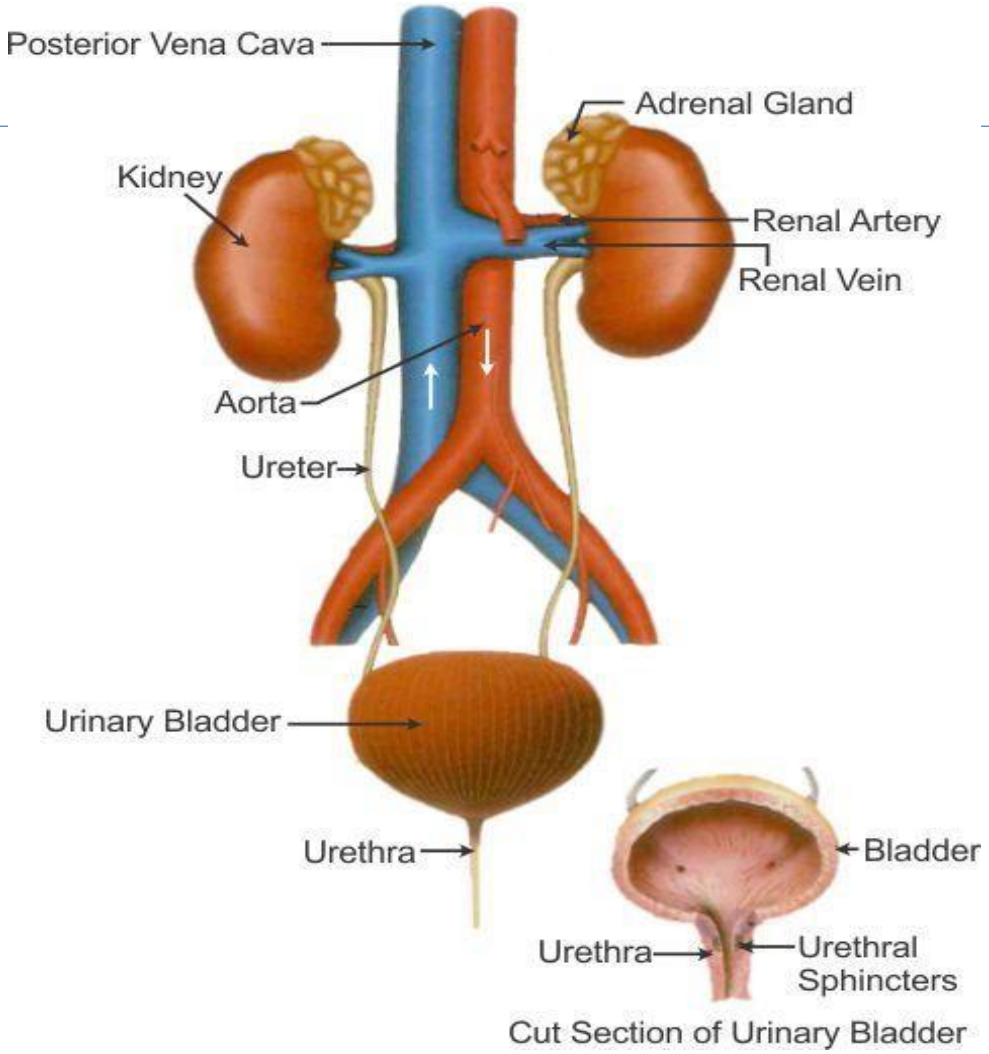
1.Excretion

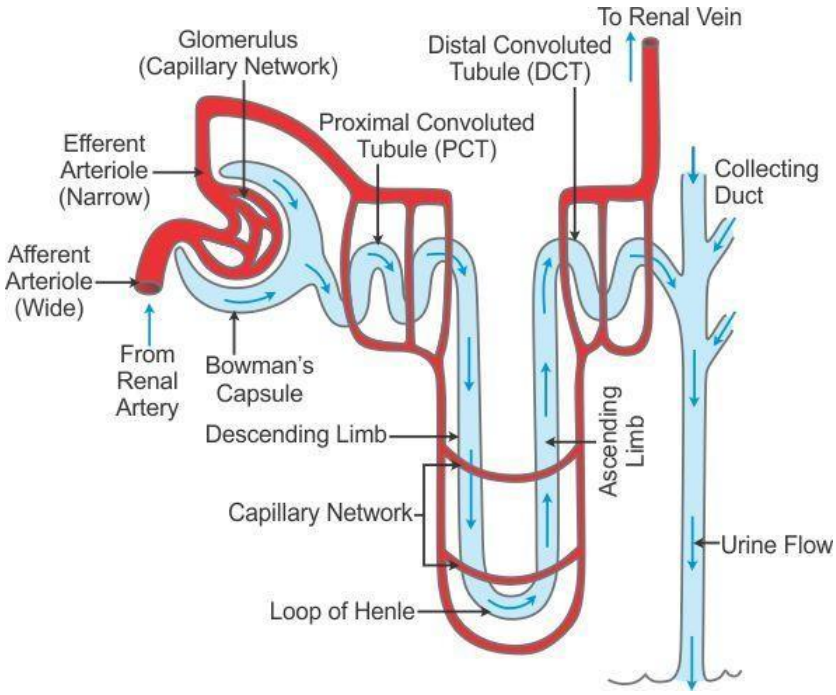
- Excretion is the removal of harmful and unwanted substances, especially nitrogenous wastes, from the body.
- The human urinary system consists of-
  1.Pair of kidneys
  2.Pair of ureters
  3.Urinary bladder
  4.Urethra



Human Urinary System

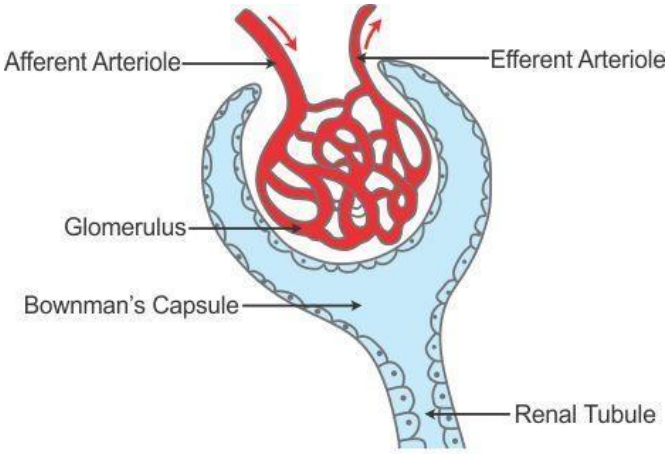
Pair of kidneys	• **Dark red, bean-shaped, 10 cm long, 6 cm wide.** • **The right side of the kidney is slightly lower in position due to the presence of the liver.**
Pair of ureters	• Ureters are tube-like structures which arise from the notch, i.e. the hilum of each kidney. • The ureters connect behind with the urinary bladder. • The ureters carry the urine produced to the urinary bladder.
Urinary bladder	• Muscular sac-like structure. • It stores urine temporarily. • Its opening is guarded by muscular sphincters. • The sphincters open at the time of micturition (urination).
Urethra	• Short muscular tube which expels urine out of the body. • The urethra is long in males and is very short in females. • The opening is guarded by sphincters which open at the time of urination.

Uriniferous Tubule



Uriniferous Tubule

- Each kidney is composed of an enormous number of uriniferous tubules.
- They are also known as nephrons, renal tubules or kidney tubules.
- Uriniferous tubules are the structural and functional units of the kidney.



Malpighian Tubule

- Each nephron has a Malpighian body and body of tubules.
- Malpighian body is nothing but a cup-shaped Bowman's capsule. In its cup-shaped depression, a tuft of blood capillaries called glomerulus is situated.
- The body of tubules contains proximal convoluted tubule (PCT), loop of Henle and distal convoluted tubule (DCT).
- DCT opens into the collecting duct.

Approximately 2 million uriniferous tubules are present in both the kidneys.
Each single uriniferous tubule is 4 to 5 cm long.
The great length of the uriniferous tubule provides a large surface area for the reabsorption of usable substances such as water.
Blood flow through the kidneys per minute = 1 litre
Glomerular filtrate produced in 24 hours = 160 litre
Urine produced from the glomerular filtrate after reabsorption per day = 1.2 litre

Formation of Urine

The process of urine formation occurs in two major steps.

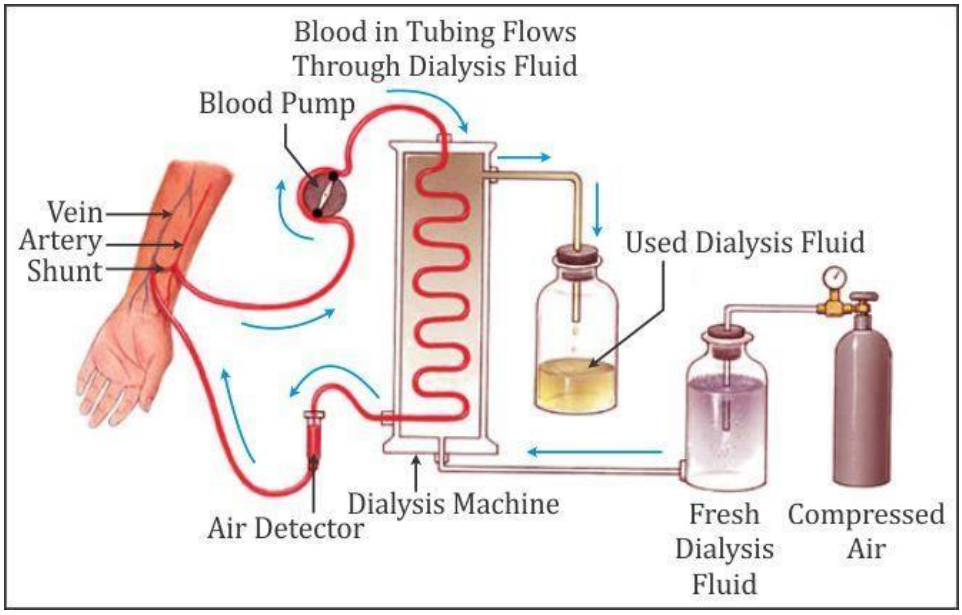
Ultrafiltration	Reabsorption
• The efferent arteriole is narrower than the afferent arteriole which develops a hydrostatic pressure on the blood. • Thus, the blood flows through the glomerulus with a great pressure. • Due to the pressure, the liquid part of the blood filters out from the glomerulus and passes into the Bowman's capsule. • The glomerular filtrate consists of water, urea, salts, glucose and other plasma solutes.	• The glomerular filtrate entering the renal tubule contains many useful substances. • Hence, as the filtrate passes down the tubule, water and other substances required by the body are reabsorbed. • Potassium ions and certain substances such as penicillin are passed into the forming urine through the distal convoluted tubule (DCT). • The cells of the walls of DCT are

• Blood corpuscles, proteins and other large molecules remain behind in the glomerulus. • Therefore, the blood carried away by the efferent arteriole is relatively thick.	involved in bringing potassium ions and other substances back into the renal tubule; hence, this process is known as tubular secretion.

Urine Excretion

- The filtrate left after reabsorption and tubular secretion is called urine.
- The urine passes from the collecting duct into the pelvis of the kidney. From there it is sent to the urinary bladder through the ureters.
- By relaxing the sphincters present at the opening of the urethra, the urine is expelled from the body. This process is known as micturition or urination.

Artificial Kidney



- If one kidney is damaged or removed, then the other kidney alone can fulfil excretory needs.
- However, the failure of both the kidneys allows urea and other wastes to accumulate in the blood.
- Such a patient undergoes dialysis.
- In dialysis, an artificial kidney is used.
- The artificial kidney contains tubes with a semi-permeable lining.
- These tubes are suspended in a tank filled with a dialysing solution.
- This fluid contains water and glucose in concentrations similar to those in blood.
- The patient's blood is led from the radial artery through the tubes of the artificial kidney where excess salts and urea are removed.
- The purified blood is returned through a vein in the same arm.
- The function of dialysis is similar to the function of the kidney, but the only difference is there is no reabsorption during dialysis.

Excretion in Plants

- Plants also produce several waste products during their life processes.
- The major waste products are water, carbon dioxide and oxygen produced during respiration and photosynthesis.
- These wastes are excreted through the stomata and lenticels.
- Plants store some waste products in leaves which fall off.
- Wastes such as gums and resins are stored in the old xylem.