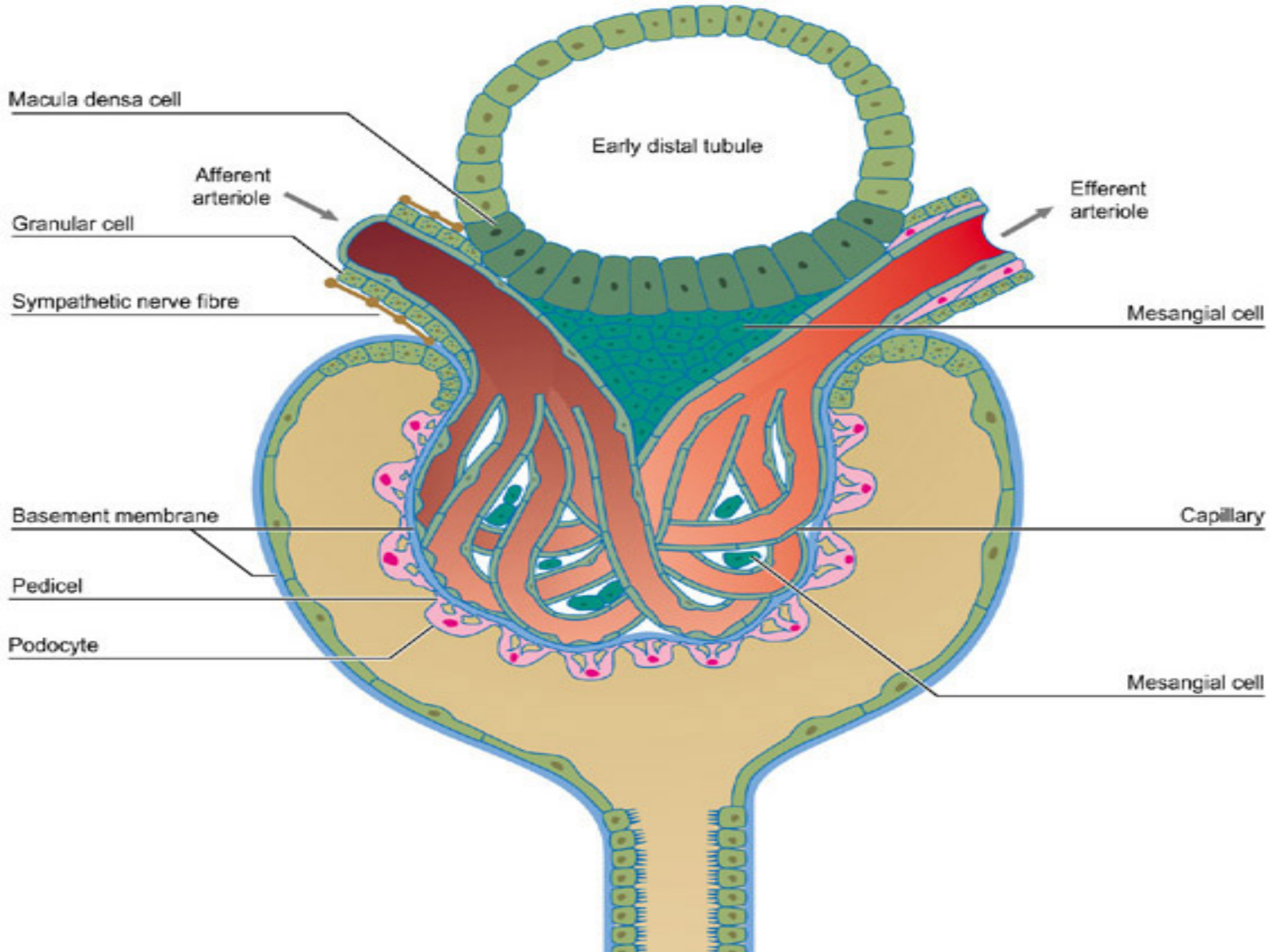
- 1200 – 1300 ml / min.

- 300 – 400 ml / 100 gm / min.

2. A – V O₂ difference across kidney is low. So renal blood flow has high Po₂ & is 80-85% saturated with O₂.

3. Normal resting RBF is $\geq 80\%$ of the maximal blood flow.

- During maximum vasodilatation it increases to 1.5 times the resting level.



4. $A - V O_2$ difference in most body organs is inversely proportional to their blood flow, but in kidney it does not change in spite of massive alteration in blood flow.
5. Blood flow to the renal cortex is higher than that of medulla.
 - i) High cortical blood flow is required filtration.
 - ii) Low blood flow in inner medulla is very important for the production of concentrated urine.
6. RBF shows very efficient phenomenon of auto regulation.

7. The renal circulation is unique, in that it has two capillary beds.

i) Glomerular

ii) Peritubular

- Hydrostatic pressure of glomerular capillary is very high ---- 60 mm Hg ----- important for rapid fluid filtration.
- Hydrostatic pressure of peritubular capillary is low -----8 – 10 mm Hg. ----- important for rapid fluid reabsorption.

