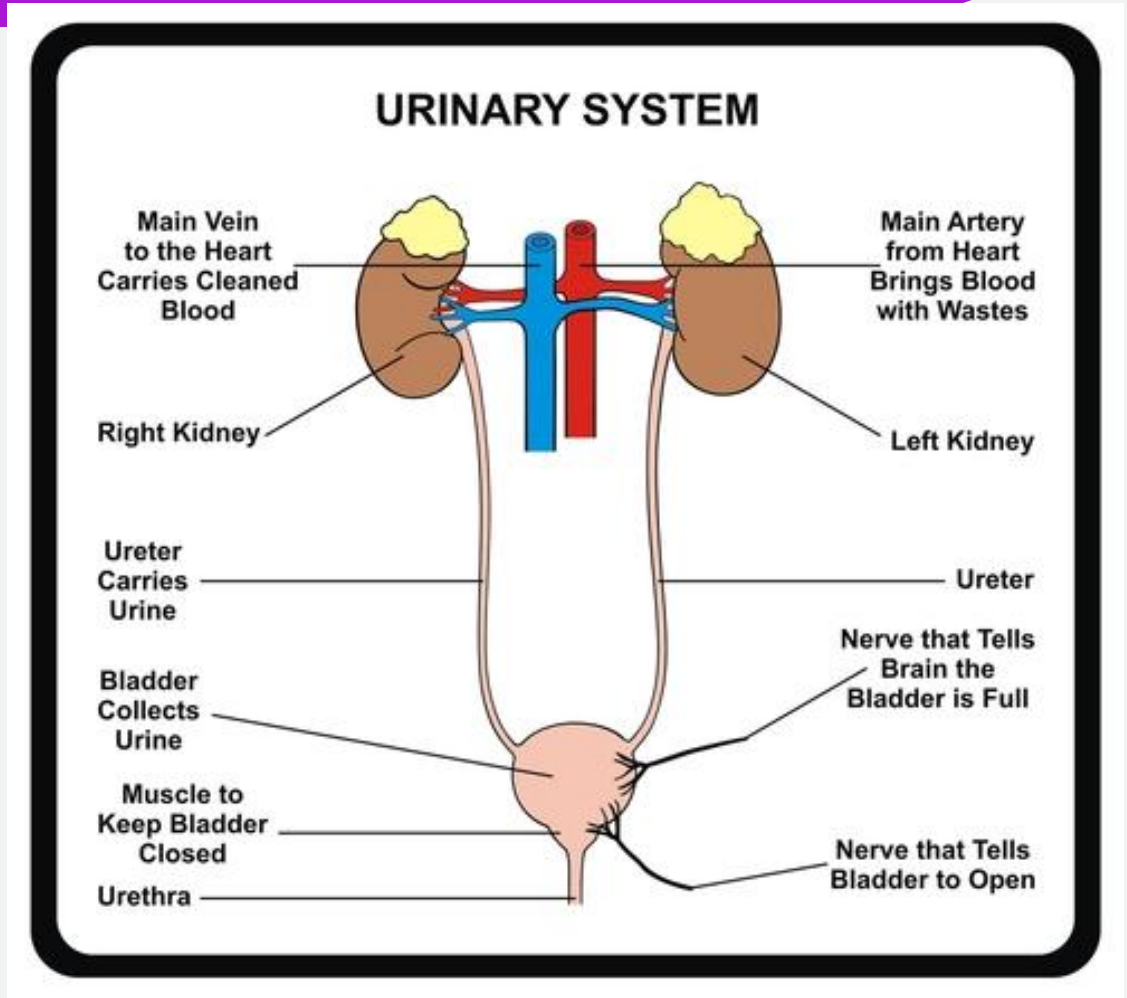
Kidney & Urinary System Basics

The Urinary System AKA the Renal System
AKA the Excretory System

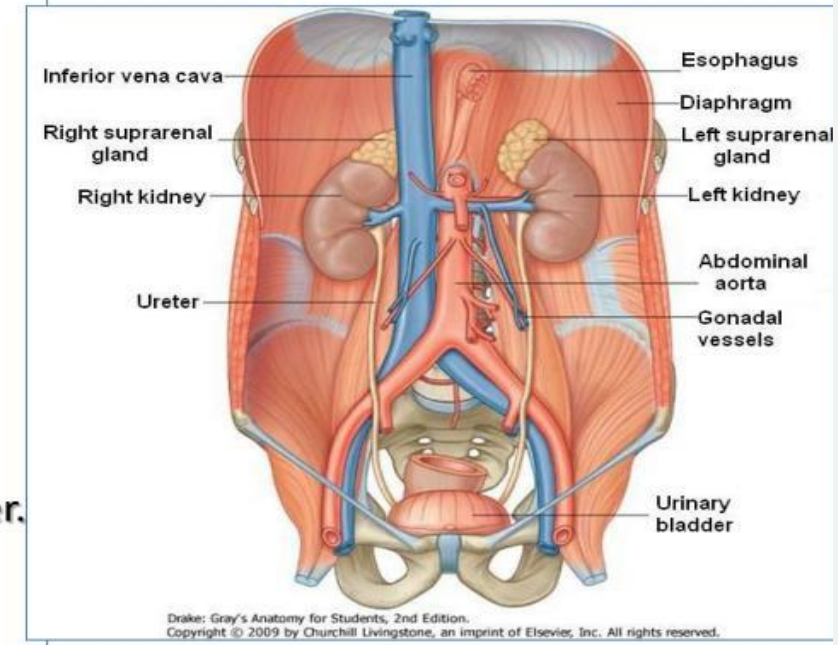
Components:

- **2 Kidneys –** regulate the blood volume & composition, regulate pH, produce hormones & create urine.
- **2 Ureters –** transport urine from kidneys to bladder
- **1 Bladder –** store urine
- **1 Urethra –** Transport urine from bladder to outside of the body



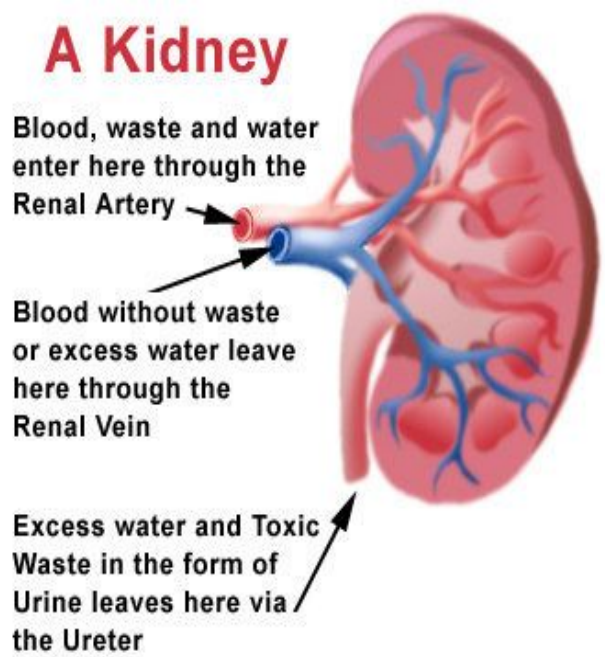
Location & Position of the kidneys

- The *kidneys* are **retroperitoneal** paired organs
- Each kidney lies **lateral to the vertebral column, on the posterior abdominal** wall largely **under cover of the costal margin**
- In the supine position, the kidneys extend from approximately **T12 vertebra superiorly to L3 vertebra inferiorly**
- The **right kidney lies slightly lower than the left kidney** because of the large size of the right lobe of the liver.
- With contraction of the diaphragm during respiration, both kidneys move downward in a vertical direction by as much as 1 in. (2.5 cm)



Retroperitoneal – located behind the peritoneal membrane that borders the abdominal cavity

Functions of the Kidneys



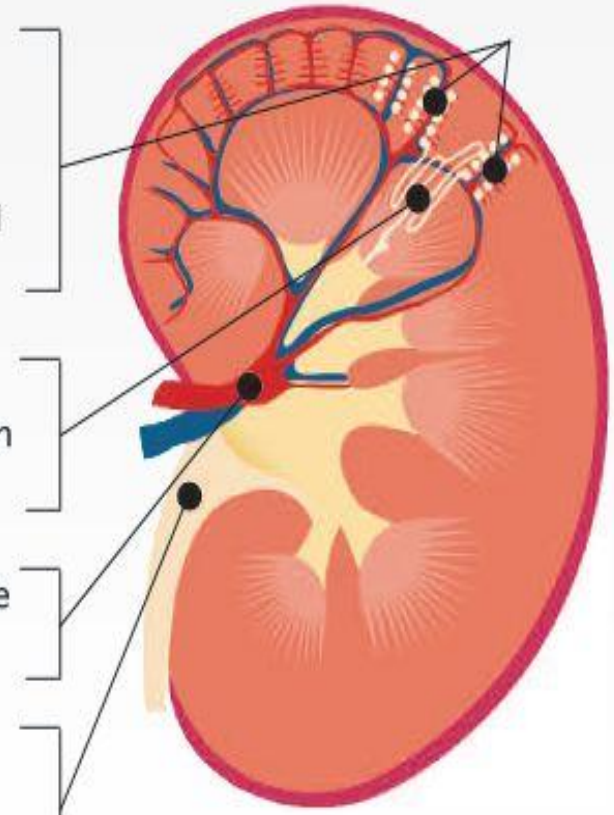
How Kidneys Work

Inside each nephron, a special blood vessel called a glomerulus works like a strainer to keep blood cells and needed substances in while letting extra fluid and wastes out.

Each kidney contains about one million nephrons—tiny filtering centers that clean the blood.

Blood enters the kidney here, through the renal artery.

Drop by drop, urine is produced and travels to the bladder through this tube, called a ureter.

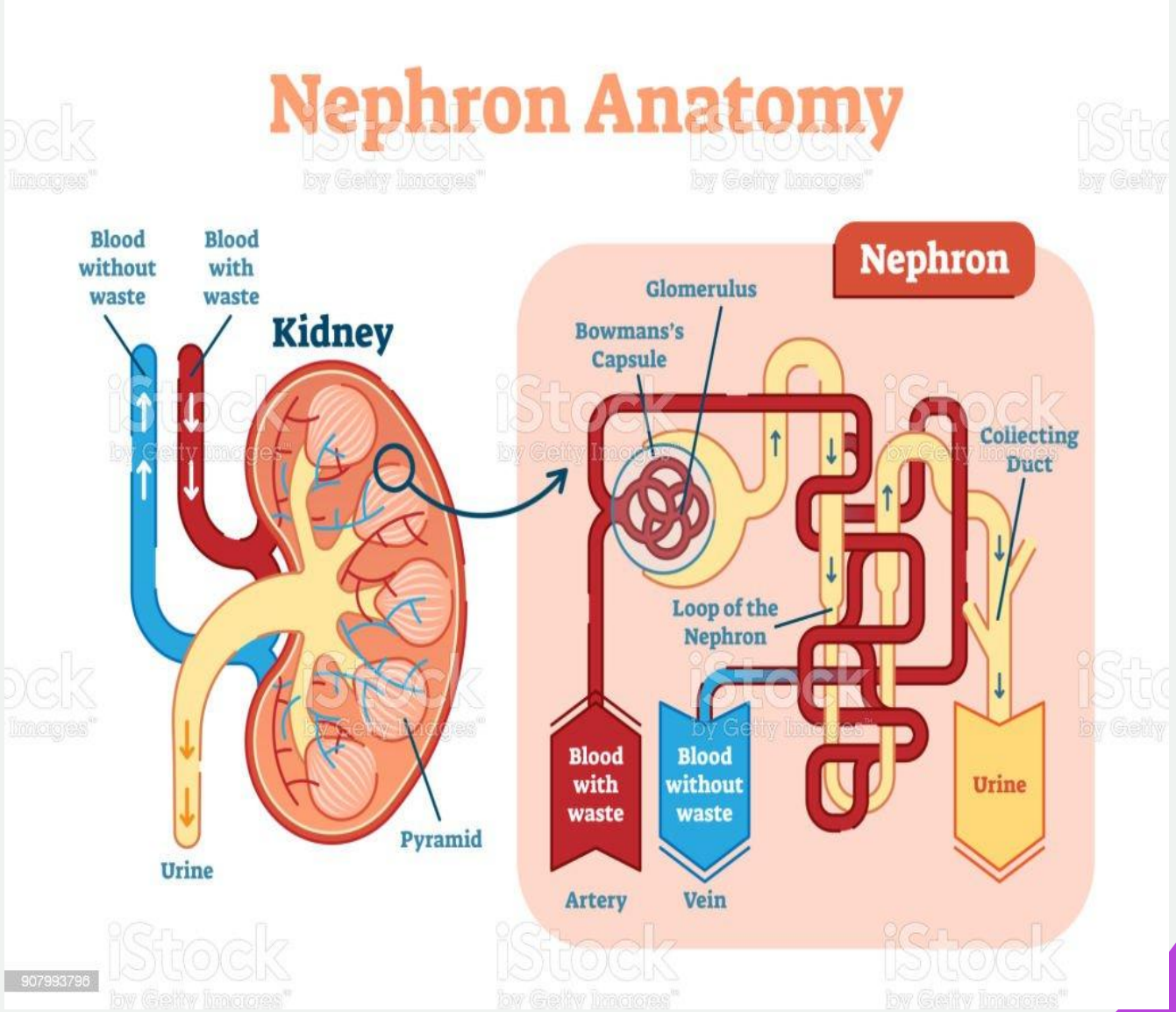


The Nephron

The Nephron is the functional unit of the kidney. Each kidney contains millions of nephrons.

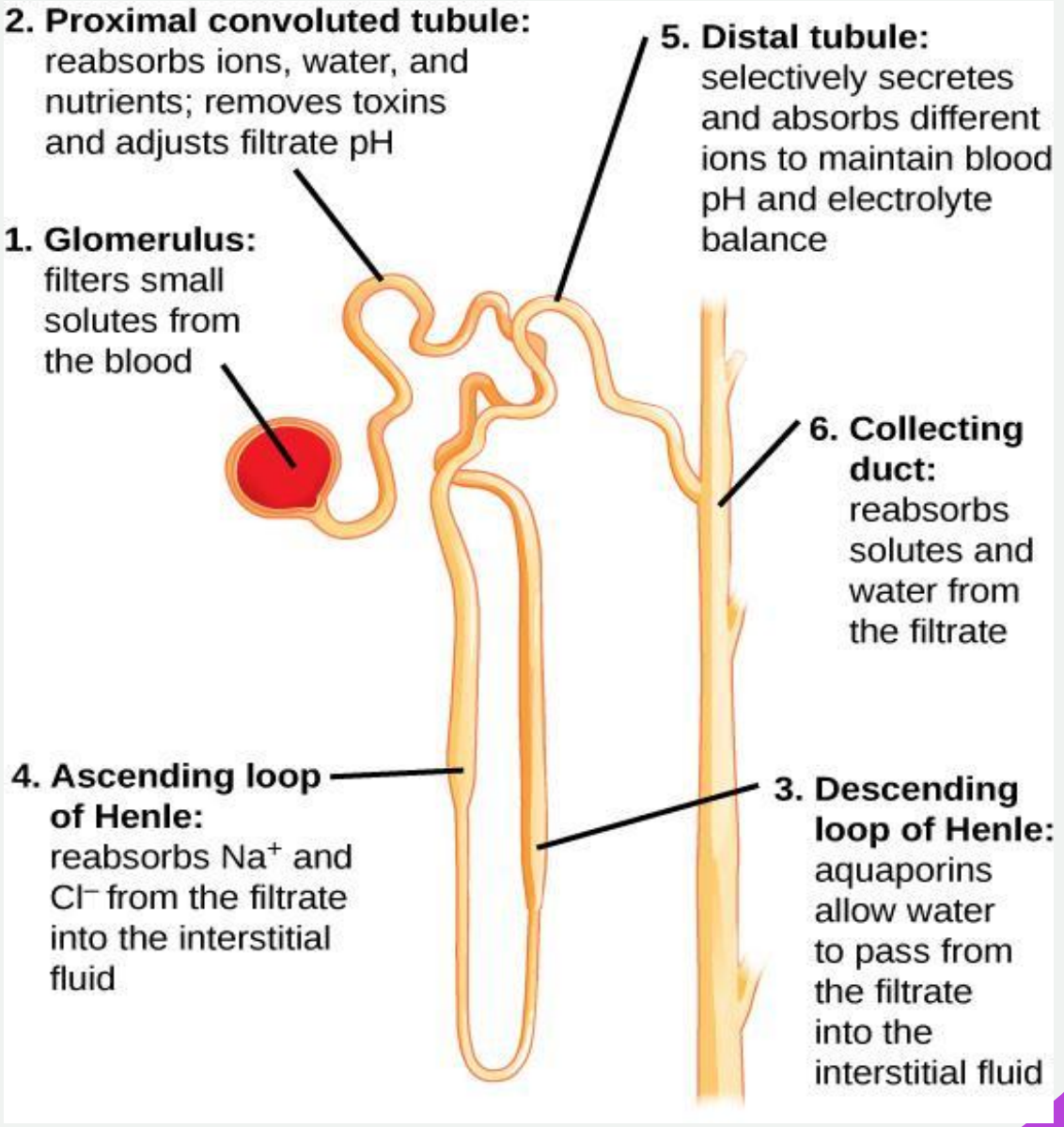
-Separates water, ions & small molecules from the blood.

- **Glomerulus-** cluster of capillaries surrounded by a membrane called a **Bowman's capsule.** The membrane allows smaller molecules like water, glucose & small proteins. Blood cells & large proteins should not be able to pass through this membrane so their presence in urine often indicates a kidney problem



Functions of the Nephron

1. **Filtration** of the blood
2. **Reabsorption –** of water, glucose, amino acids, salt
3. **Secretion –** of ammonium, K, H+ (affects pH), breakdown products of proteins and drugs
4. **Excretion-** the filtered waste leaves the body as urine



Kidney Functions

The Kidneys are critical to maintaining homeostasis in the body.

Erythropoiesis – The kidneys produce the hormone **erythropoietin,** which stimulates red blood cell development

Blood Pressure Control – The kidneys respond to the adrenal hormone aldosterone to change the amount of water & salt retained, therefore blood pressure

Vit D Activation – Calcitriol (active Vit D) is produced from precursors in the proximal tubules of the kidney

https://youtu.be/FN3MFhYPWWo