

### Modes of Excretion /

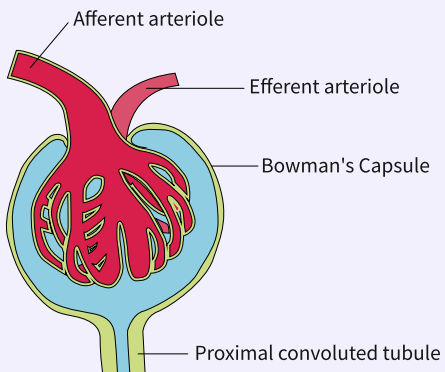
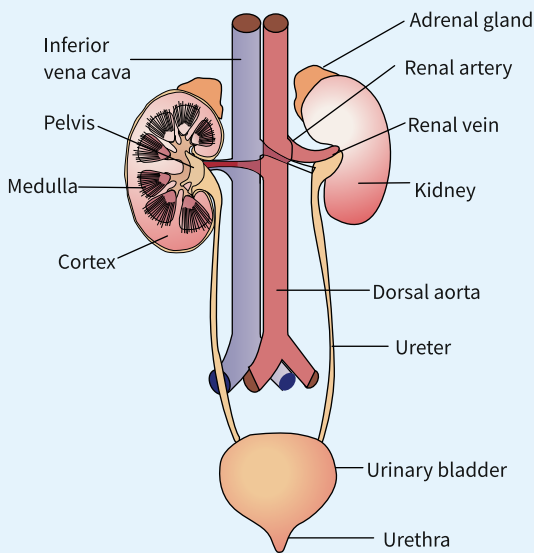
- ✦ **Ammonotelism** → excretory product is ammonia ; bony fishes, aquatic amptibians.
- ✦ **Uricotelism** → excretory product is uric acid ; Birds
- ✦ **Ureotelism** → excretory product is urea ; mammals

### Excretory Structures /

- ✦ **Protonephridia or flame cells** - Platyhelminthes (Flatworms, e.g., Planaria), rotifers, some annelids and the cephalochordate – Amphioxus.
- ✦ **Nephridia** in earthworms and other annelids.
- ✦ **Malpighian tubules** in insects including cockroaches.
- ✦ **Antennal glands or green glands** in crustaceans like prawns.
- ✦ **Kidneys** in higher animals.

### Human Urinary system /

The excretory system consists of a pair of kidneys, one pair of ureters, a urinary bladder and a urethra.

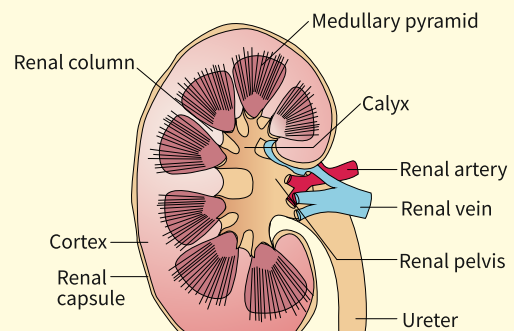


**BOWMANNS CAPSULE + GLOMERULUS  
= MALPIGHIAN BODY**

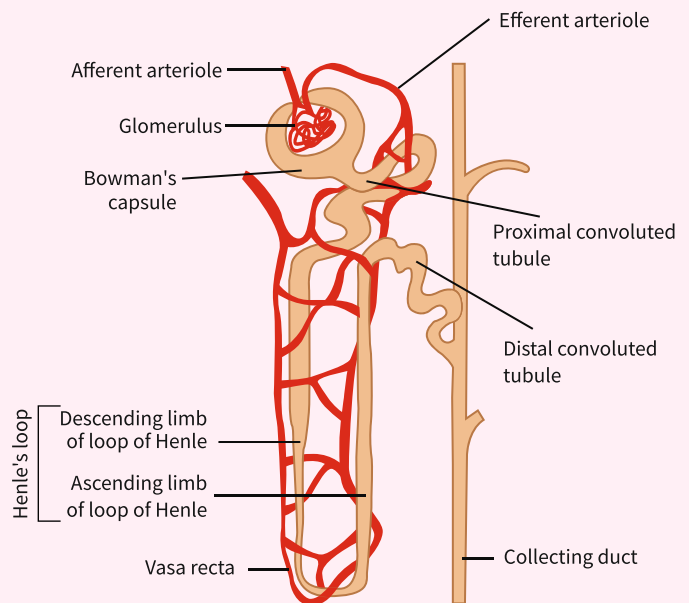
## 16. EXCRETORY PRODUCTS AND THEIR ELIMINATION

### KIDNEY /

- 1) Reddish-brown, bean-shaped
- 2) Location → between last thoracic & third lumbar vertebra
- 3) Two zones → Outer : Cortex ; Inner : Medulla
- 4) Kidney has nephrons (in millions)



### Nephron structure /



### Structural & Functional Unit of Kidney

- ✦ Two parts → Glomerulus & Renal Tubule.
- ✦ Glomerulus → tuft of capillaries enclosed by Bowmans's capsule.
- ✦ Renal tubule begins with Bowman's Capsule, Proceed as PCT, Henle's Loop and DCT.
- ✦ DCT's open into a collecting duct
- ✦ Vasa recta is a minute network of blood vessels.

## Urine Formation Steps

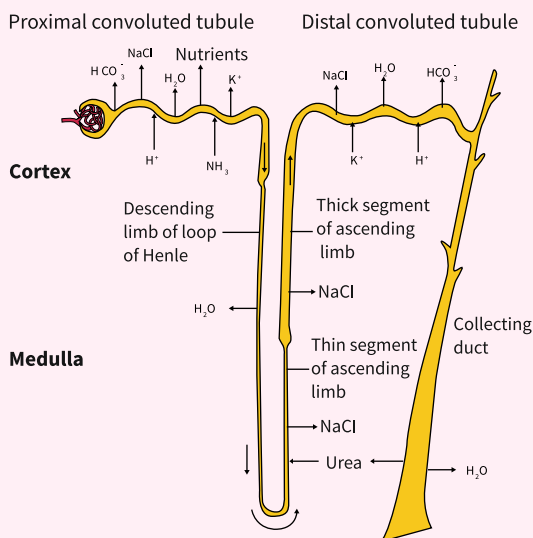
- 1) Glomerular filtration
- 2) Reabsorption
- 3) Secretion

## Glomerular filtration

- ✦ The epithelial cells of Bowman's capsule called podocytes are arranged in an intricate manner so as to leave some minute spaces called filtration slits or slit pores.
- ✦ Blood is filtered through these membranes, that almost all the constituents of the plasma except the proteins pass into the lumen of the Bowman's capsule. Therefore, it is considered as a process of ultra filtration.

## Functions of The Tubules

- ✦ PCT → 70-80% of electrolytes & water are reabsorbed.
- ✦ Henle's loop → help to maintain high osmolarity of interstitial fluid.
- ✦ DCT → Reabsorption of sodium ions & water.
- ✦ Collecting Duct → large amount of water is reabsorbed leads to concentrated Urine.



## Regulation of Kidney

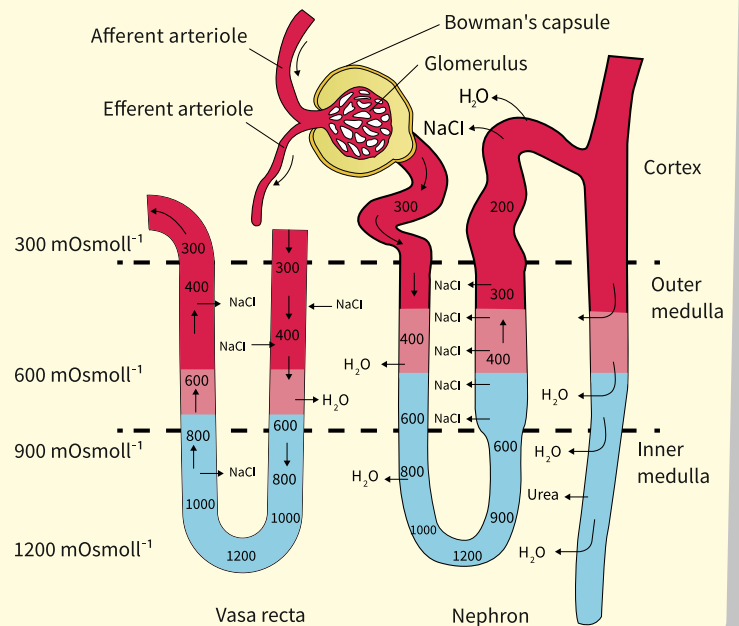
- ✦ By ADH (Vasopressin); ADH prevents diuresis
- ✦ BY JGA (Juxtaglomerular Apparatus); RAAS mechanism
- ✦ By ANF (Atrial natriuretic factor) checks RAAS

## MICTURITION

Process of expulsion of urine from bladder. The urine formed is a light yellow coloured watery fluid which is slightly acidic (pH-6.0) and has a characteristic odour. On an average, 25-30 gm of urea is excreted out per day.

## Concentration of Urine

- ✦ Counter – current mechanism.
- ✦ Henle's loop and Vasa recta play a crucial role in concentration of urine.
- ✦ Osmolarity increases from 300- 1200mOsmolL<sup>-1</sup>
- ✦ NaCl and urea are responsible for this.



## Other Organs in Excretion

- ✦ Our lungs remove large amounts of  $\text{CO}_2$  (approximately 200mL/ minute)
- ✦ Liver secretes bile - bilirubin, biliverdin, cholesterol, degraded steroid hormones, vitamins and drugs - ultimately pass out along with digestive wastes.
- ✦ Sweat glands - Sweat -  $\text{NaCl}$ , small amount of urea, lactic acid, etc.
- ✦ Sebaceous glands - sterols, hydrocarbons & waxes through sebum.

## DISORDER OF EXCRETORY SYSTEM

- ✦ **Glomerulonephritis** → inflammation of glomerulus
- ✦ **Renal Failure** → Kidney failure.
- ✦ **Uremia** → accumulation of urea in blood; hemodialysis is done

## Haemodialysis

