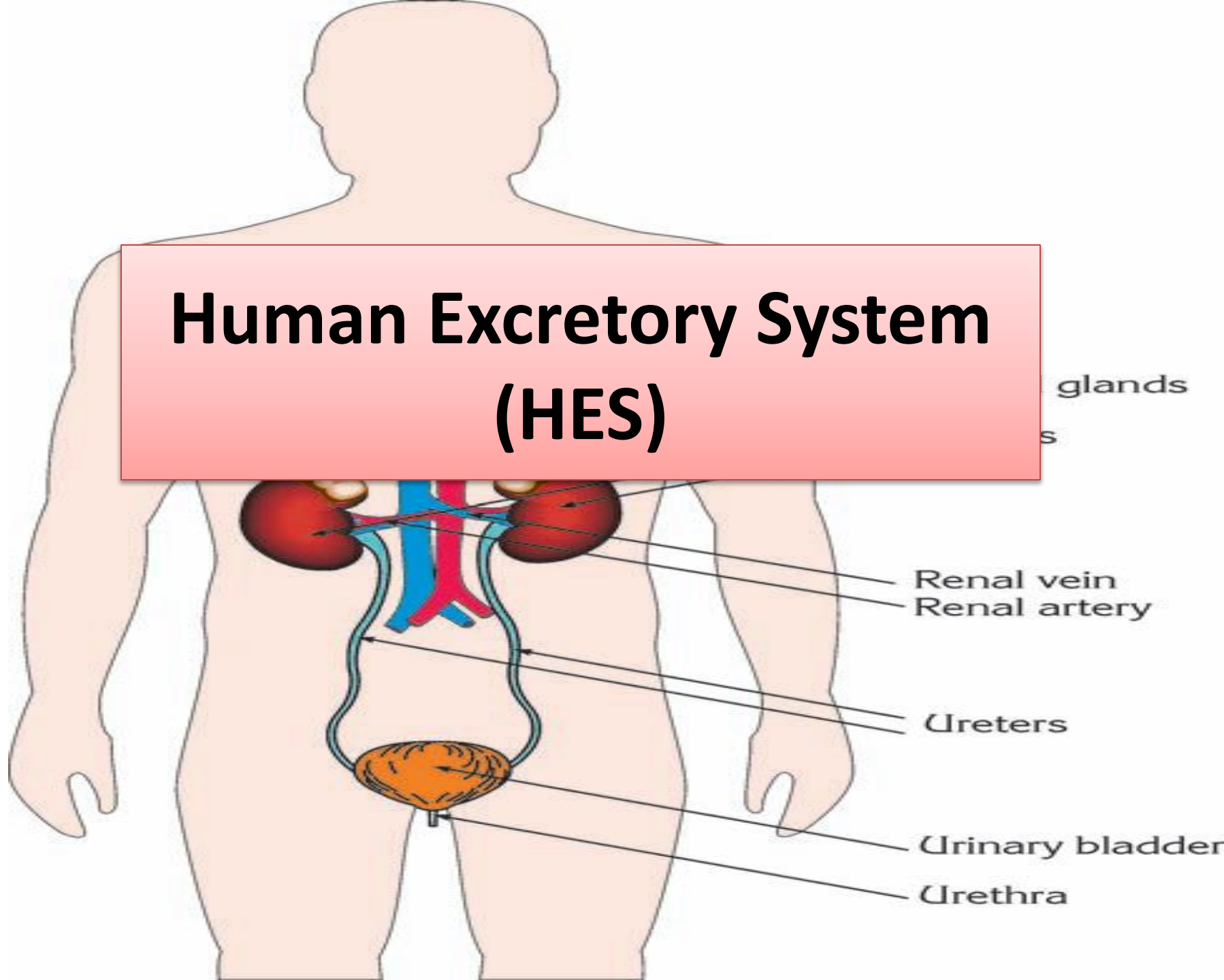
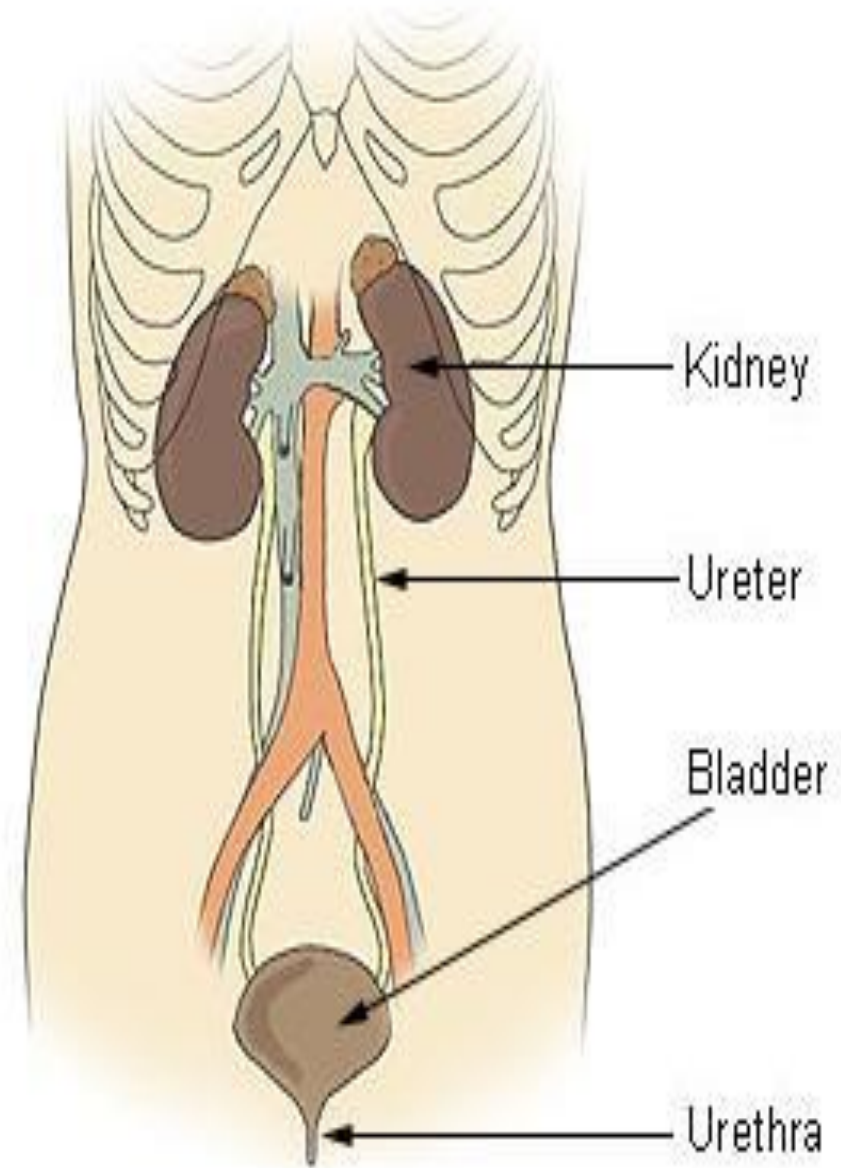


Human Excretory System (HES)



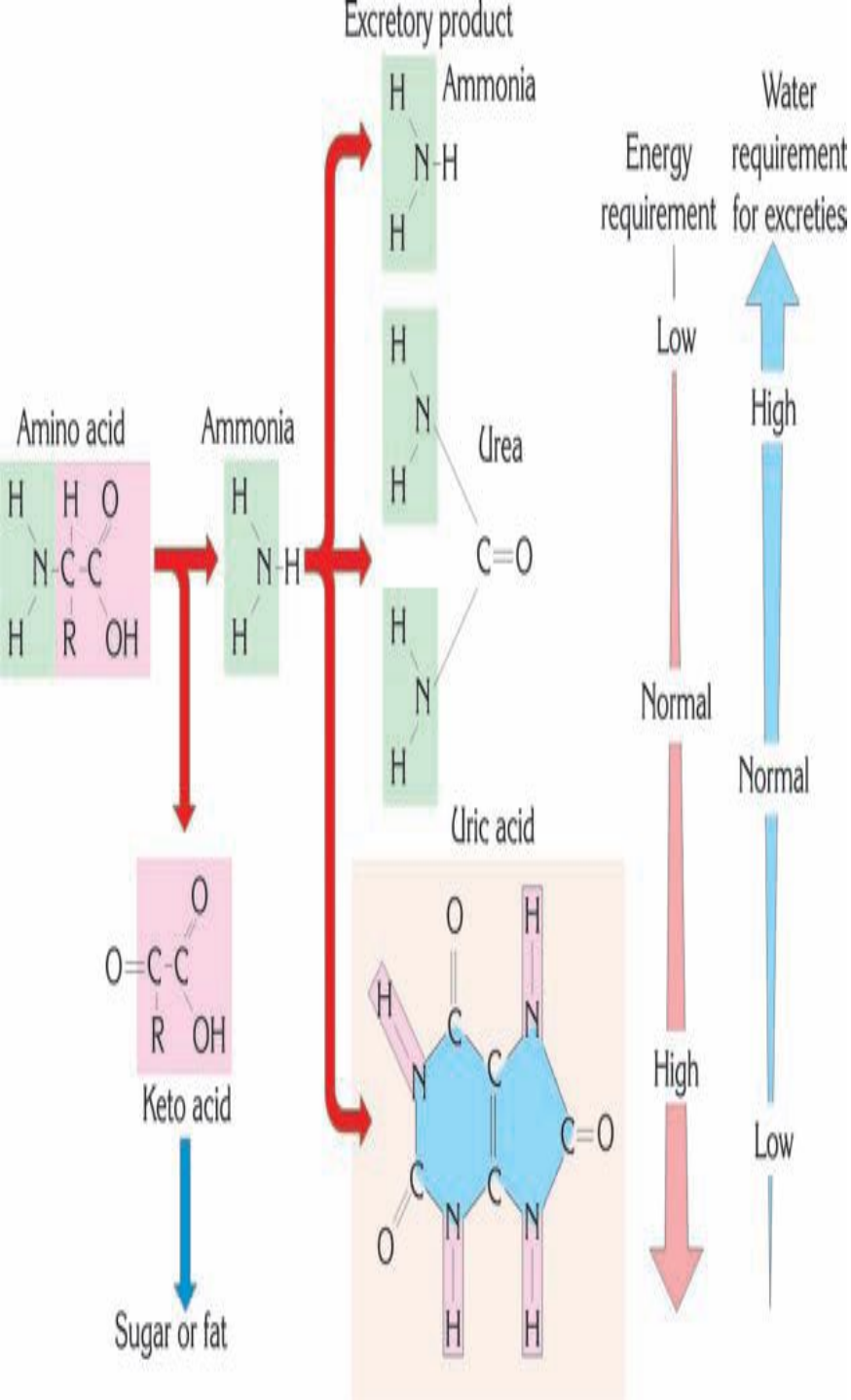
Excretion

- Excretion rids (избавляет) the body of metabolic wastes, which come from the breakdown of substances (nutrients)



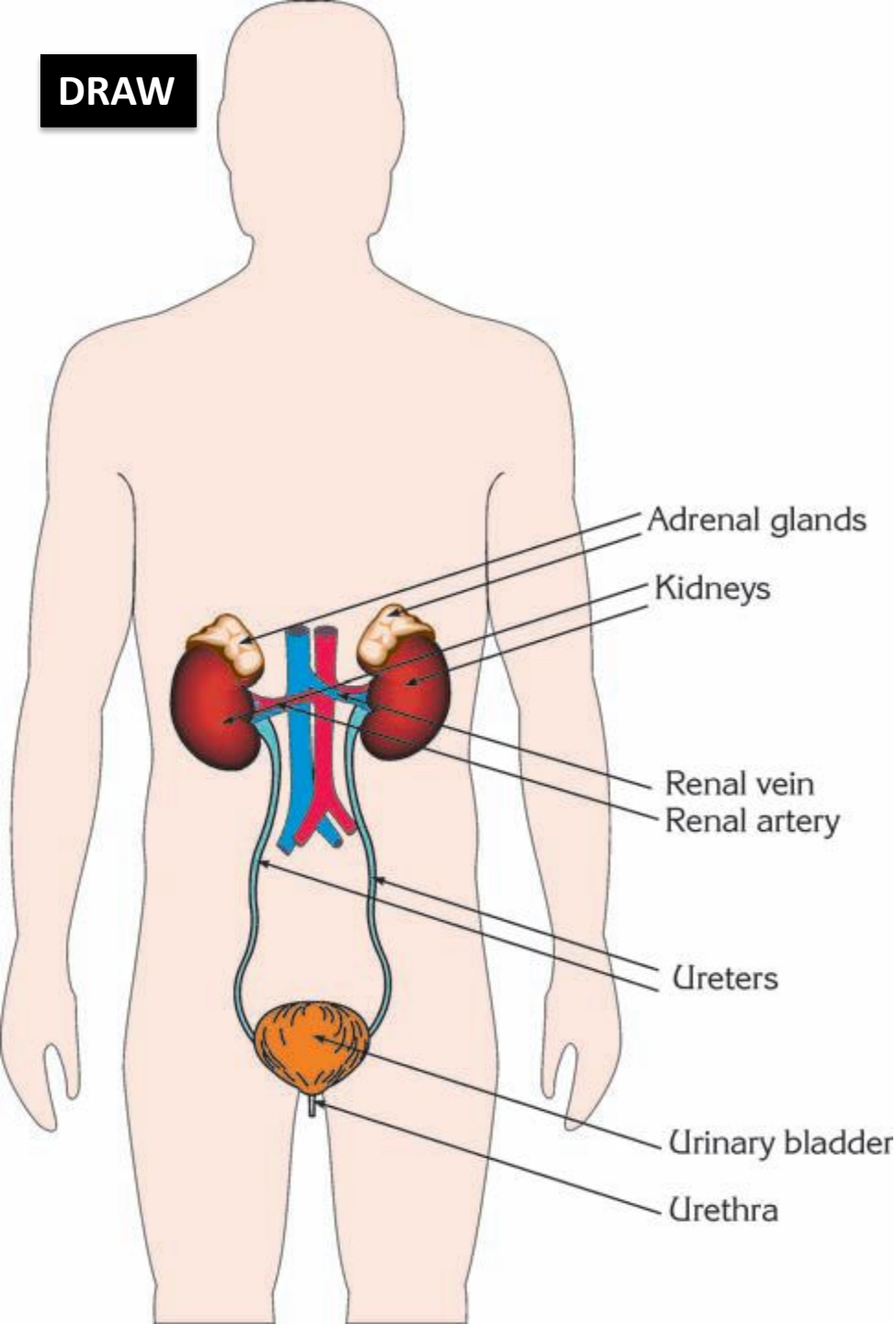
Excretory system

Excretory Substances



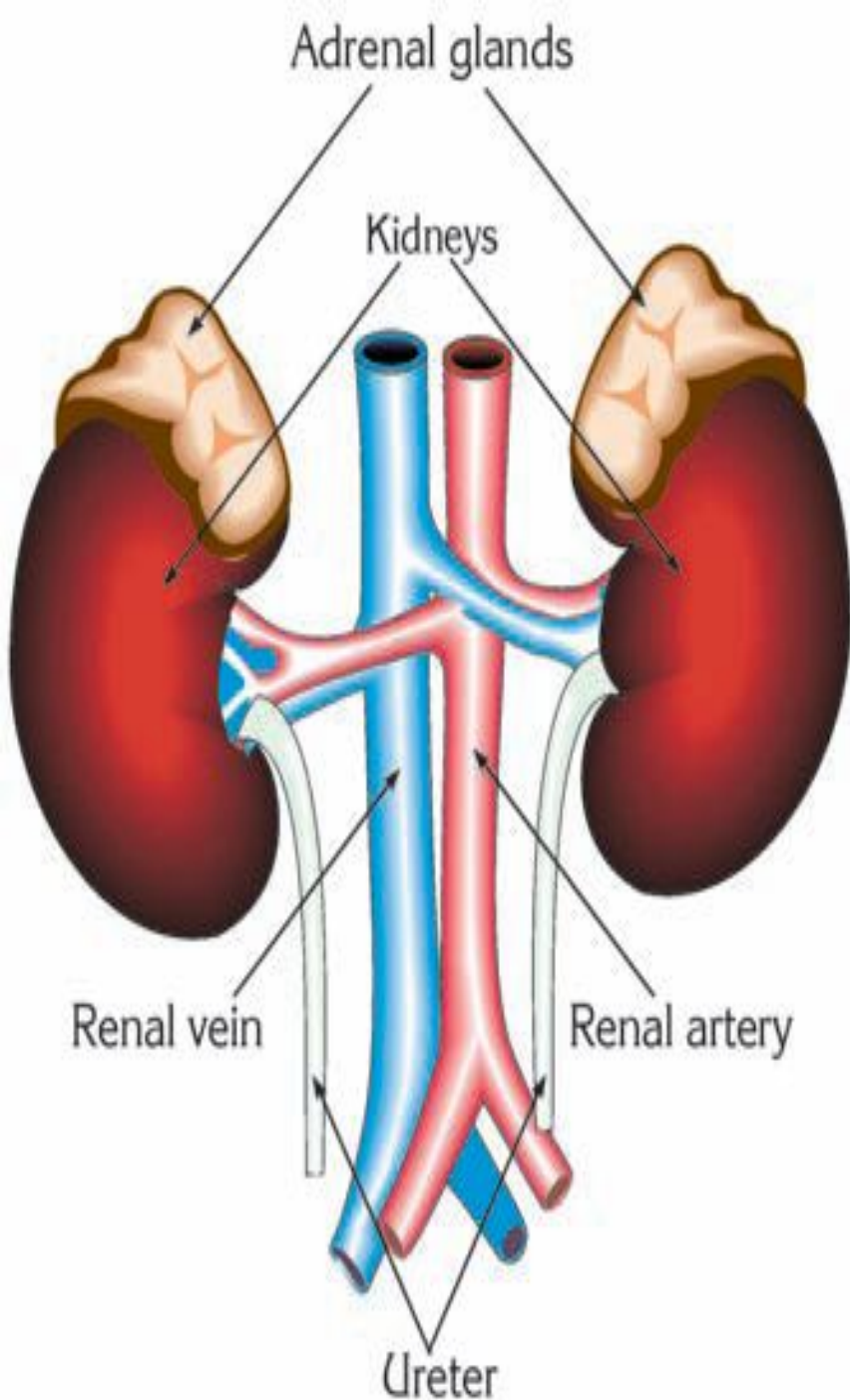
- Water and Carbon dioxide (H_2O , CO_2)
- Ammonia (NH_3) – highly toxic
- Urea (мочевина) - HUMANS
- Uric acid (мочевая кислота)

DRAW



The Human Excretory System

- The human excretory system is composed of
 - - kidneys
 - - ureter (urinary tract)
 - - urinary bladder
 - - urethra

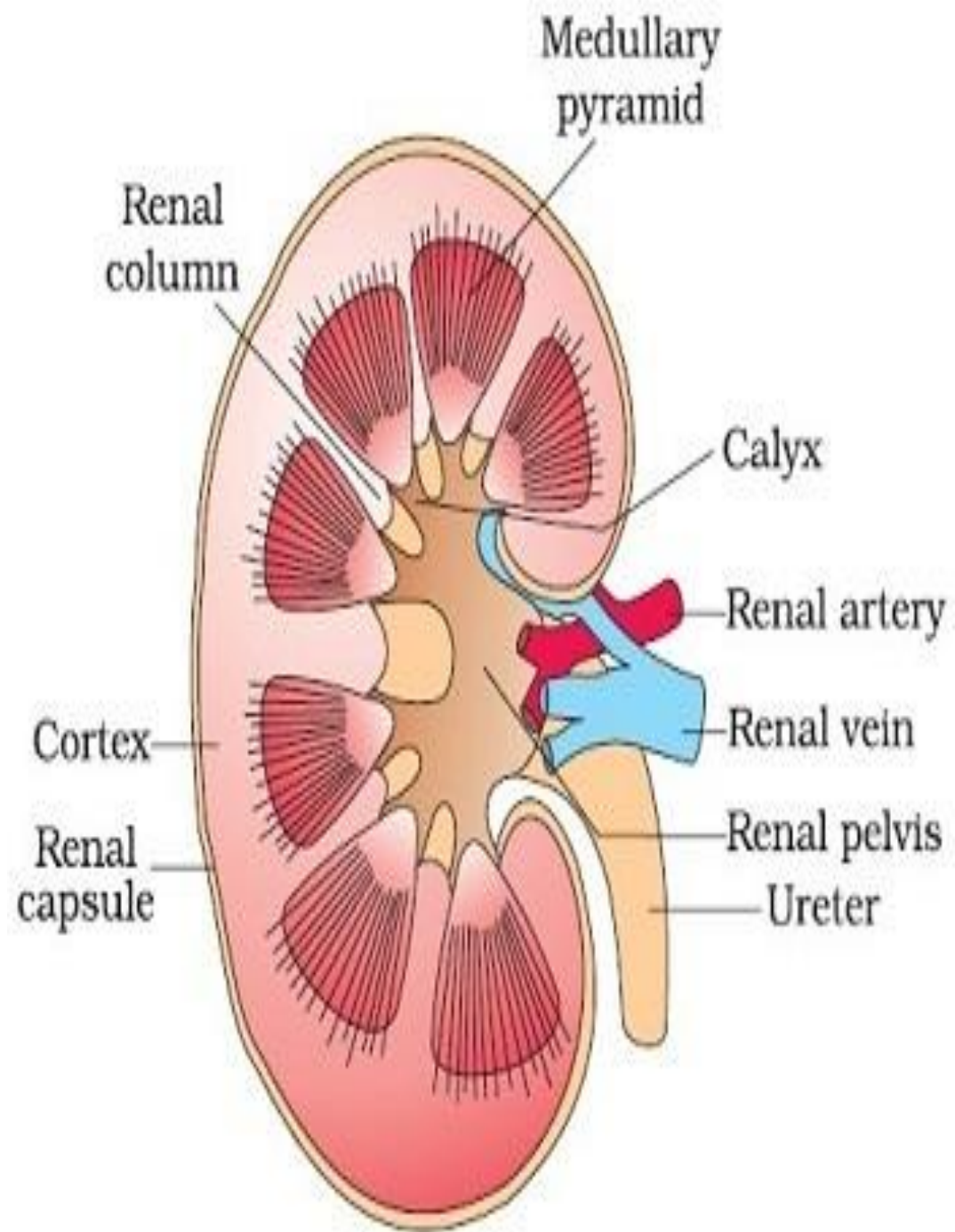


Kidney

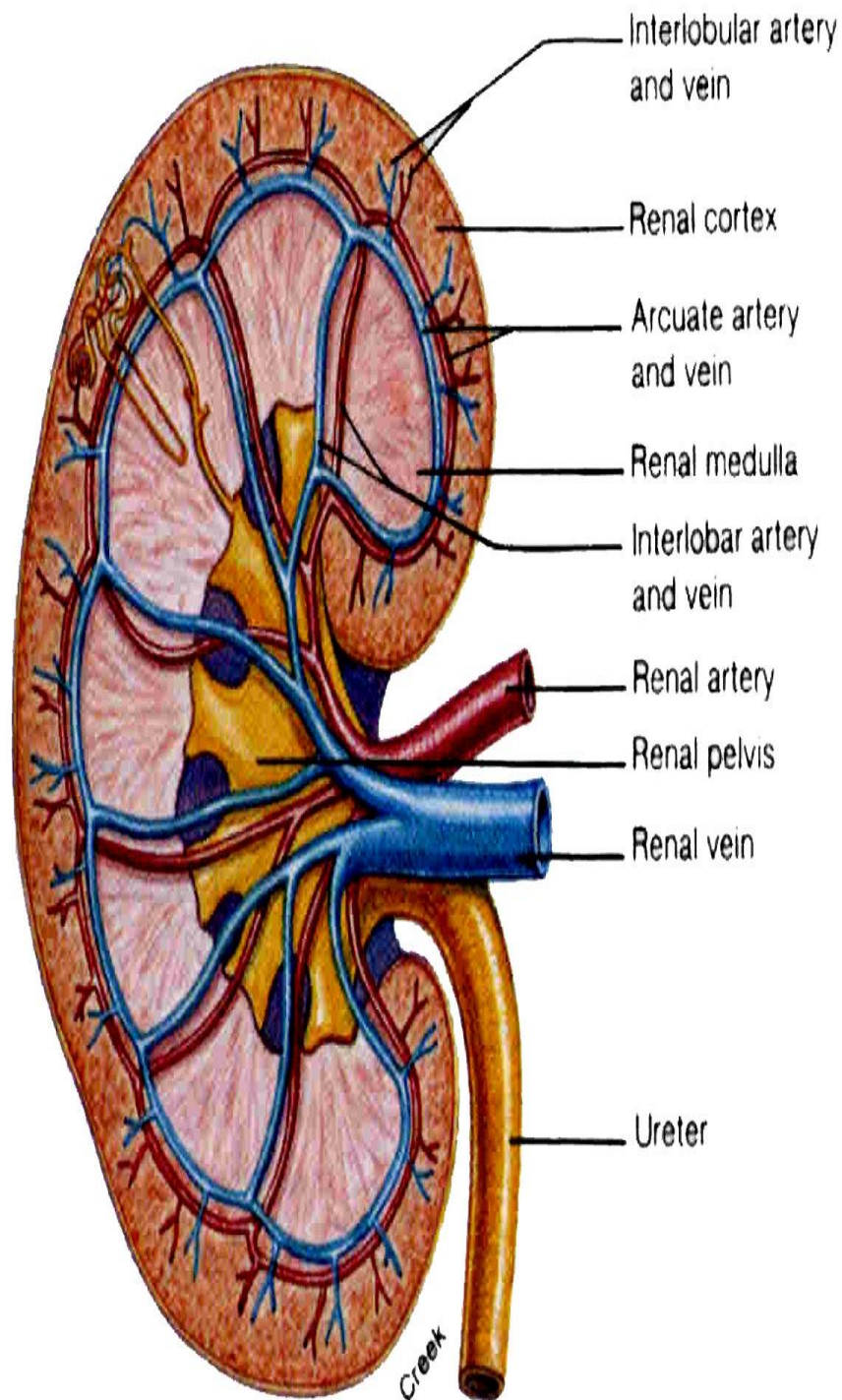
- Situated in the lower thoracic region of the back
- It is protected by a thick layer of fat
- The upper region of each kidney is covered by an adrenal gland

Structure of the kidney

- It is composed of three main parts:
- - **Renal Cortex:** It is red in color and contains the Malpighian bodies



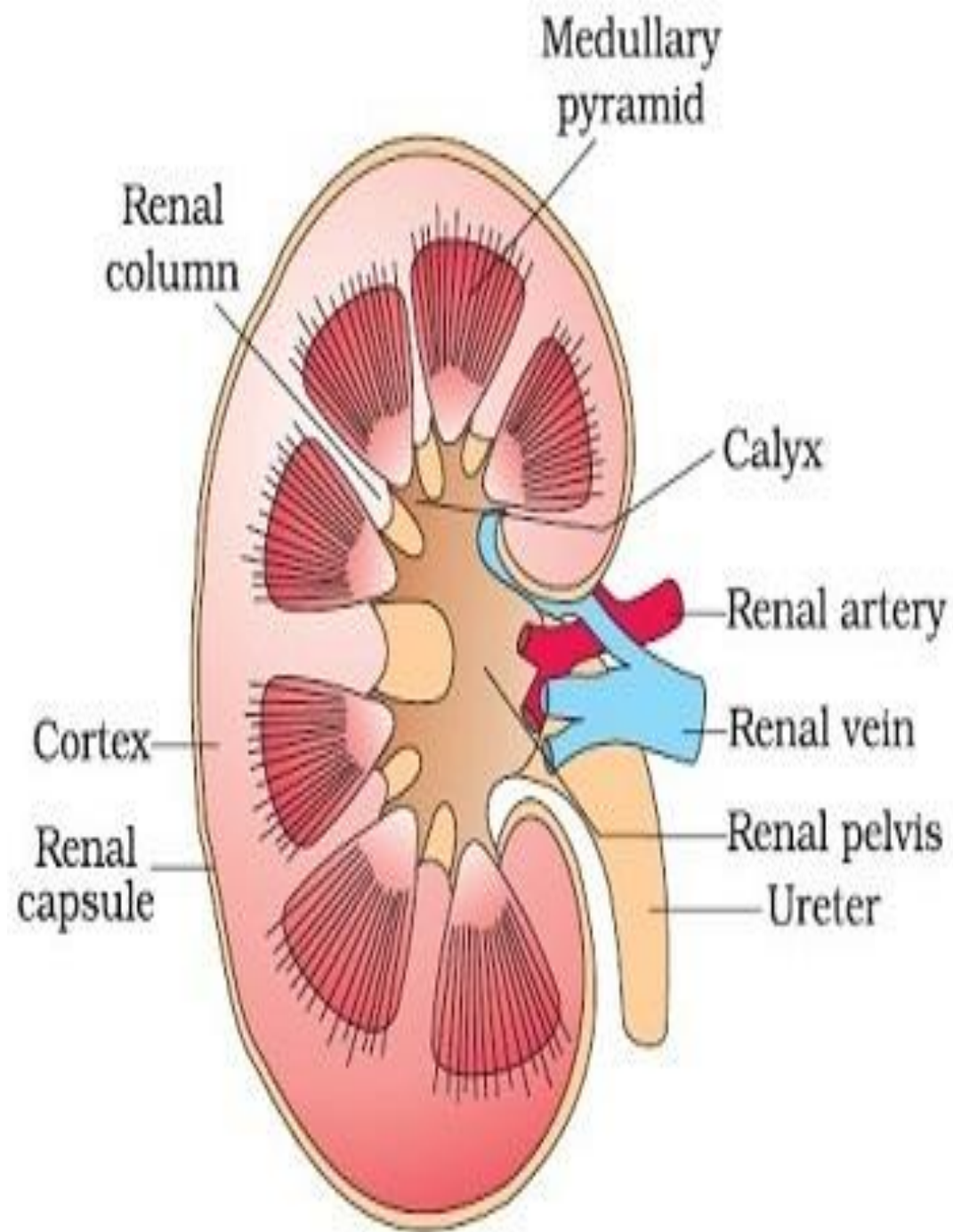
Structure of the kidney



- **Renal Medulla:** It is located directly beneath the cortex
- Urinary tracts which drain from the cortex form pyramids in this region
- There are approximately 8-10 laterally arranged Malpighian pyramids

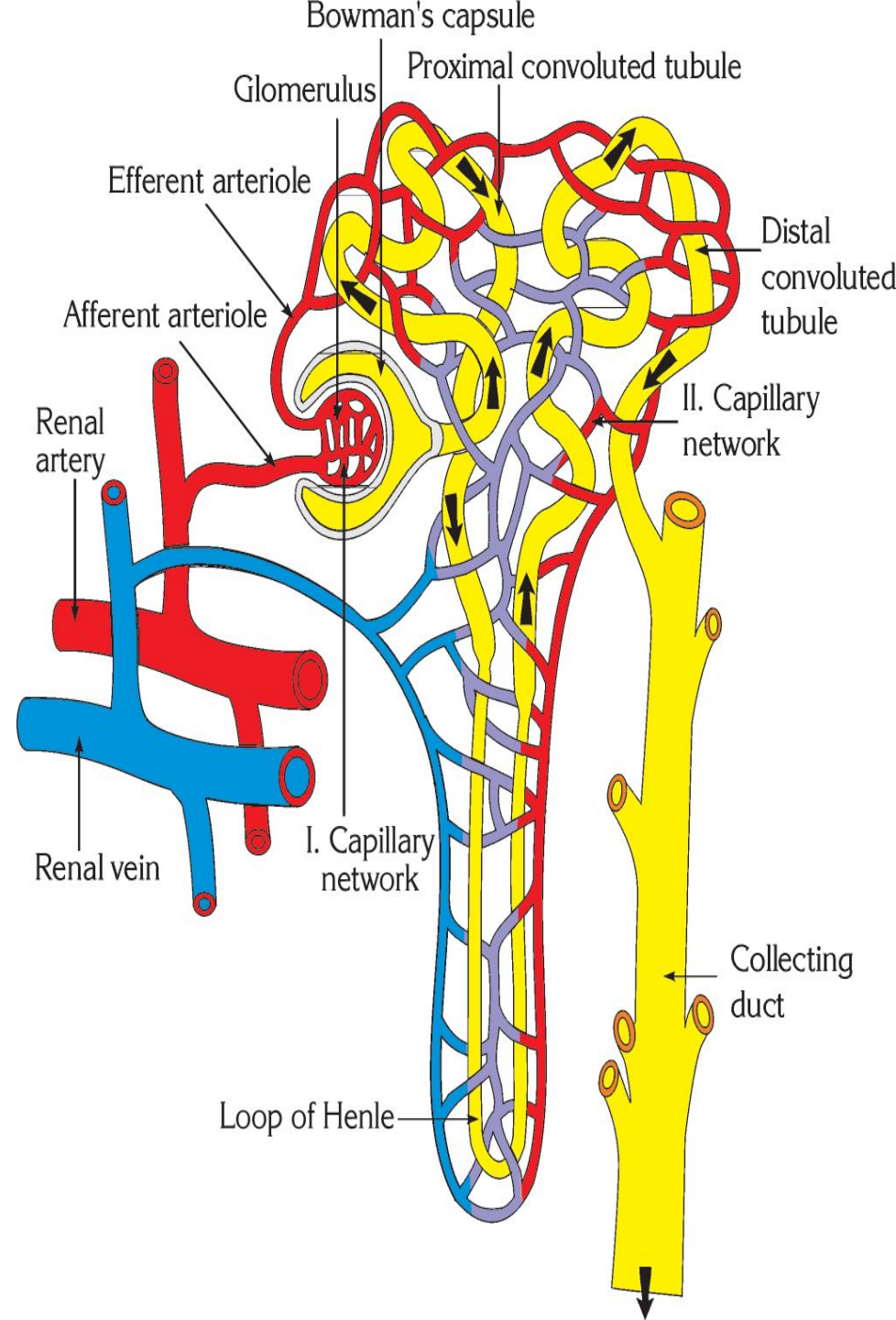
Structure of the kidney

- **Renal Pelvis:** Its function is the collection of urine from the Malpighian pyramids
- The pelvis transmits the accumulated urine to the ureter

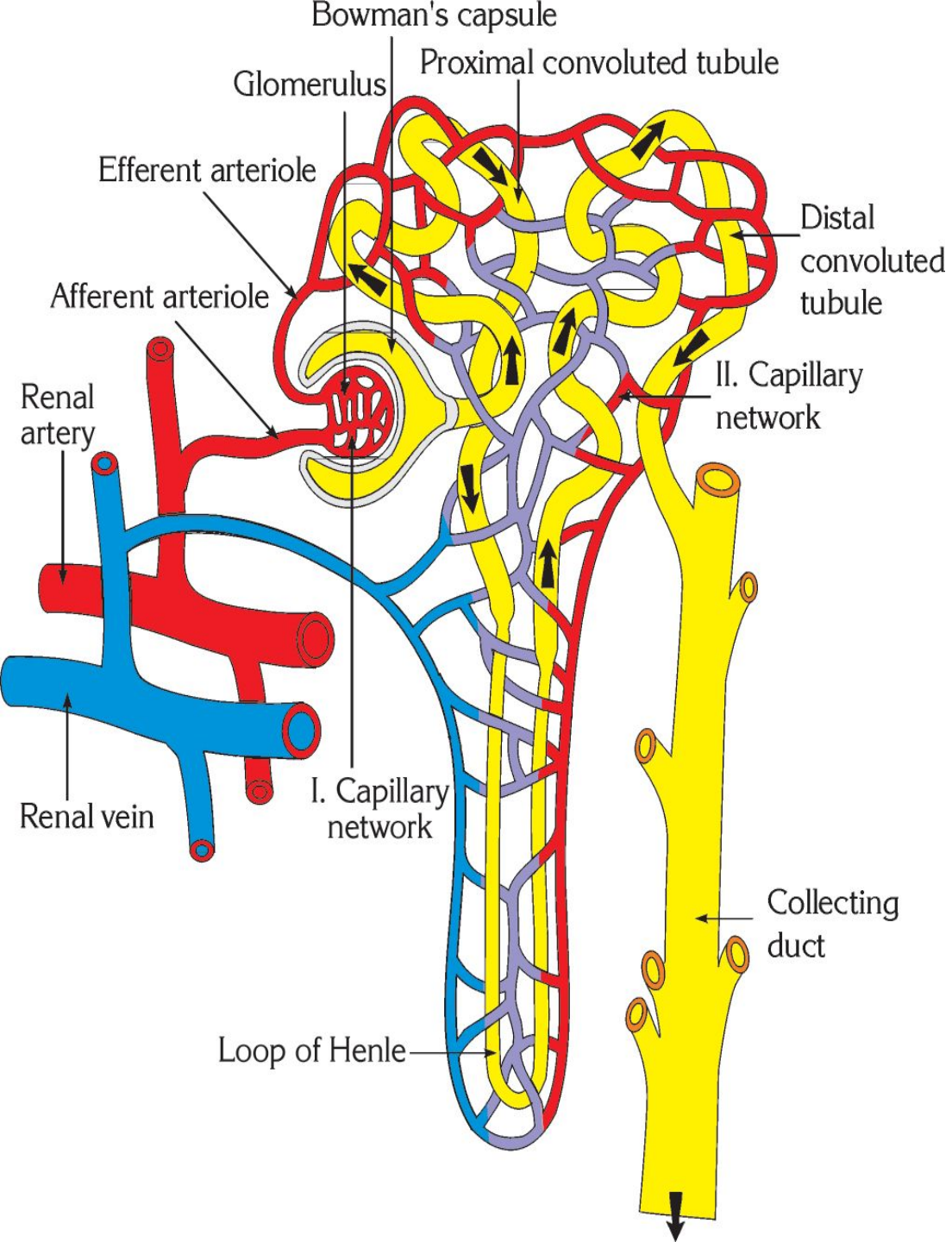


Nephron

- Units of kidneys
- Nephrons filter 180 liters of fluid and form 1.5 liters of urine (моча) per day
- ***A nephron consists of three units:***
 - - Glomerulus
 - - Bowman's capsule
 - - Urinary tract



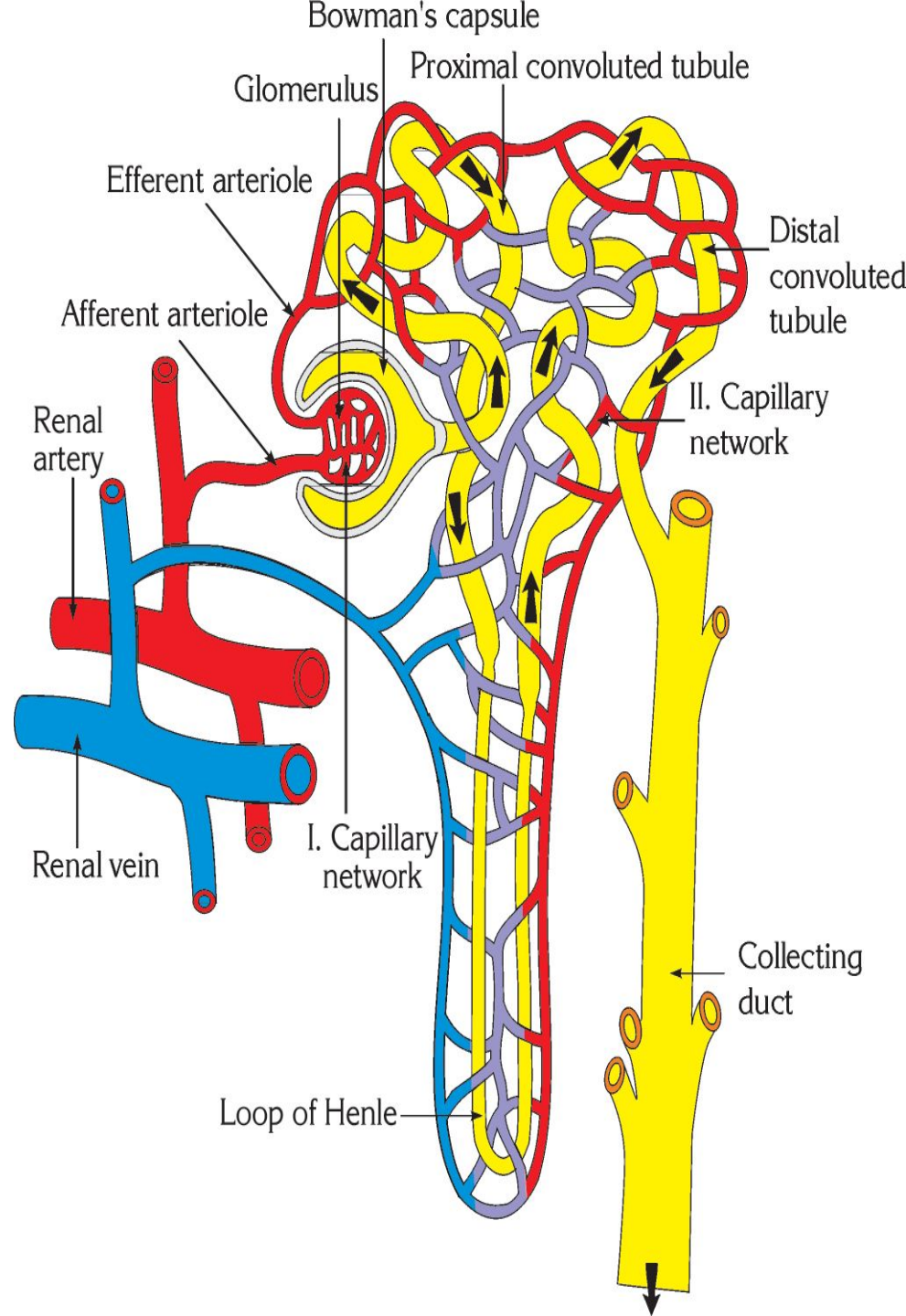
Nephron



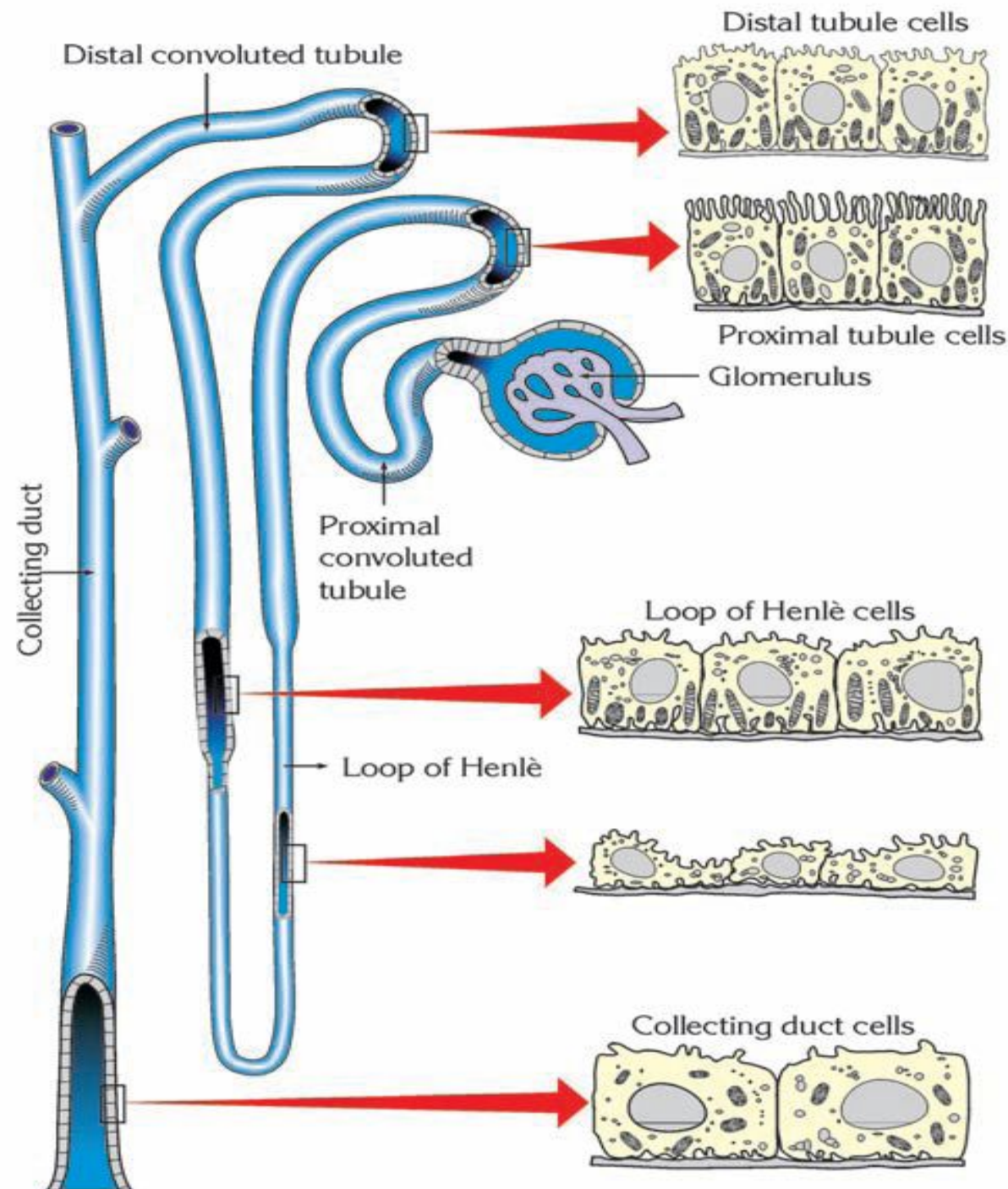
- It begins with a **glomerulus**
- Glomerulus is surrounded by a **Bowman's capsule**
- Each glomerulus is formed by capillaries from a branch of renal arteriole

Nephron

- The complex of Bowman's capsule and glomerulus is called **Malpighian body**
- Bowman's capsule is connected with long tubule that is called **Loop of Henle**
- Loop of Henle is joined with collecting duct



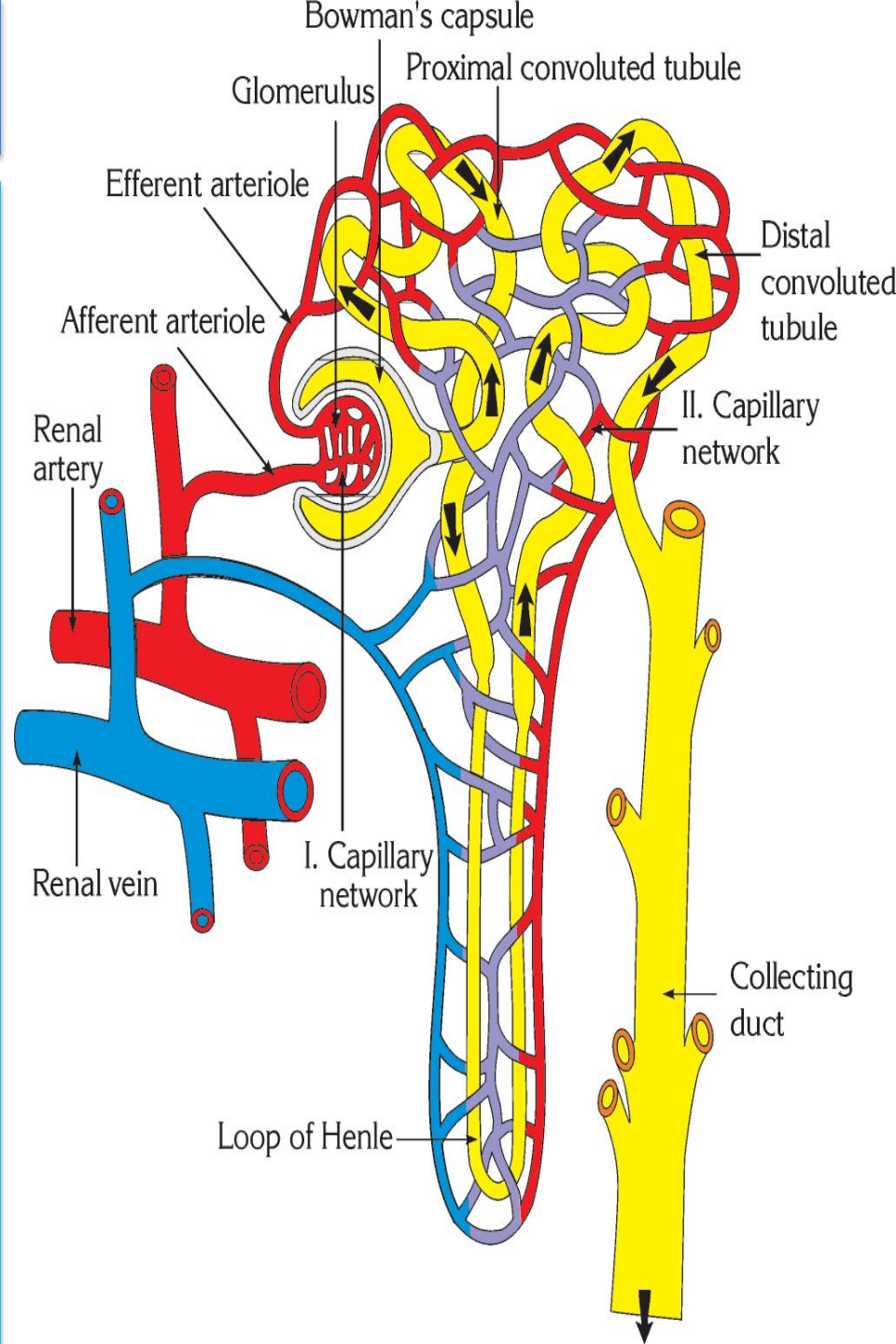
Urine formation



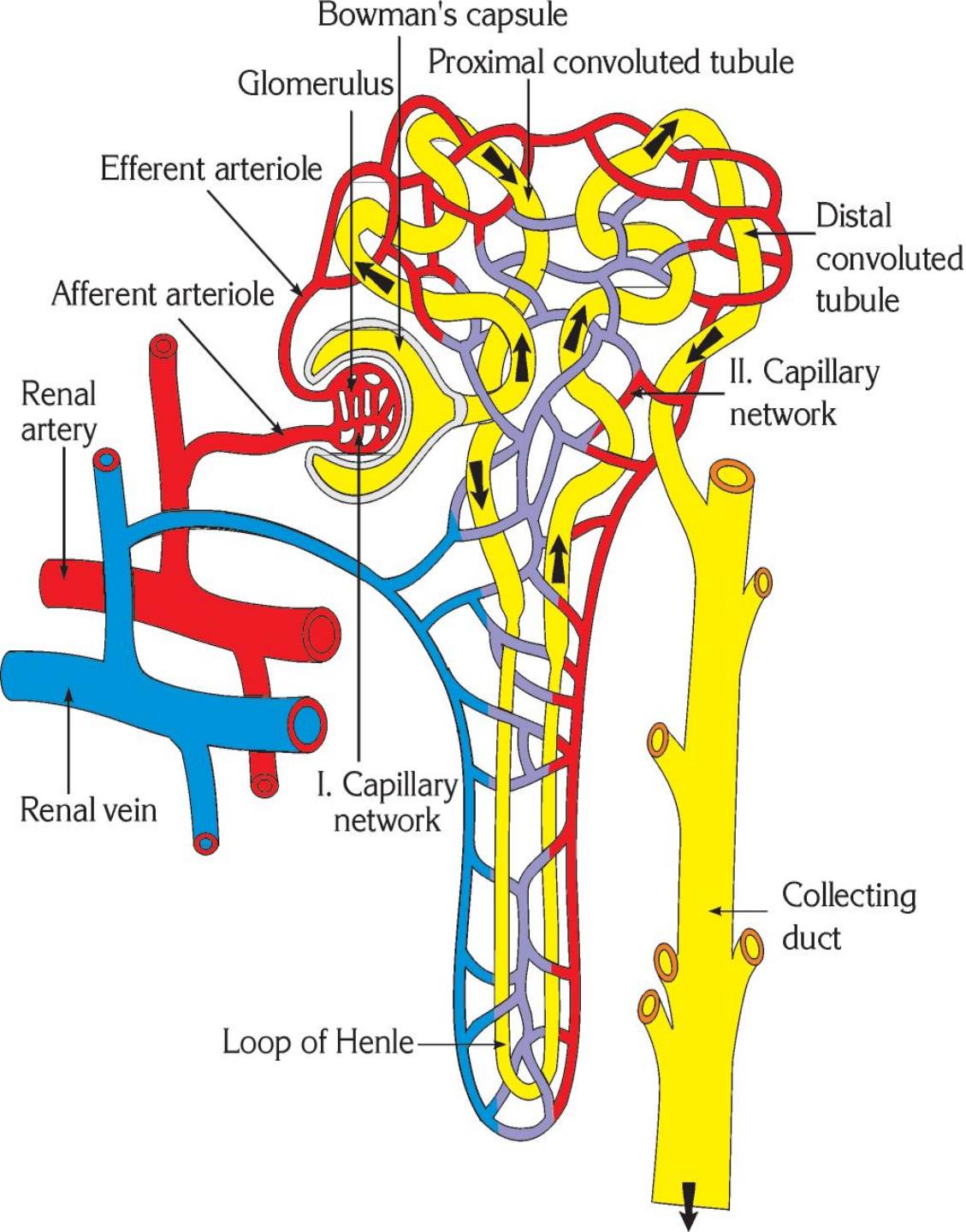
- There are 3 steps during urine formation:
- 1 – Filtration
- 2 – Reabsorption
- 3 – Secretion

Filtration

- During filtration, substances pass from the blood into the Bowman's capsule
- Under pressure, water and many small molecules such as salts, urea, glucose and aminoacids pass from glomerulus into Bowman's capsule



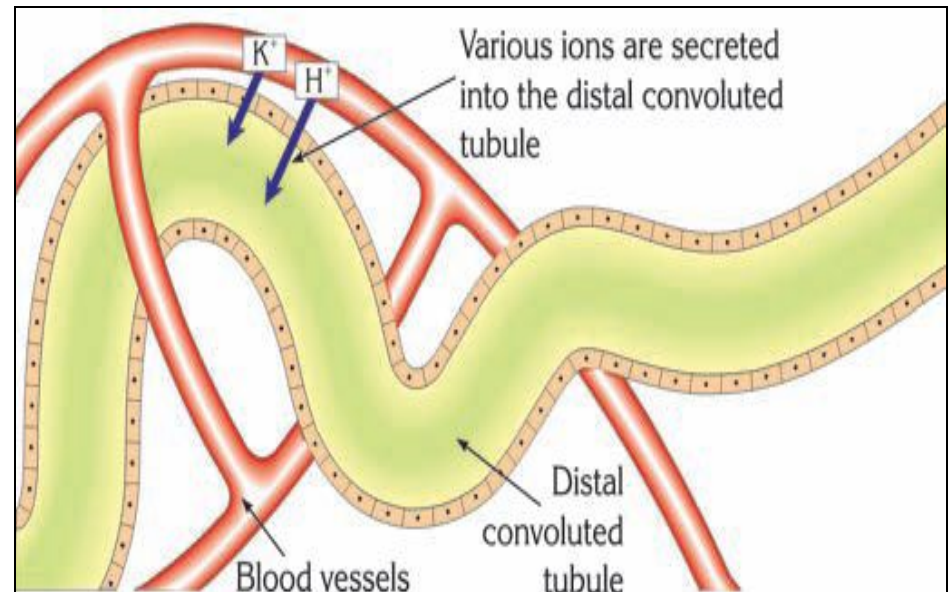
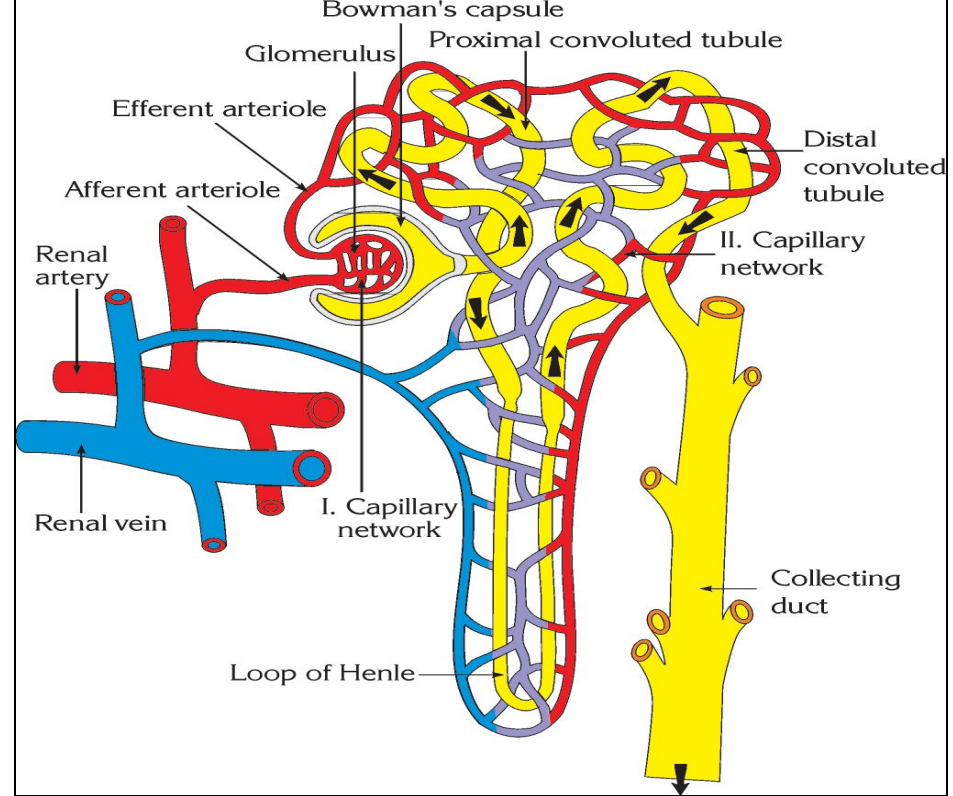
Reabsorption



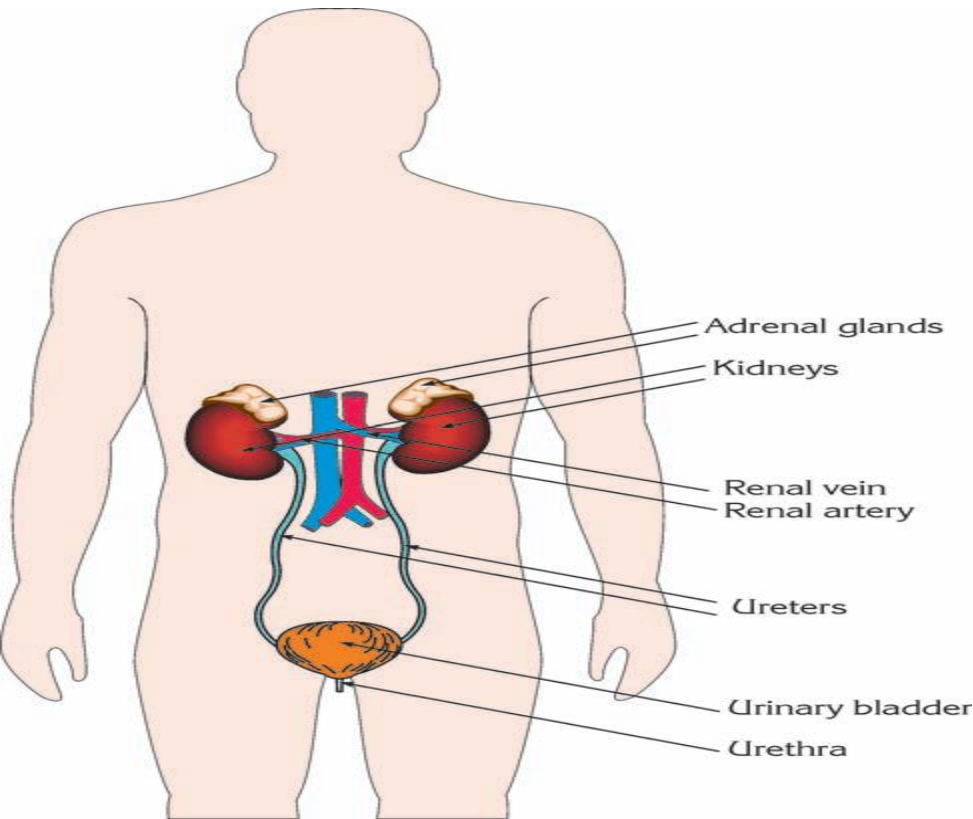
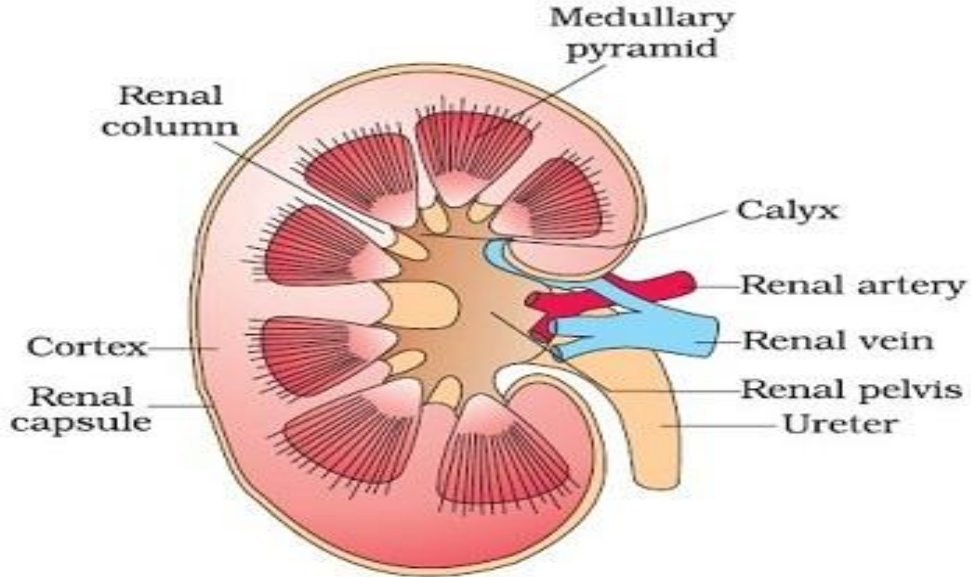
- The absorption of needed materials such as glucose, aminoacids and water from nephrons to blood capillaries is called ***reabsorption***

Secretion

- The cells of *distal tubule* excrete molecules such as penicillin, ammonia, potassium and excess acids
- After secretion, the fluid remaining in the nephrons is called *urine*
- Urine contains urea, uric acid, Na, K, Ca, Cl, P, water and small amount of blood cells



Excretion



- Urine flows from the ***tubules*** into the ***collecting ducts*** and it is stored in **pelvis**
- Then urine is transported into the ***urinary bladder*** by the ***ureter*** of each kidney
- And then it is expelled through the **urethra**