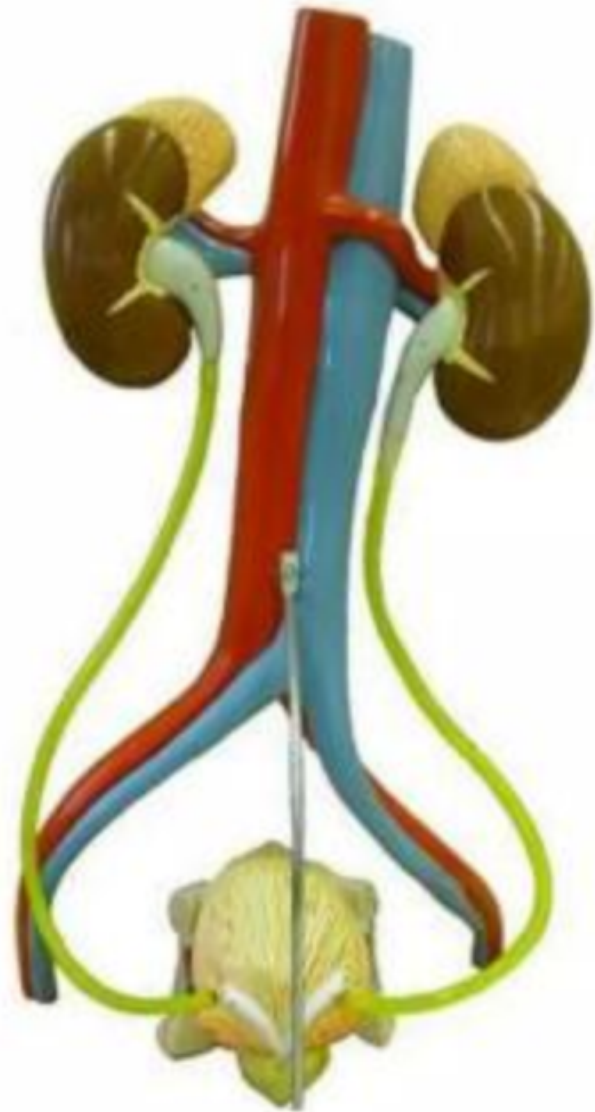




# Excretory



# System

**Vishal Tiwari**

## Excretory System :-

↳ ऐसे Organ's जो Impurities को बाहर निकालते

→ Skin  $\Rightarrow$  Sebum + Sweat + NaCl (नमक)

→ Lungs =  $\text{CO}_2$  + Water vapour + Cough

→ Rectum/Anus = Undigested food को बाहर

→ Liver = शरीर के अंदर बने वाले  $\text{NH}_3$  को बाहर ✓

→ Kidney =

Filteration of Blood

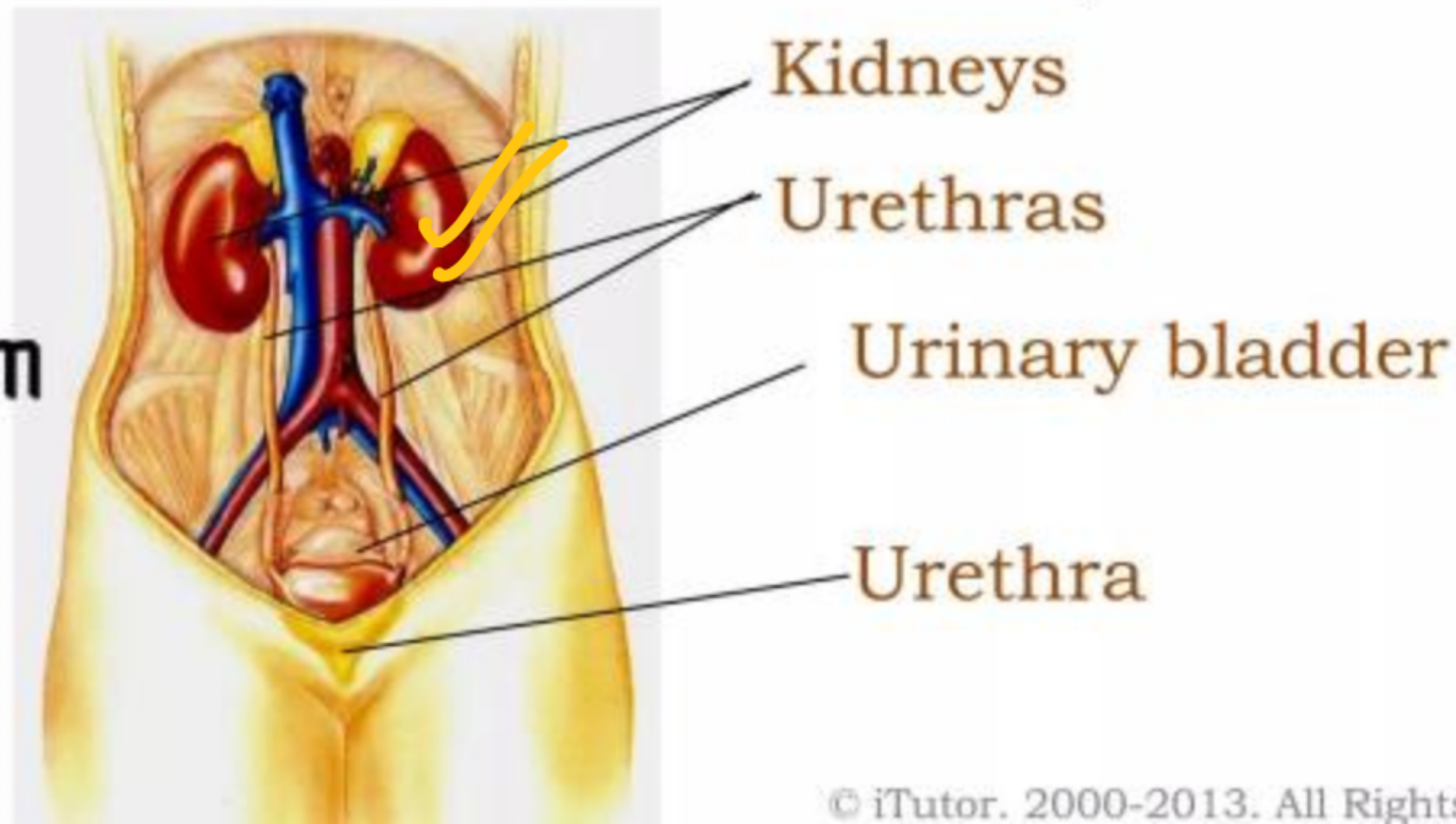
Urine



# Function of the Excretory System <sup>iTutor®</sup>

- The human excretory system functions to remove waste from the human body.
- During this process animals get rid of nitrogenous waste products of metabolism, including ammonia, urea, and uric acid.
- Although excretory systems are diverse, nearly all produce urine in a process that involves several steps.

## Organs of the Excretory System



# Kidney



- Functional and Structural unit of Kidney = Nephron
- Study of Kidney = Nephrology
- No. - 2 (1 Pair)
- weight
  - male = Right - 129 gm, Left = 137 gm
  - Female = Right - 108 gm, Left = 116 gm
- Gland ⇒ Adrenal Gland
- Blood to Filter
  - $\text{NH}_3$
  - Urea
  - Uric acid
  - Creatinine
  - Phosphate, Silicate ~ ~ ~

# Function of the Excretory System <sup>iTutor®</sup>

## 1. Filtration:

- The excretory tubule collects filtrate from the blood. Water and solutes are forced by blood pressure across the selectively permeable membranes of a cluster of capillaries and into the excretory tubule.

## 2. Reabsorption:

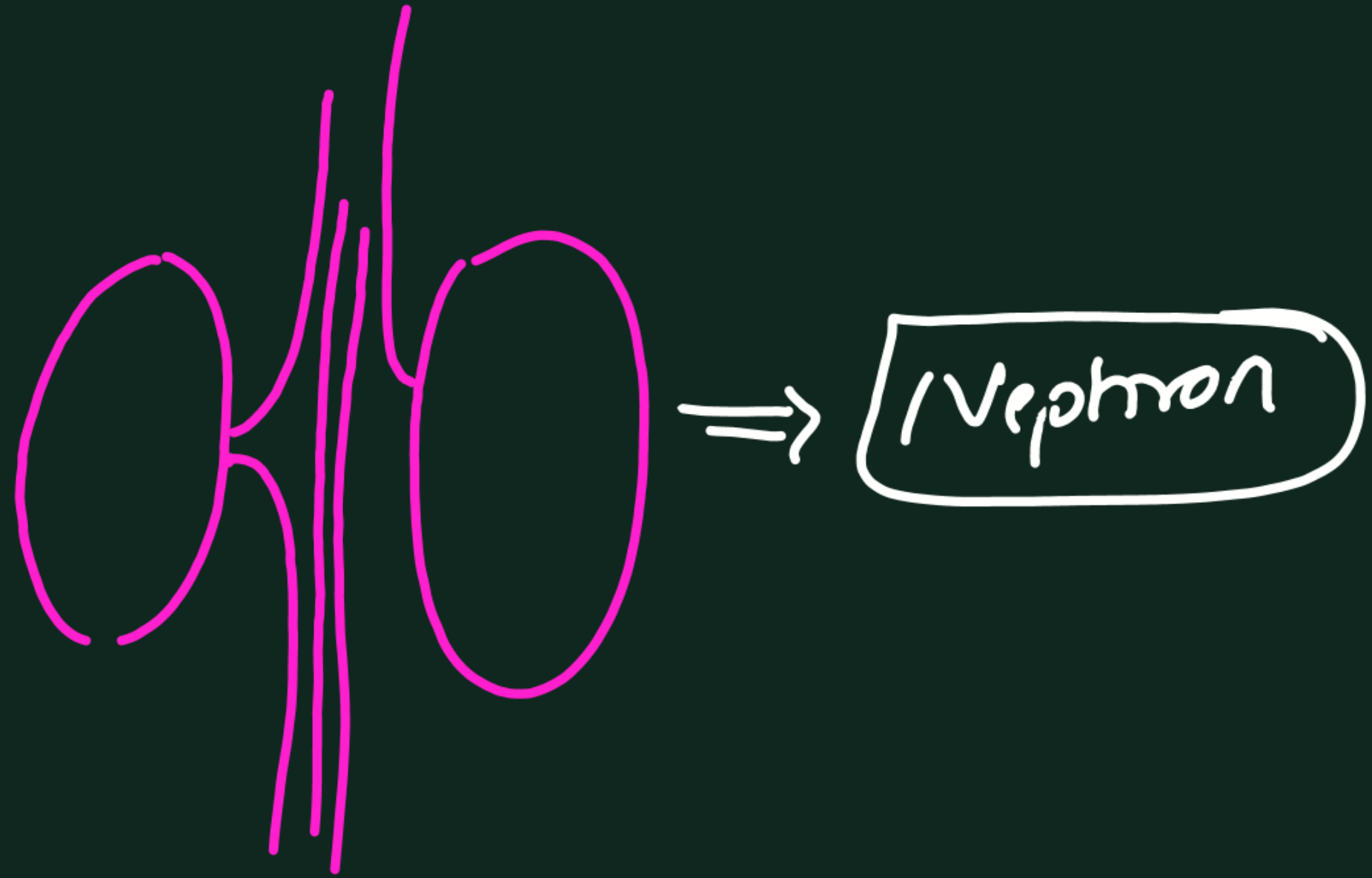
- The transport epithelium reclaims valuable substances from the filtrate and returns them.

## 3. Secretion:

- Other substances are extracted from body fluids and added to the contents of the excretory tube.

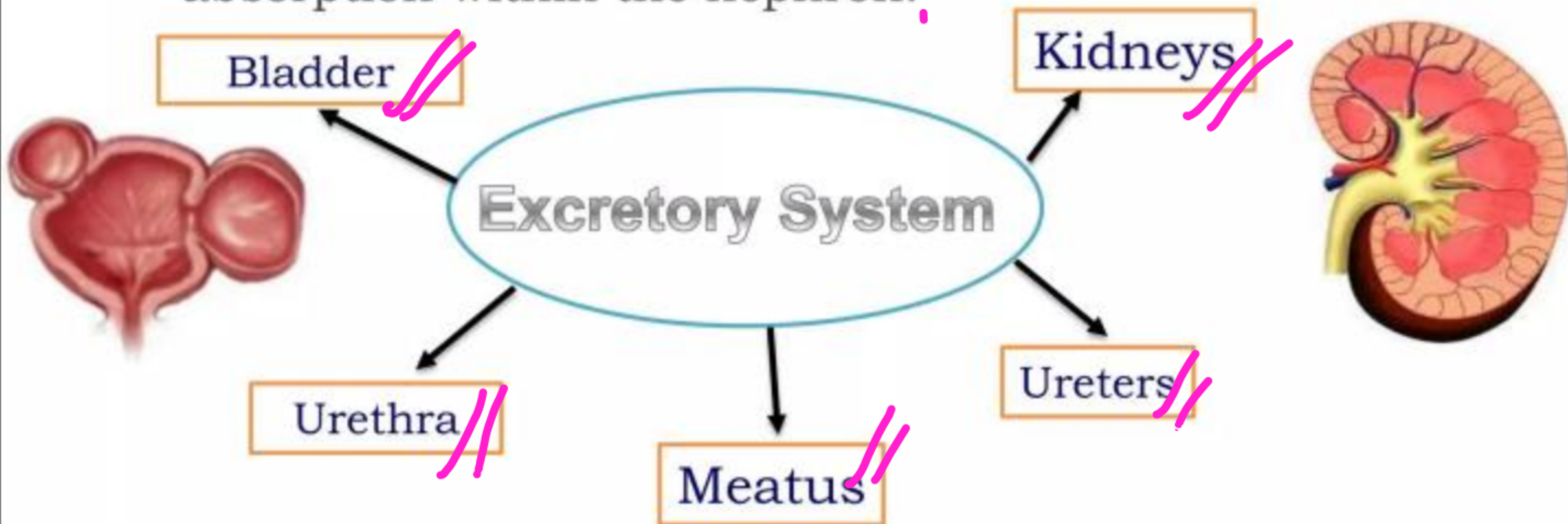
## 4. Excretion:

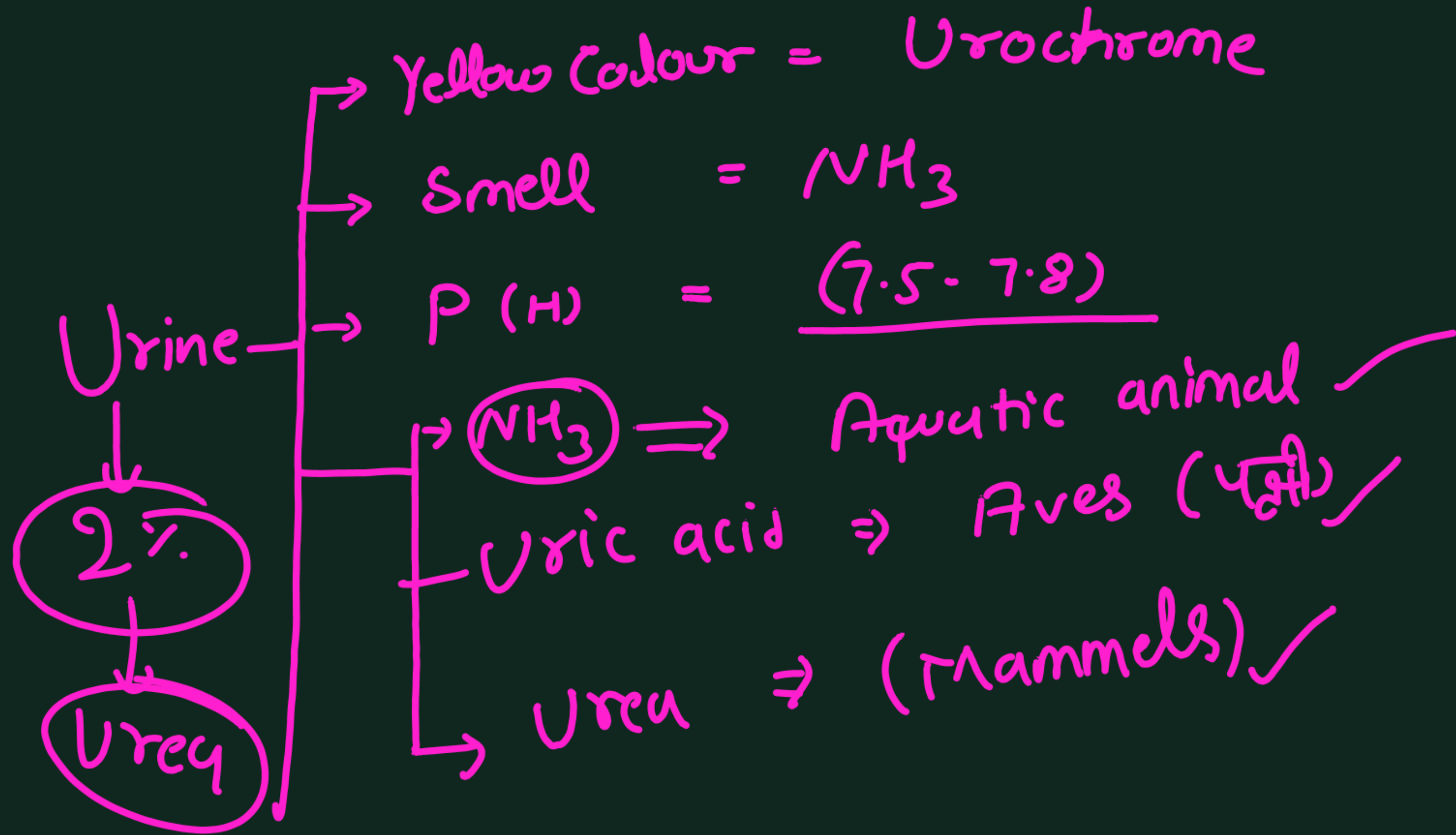
- The filtrate leaves the system and the body.

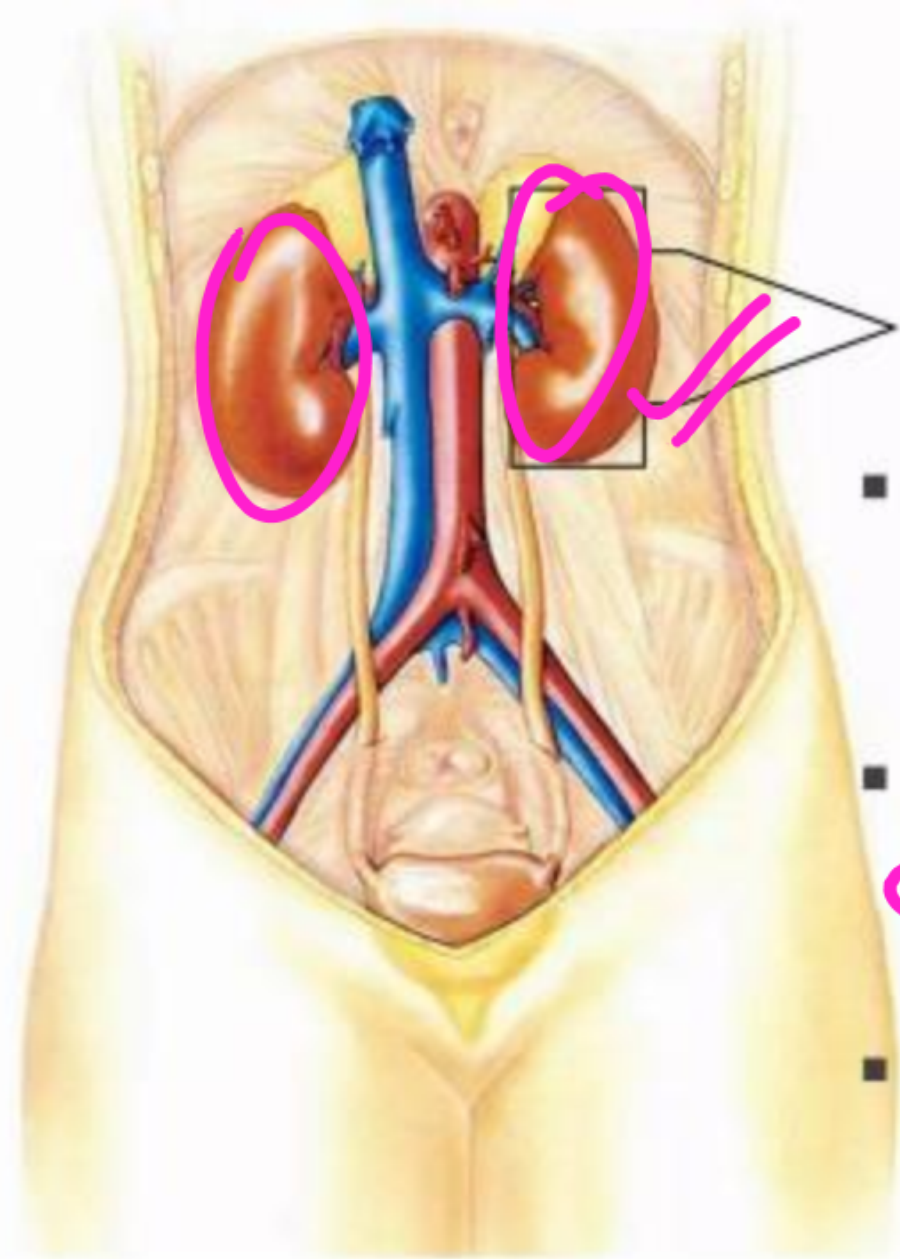


# Structure of the Excretory System <sup>iTutor®</sup>

- This system consists of specialized structures and capillary networks that assist in the excretory process.
- The human excretory system includes the kidney and its functional unit, the nephron.
- The excretory activity of the kidney is changed by specialized hormones that regulate the amount of absorption within the nephron.

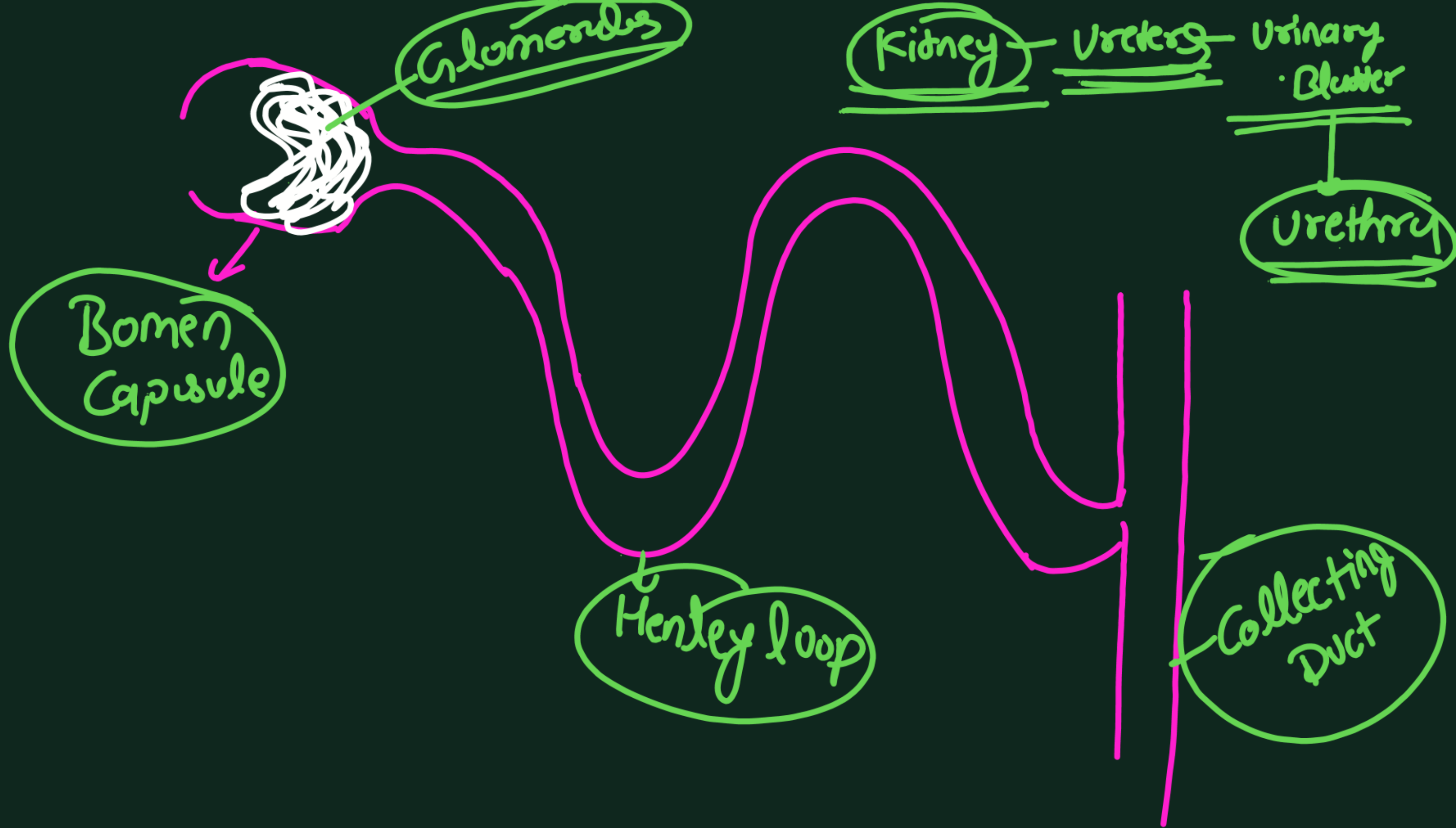




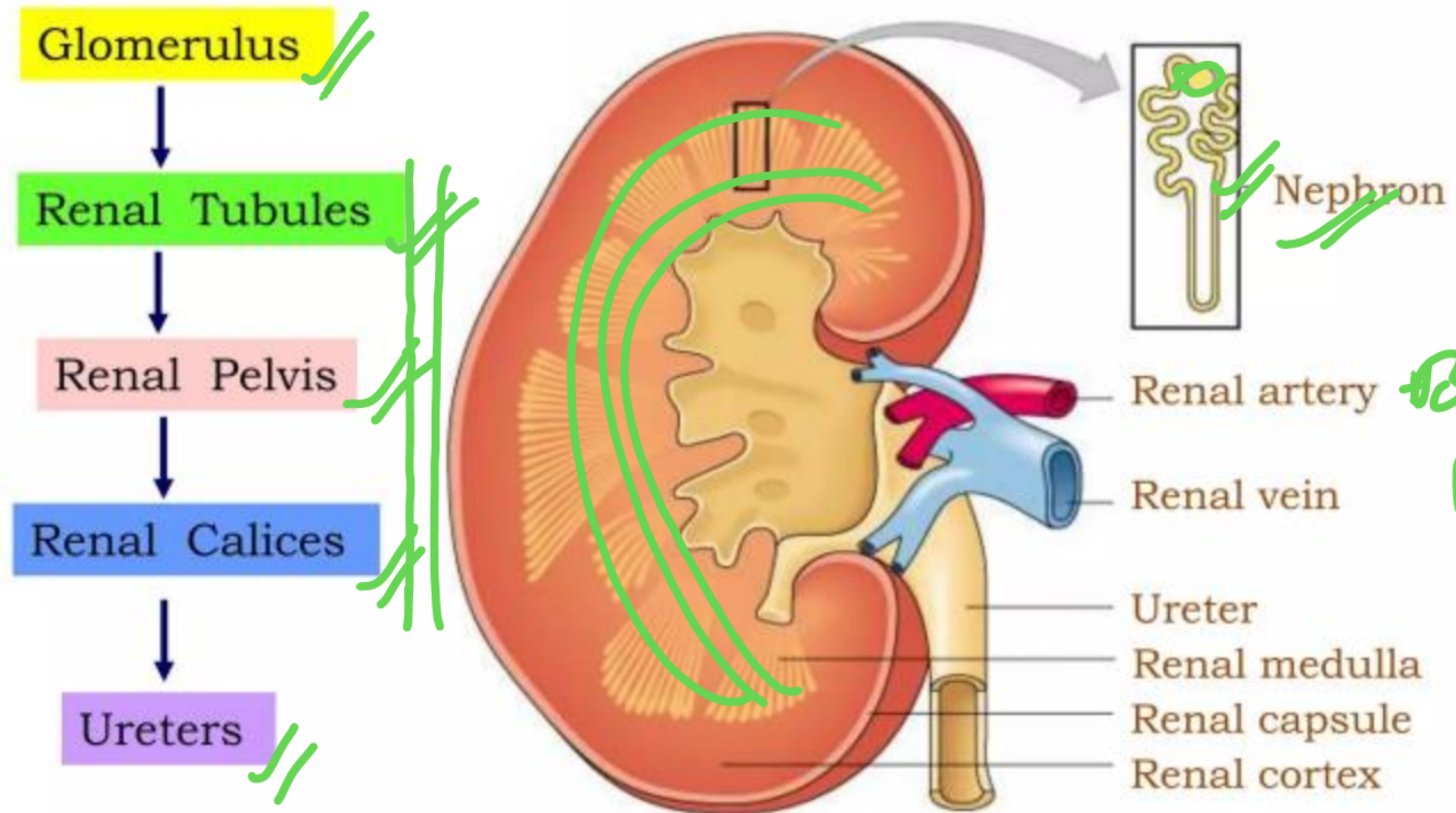


# Kidney ✓

- Located both sides of the spine between thoracic and lumbar vertebrae.
  - Blood enters the kidneys through renal arteries and leaves through renal veins.
  - Tubes called **ureters** carry waste products from the kidneys to the **urinary bladder** for storage or for release.
- During urination, urine is expelled from the urinary bladder through the **urethra**.



# Flow of Urine



Blood Enter  
Blood Out

Kidneys filter about 1700 liters of blood daily in the average adult.

## Parts of the kidneys

- **Cortex**

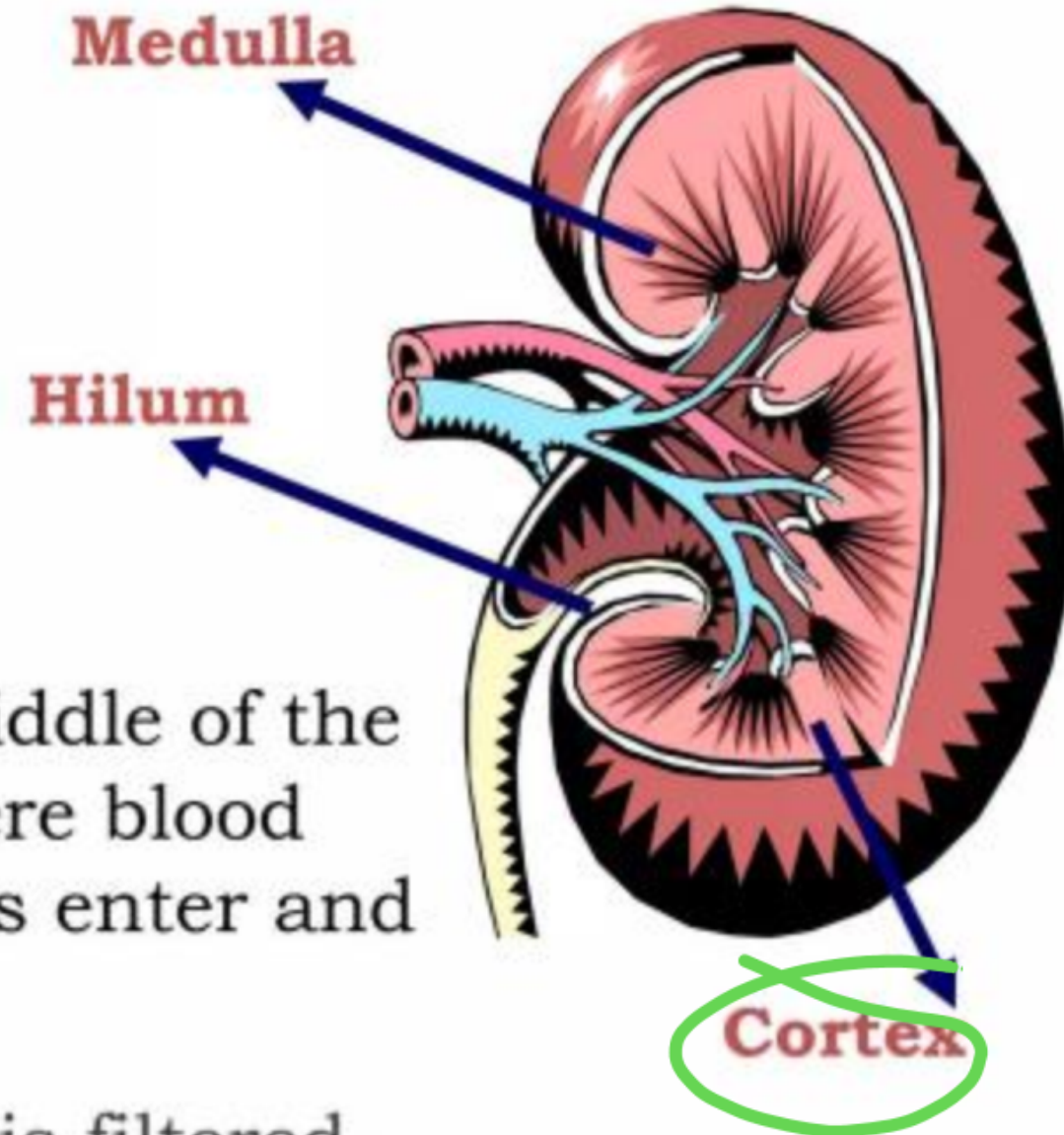
- outer protective portion

- **Medulla**

- inner soft portion

- **Hilum**

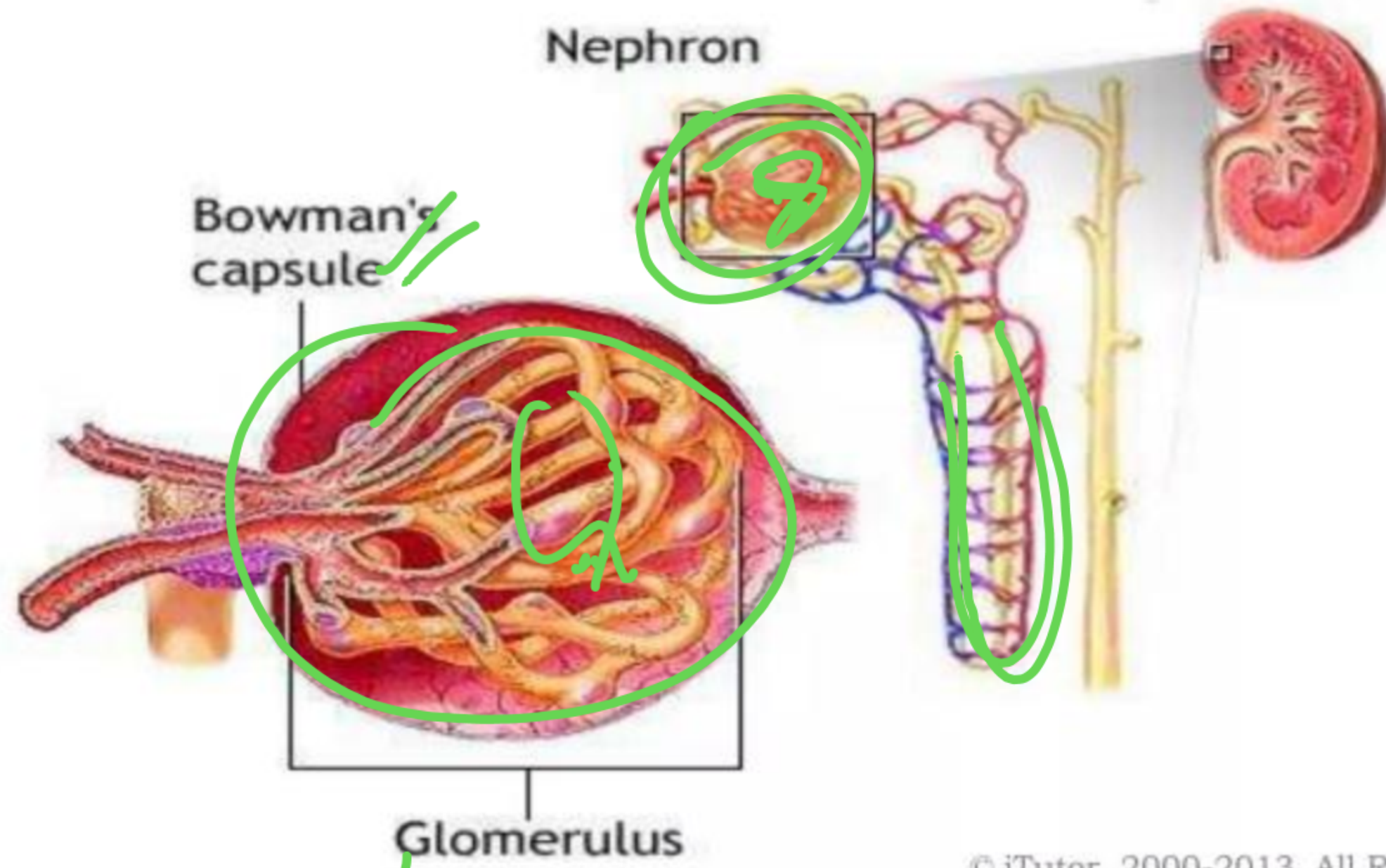
- a depression located in the middle of the concave side of the kidney where blood vessels, nerves, and the ureters enter and exit the kidneys



- The **cortex** is where the blood is filtered.
- The **medulla** contains the collecting ducts which carry filtrate (filtered substances) to the pelvis.
- The **pelvis** is a hollow cavity where urine accumulates and drains into the ureter.

# Nephron

- The functional units of the kidney are called nephrons.
- Nephrons are located in the renal cortex, except for their loops of Henle, which descend into the renal medulla.



# Nephron

Two parts //

a. Renal Corpuscle ✓

1. Bowman Capsule ✓

2. Glomerulus ✓

a. *Fenestrae* - pore in endothelial walls of glomerulus.

b. *Podocytes* - specialized cells.

c. *Filteration slits*

b. Renal Tubule - Series of single layer tubules

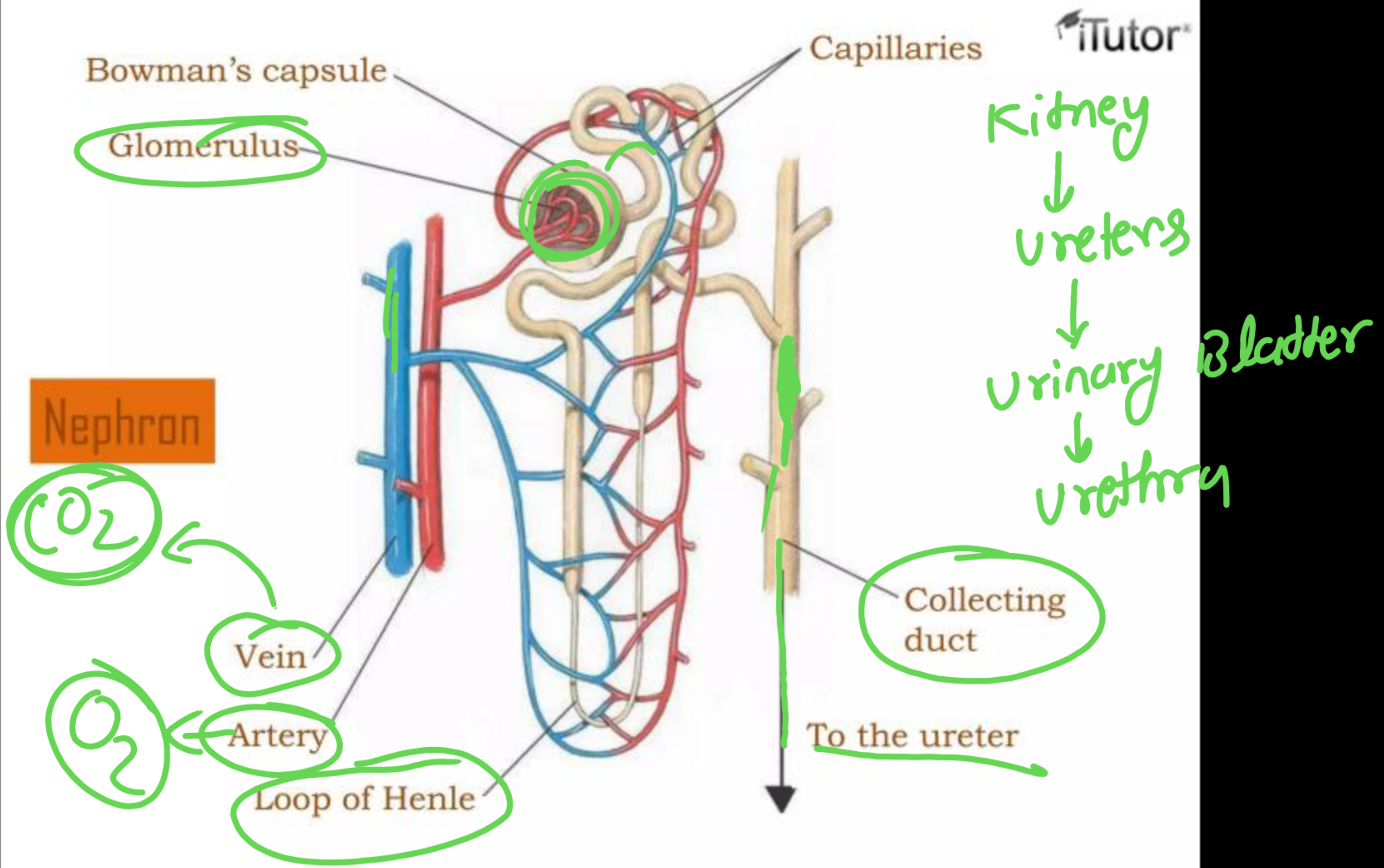
1. Proximal Convoluted tubule |

2. Loop of Henle

3. Distal Convoluted tubule

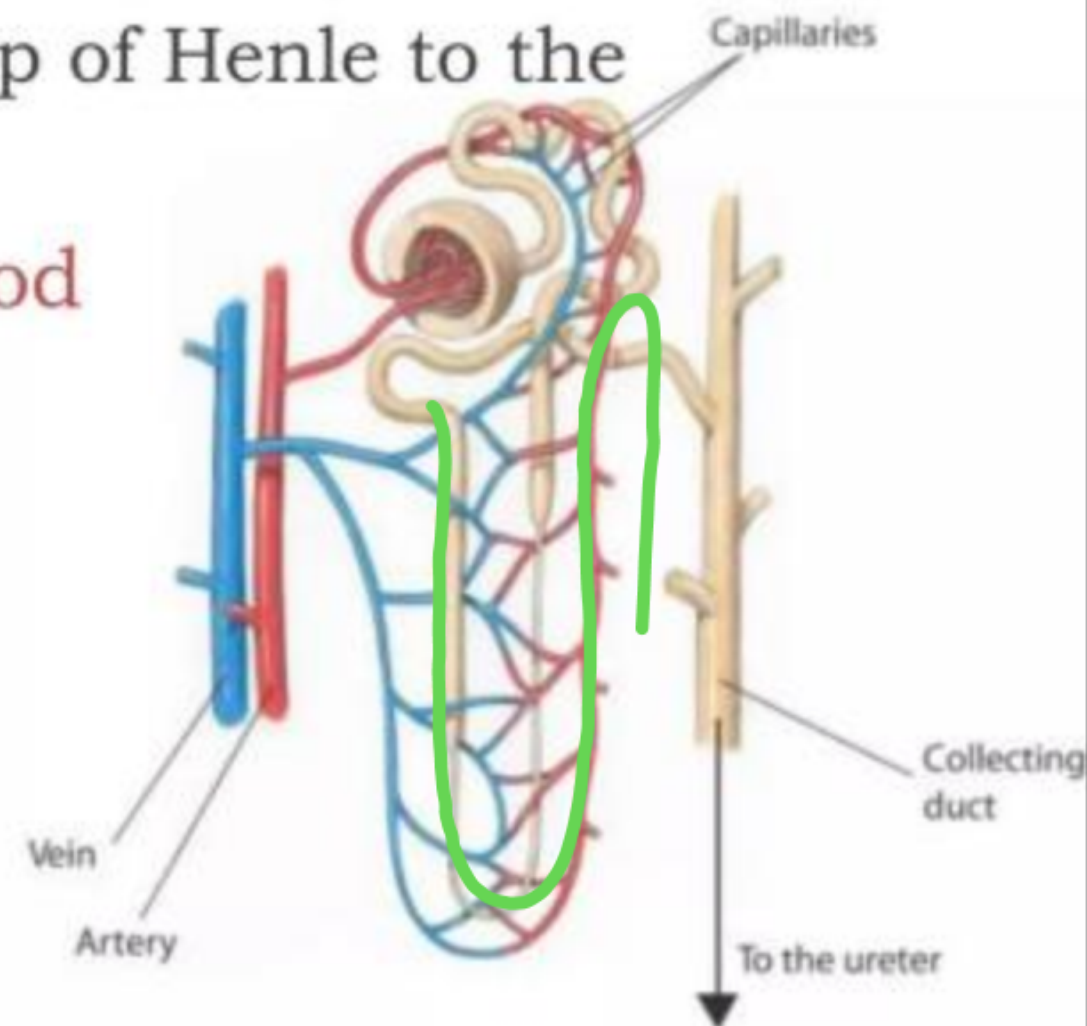
Blood Enters

Kidneys are made up of nephrons. Blood enters the nephron, where impurities are filtered out and emptied into the collecting duct. The purified blood leaves the nephron through the renal vein.



- The *glomerulus* is a mass of thin-walled capillaries
- The *Bowman's capsule* is a double-walled, cup-shaped structure.
- The *proximal tubule* leads from the Bowman's capsule to the Loop of Henle.
- The *loop of Henle* is a long loop which extends into the medulla.
- The *distal tubule* connects the loop of Henle to the collecting duct.
- Each nephron has its own blood supply:
  - An arteriole
  - A venule
  - A network of capillaries connecting them

Each nephron releases fluids to a collecting duct, which leads to the ureter.



Each kidney contains more than 1 million **nephrons**.

### ▪ **Blood Flow through the Kidneys**

Blood enters through the renal artery → Arterioles →

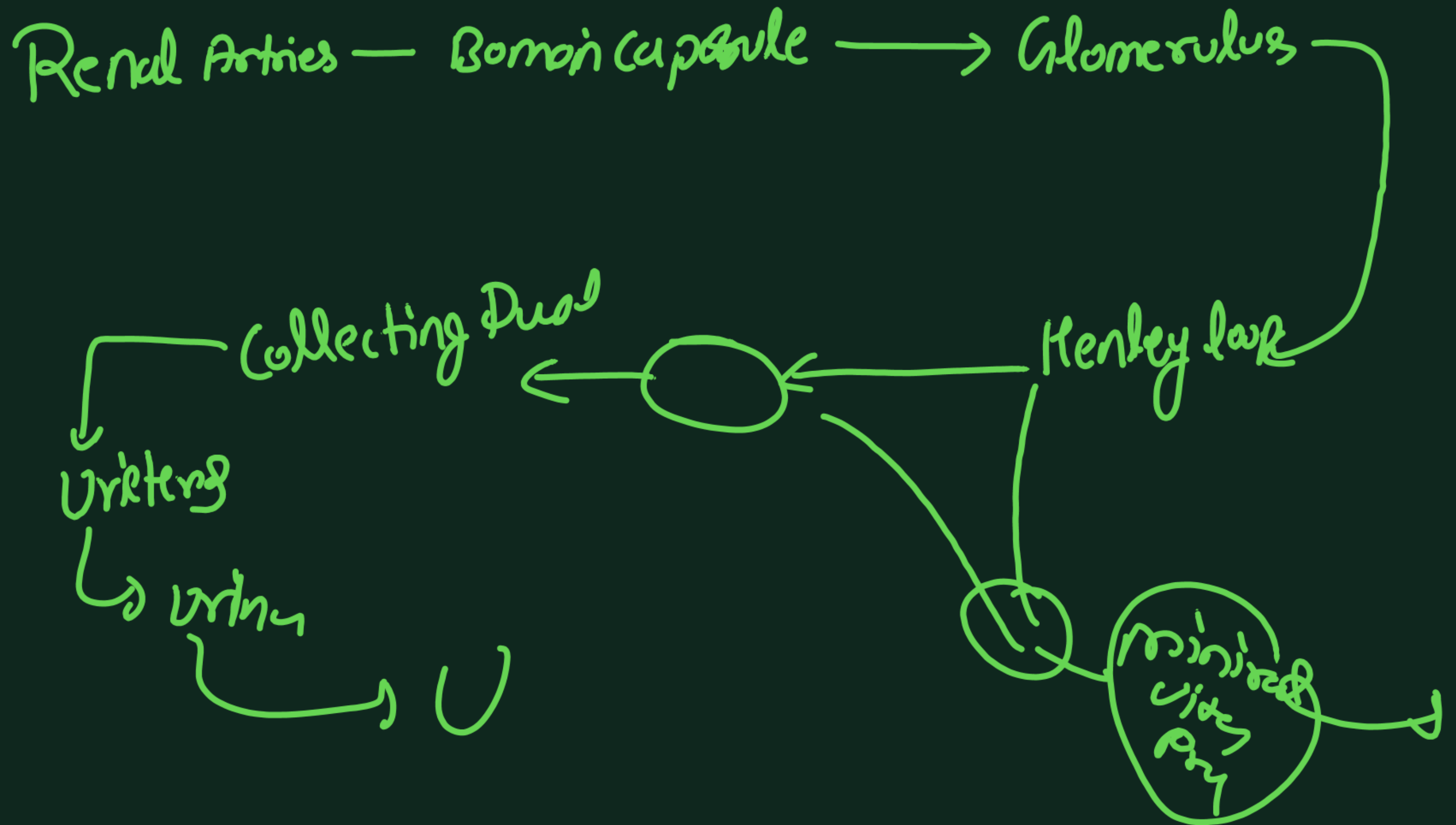
Each arteriole leads to a nephron → Renal corpuscle

▪ The **glomerulus** filters fluid from the blood, and is the first place where urine is formed in the kidneys.

▪ Blood flows through the glomerulus at a constant rate.

▪ Each glomerulus is surrounded by a capsule known as Bowman's capsule.

▪ Blood then passes into the renal tubules where some substances are reabsorbed and the remaining become urine.



# The Kidneys

## *How is blood filtered?*

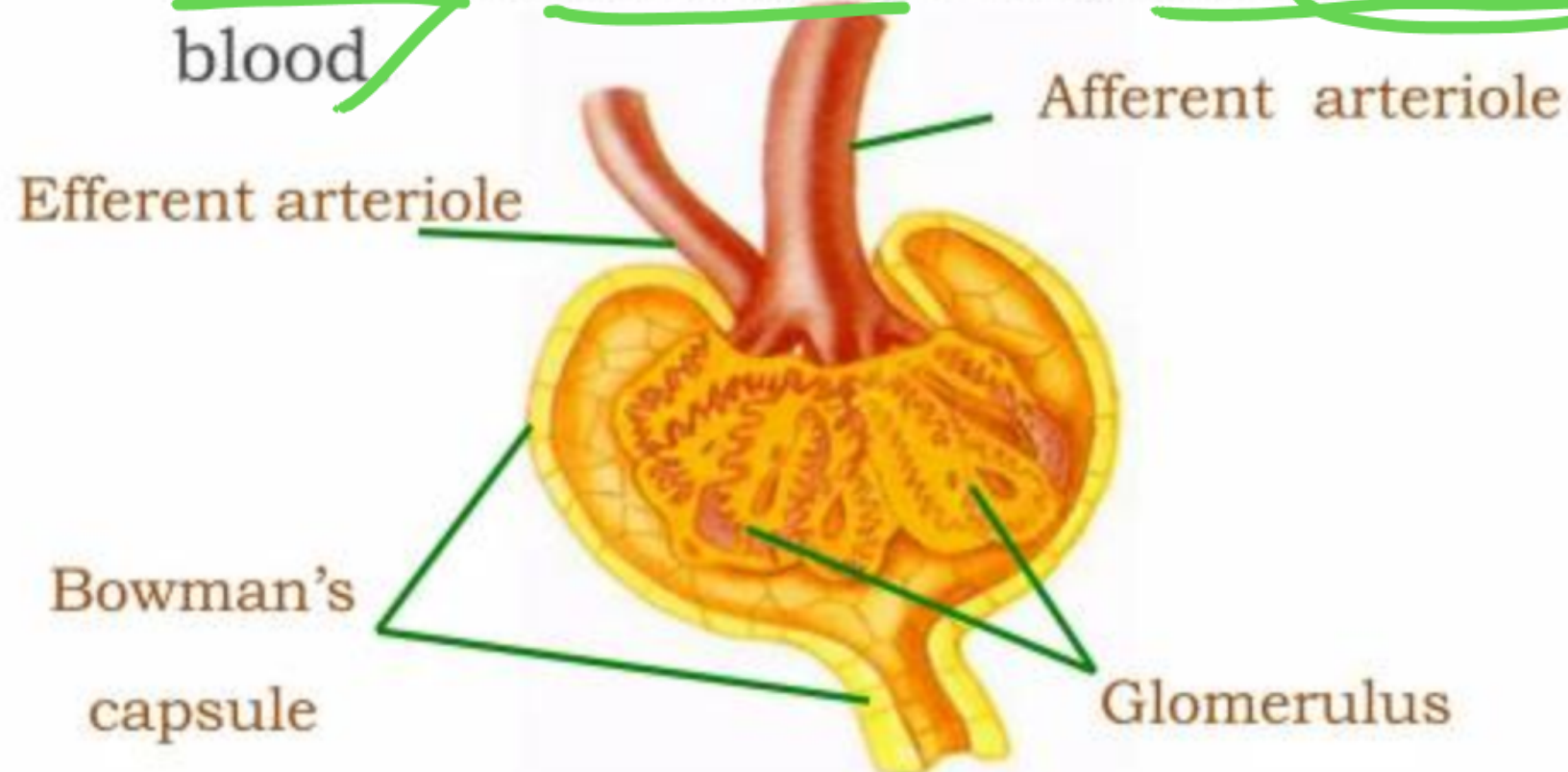
- As blood enters a nephron through the arteriole, impurities are filtered out and emptied into the collecting duct.
  - The purified blood exits the nephron through the venule.
- *The mechanism of blood purification involves two distinct processes:*
- Filtration
  - Reabsorption

- **Filtration**

- Passing a liquid or gas through a filter to remove wastes is called **filtration**.
- The filtration of blood mainly takes place in the glomerulus.
- The **glomerulus** is a small network of capillaries encased in the top of the nephron by a hollow, cup-shaped structure called **Bowman's capsule**.
- Fluid from the blood flows into Bowman's capsule.
- The materials filtered from the blood include water, urea, glucose, salts, amino acids, and some vitamins.
- Plasma proteins, cells, and platelets remain in the blood because they are too large to pass through the capillary walls.

- **Reabsorption**

- Most of the material removed from the blood at Bowman's capsule makes its way back into the blood.
- The process in which liquid is taken back into a vessel is called **reabsorption**.
- Almost 99% of the water that enters Bowman's capsule is reabsorbed into the blood.
- When the filtrate drains in the collecting ducts, most water and nutrients have been reabsorbed into the blood.



**Glomerular  
Filtration**

- Remaining material, called urine, is emptied into a collecting duct.
- Urine is primarily concentrated in the loop of Henle.
- The loop of Henle is a section of the nephron tubule in which water is conserved and the volume of urine minimized.
- As the kidney works, purified blood is returned to circulation while urine is collected in the urinary bladder.
- Urine is stored here until it is released from the body through a tube called the urethra.

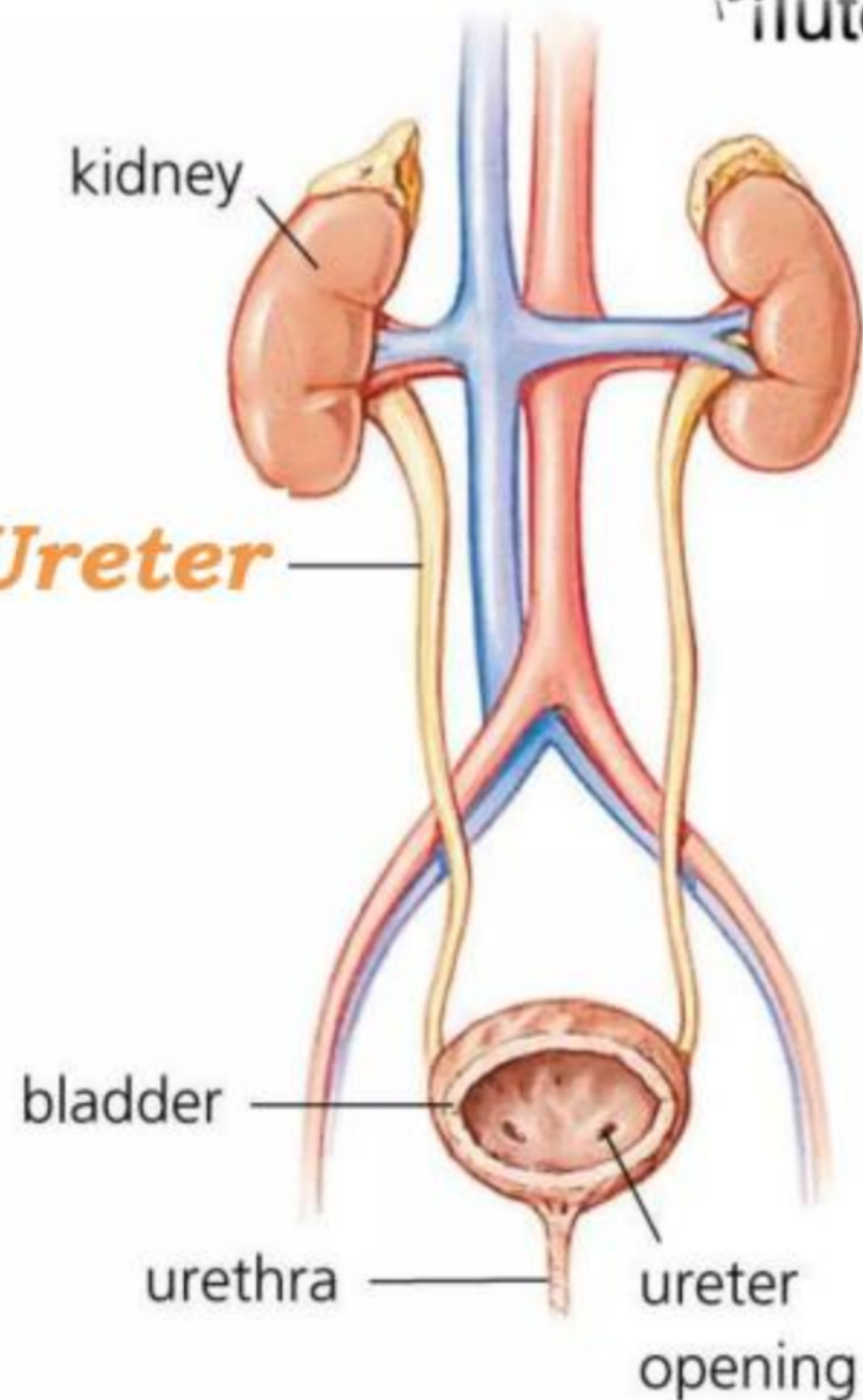
# Ureters

*A tube approximately 6 to 7 inches long attached to each kidney.*

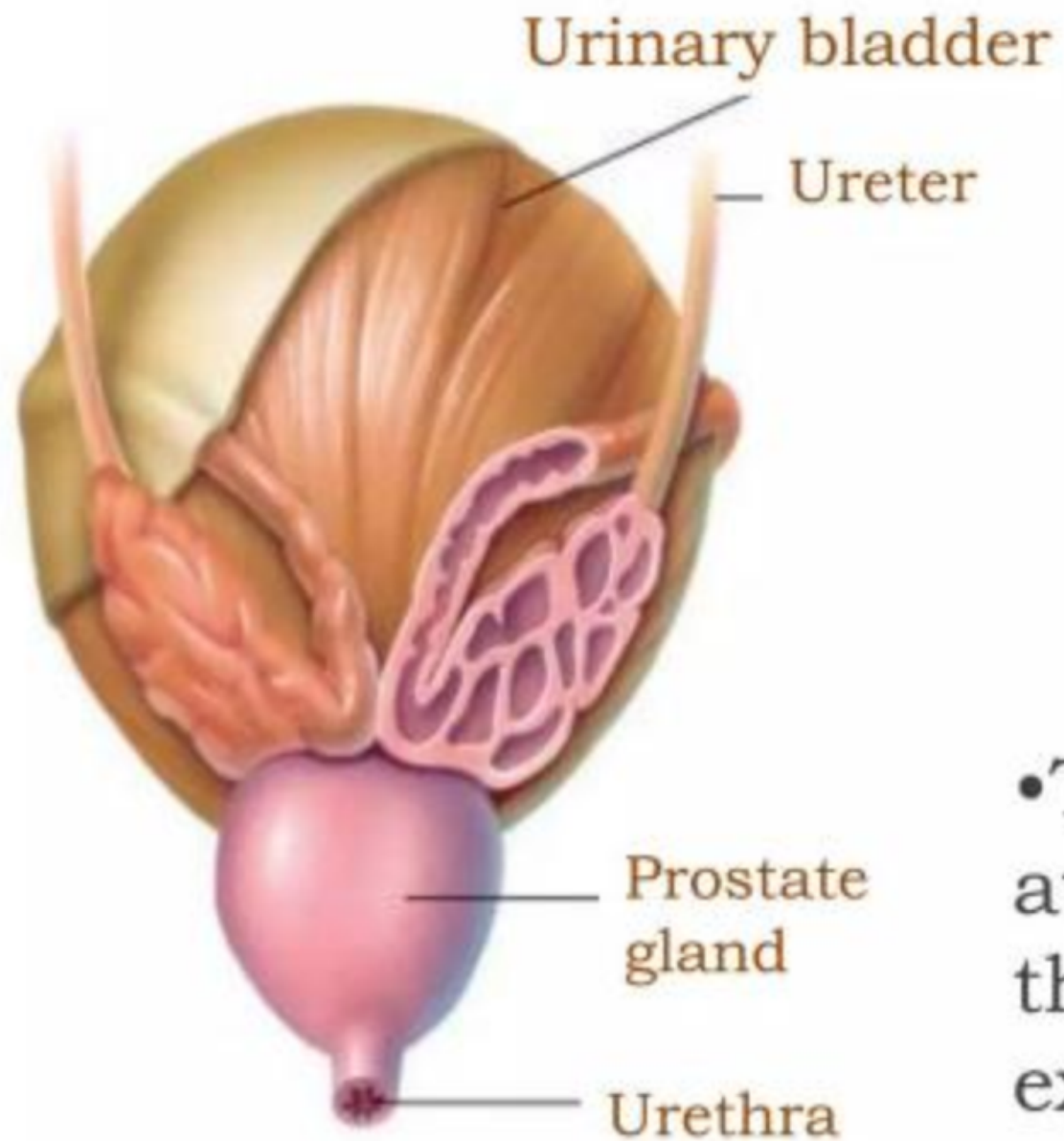
- Made up of three layers of tissue
  - Smooth muscle
  - Fibrous tissue
  - Mucous layer

**Peristalsis**, a rhythmic contraction of the ureter smooth muscle which helps to move the urine into the **bladder**.

## Ureter



## Urinary Bladder



- Hollow, muscular organ that stores urine
  - Sphincter muscles hold the urine in place
  - Holds 300 to 400 milliliters of urine before emptying
  - Walls contain epithelial tissue that stretch to allow the bladder to hold twice its capacity
- 
- The trigone is a triangular area at the base of the bladder where the ureters enter and the urethra exits

# Urethra

*A tube of smooth muscle with a mucous lining that carries urine from the bladder to the outside of the body.*

## Female Urethra

- Approximately 1.5 inches long
- Opens through the meatus

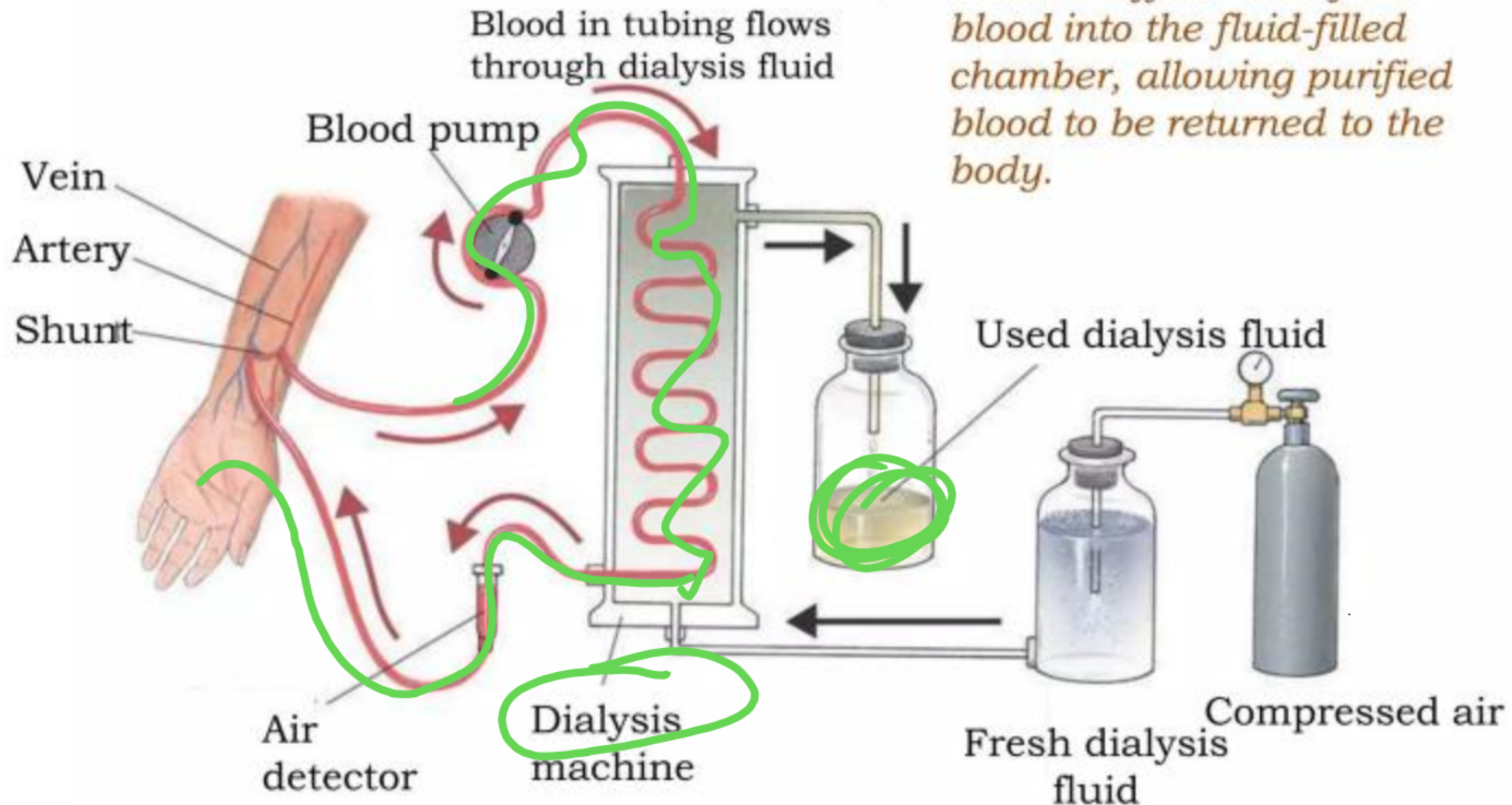
## Male Urethra

- Approximately 8 inches long
- Passes through three different regions:
  - Prostate gland
  - Membranous portion
  - Penis

# Dialysis

- Blood is removed by a tube and pumped through special tubing that acts like nephrons.

- Tiny pores in the tubing allow salts and small molecules to pass through.
- Wastes diffuse out of the blood into the fluid-filled chamber, allowing purified blood to be returned to the body.



# Revolution

1. Green Revolution = Wheat + Rice + Food grain + Protein Richest <sup>Rice</sup>  
↳ M.S. Swaminathan  $\Rightarrow$  High Yielding variety of seeds

2. White Revolution = Milk Production

3. Yellow " = Oilseeds "

4. Red " = Tomato + Meat Production

5. Pink " = Onion + Prawn "

6. Green Gold " = Bamboo + Tea "

7. Golden Revolution = Forestry Pro
8. Golden Fiber = Jute Production
9. Silver Revo = Egg "
10. Silver Fiber Revo = Cotton "
11. Round Revo. = Potato "
12. Grey Revo = Fertilizer "
13. Black Revo. = Petroleum " (Bio-Diesel  
↳ (Jaitropa)
14. Blue Revo. = Fisheries ✓

Purple Revo  $\Rightarrow$  Leventer Produa  
Saffron II = Sajron + Solar mission