

# CLASS NOTES

Class: X

Subject: Biology

Topic: Ch- 6 Life processes [Excretion]

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## EXCRETION

Excretion is the biological process of removal of harmful nitrogenous metabolic waste from the body.

Unicellular organisms excrete by **diffusion** and multicellular organisms use **specialised organ** to perform same function.

For e.g.

Vertebrates have kidneys.

Planaria have Flame cells .

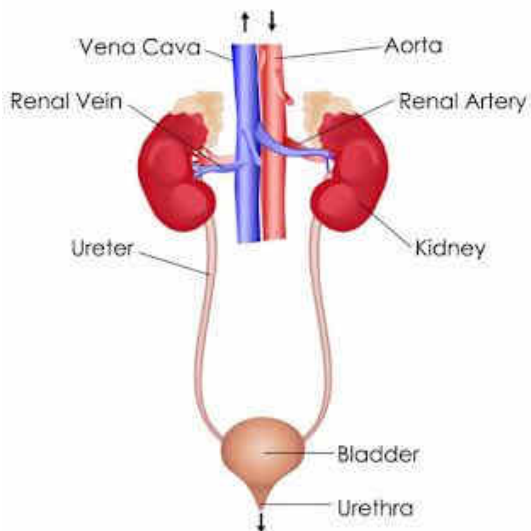
Earthworms have Nephridia.

Cockroaches have malpighian tubules.

Prawns have antennal glands or green glands.

### Excretion in human beings

- A pair of kidneys, a pair of ureters, a urinary bladder and a urethra constitutes the human excretory system.
- Kidneys are present on either side of the backbone in the abdomen. Each human adult kidney has a length of 10-12 cm, a width of 5-7 cm and weighs around 120-170g.
- Kidneys produce urine The urine from kidney passes through the ureters into the urinary bladder and remains stored there until it is released through the urethra.
- Each kidney has millions of microscopic filtration units to filter the nitrogenous waste, excess of water and electrolytes from the blood, each one is called Nephron.

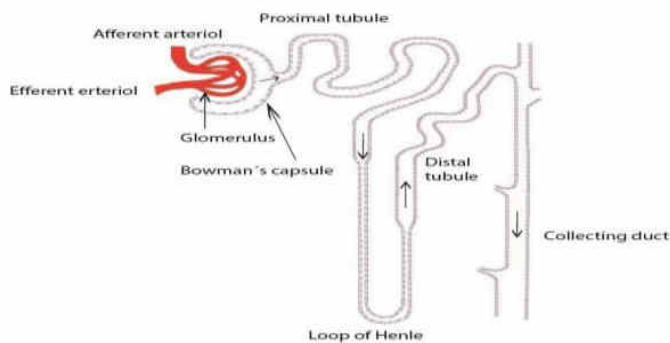
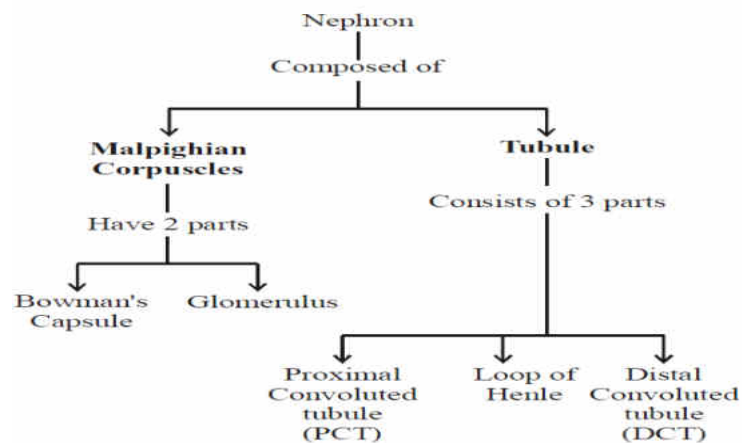


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## Nephrons

Nephrons are the functional units of the kidney to filter the nitrogenous waste, excess of water and electrolytes from the blood.

Each nephron has two parts- **Malpighian corpuscles** and **Renal tubule**.



The malpighian body consists of glomerulus and Bowman's Glomerulus. The Bowman's capsule is a double layered, cup-like structure. The glomerulus consists of a bunch of capillaries formed by afferent arterioles. Blood from glomerulus is carried away by efferent arterioles.

The renal tubule is a long and convoluted structure that extends from the Bowman's capsule and can be divided into three parts based on function.

- The first part is called the proximal convoluted tubule (PCT) due to its proximity to the glomerulus; it stays in the renal cortex.
- The second part is called the loop of Henle, or nephritic loop because it forms a loop (with descending and ascending limbs) that goes through the renal medulla.
- The third part of the renal tubule is called the distal convoluted tubule (DCT) and this part is also restricted to the renal cortex.

**The functions of the various tubules involved in urine formation are:**

- **Glomerulus** filters the blood
- **Proximal Convoluted Tubules** reabsorb ions, water, and nutrients, removes

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toxins, and maintains the pH of the filtrate.

- **Descending Loop of Henle** allows water to pass from the filtrate into the interstitial fluid through aquaporins.
- **Ascending Loop of Henle** reabsorbs sodium and chloride ions from the filtrate into the interstitial fluid.
- **Distal convoluted Tubule** reabsorbs and secretes selective ions and maintains the pH of the blood.
- **Collecting Duct**, solutes, and water is reabsorbed from the filtrate by the collecting duct.

## Steps in urine formation

The kidney performs three functions as steps involved in urine formation - ultra-filtration, selective re-absorption and tubular secretion.

1. **Ultra-filtration** is the process in which nephrons filter almost all components of the blood plasma ( e.g. minerals, nitrogenous wastes and water etc.) but retain blood cells, proteins and large molecules. This filtrate is called 'Renal filtrate'. Around 180 litres of renal filtrate is produced in kidneys in a day. It takes place in Malpighian corpuscle (Glomerulus).
2. **Selective re-absorption** involves re absorption of some useful substances of the initial renal filtrate, such as glucose, amino acids, salts, and a major amount of water.
3. **Tubular secretion** involves the secretion of substances not required by the body into the filtrate by the cells of the distal convoluted tubule before it leaves the kidney.

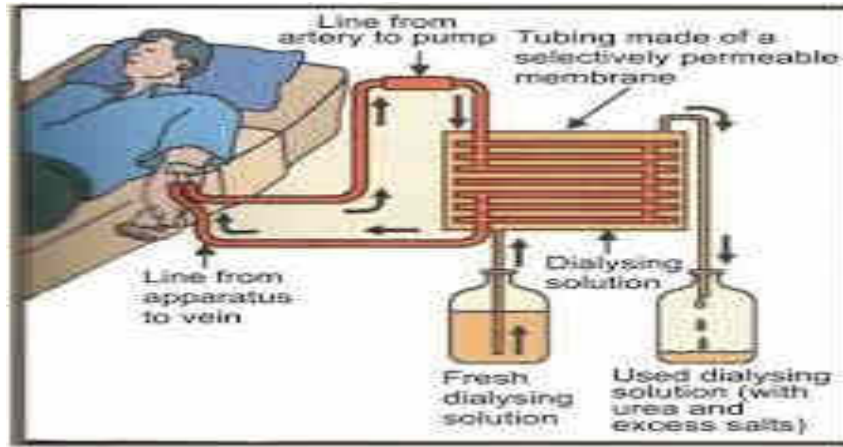
## Dialysis:

Under certain circumstances such as poor blood flow to the kidneys, infections, injuries, etc. the kidneys fail to perform their functions. In such situations, artificial kidneys are used for blood filtration and this process is called dialysis.

Dialysis is the process which involves separation of nitrogenous wastes from the blood artificially. Dialysis is performed using a device which removes nitrogenous wastes from blood in case of kidney failure.

- An artificial kidney contains a number of tubes with a semi-permeable lining suspended in a tank filled with dialysing fluid.
- The osmotic concentration of this dialysing fluid is maintained similar with the concentration of the patient's blood.
- The patient's blood (with nitrogenous wastes) is passed through these tubes.
- During this passage, the nitrogenous waste products from the blood diffuse out into the dialysing fluid.
- The purified blood is pumped back into the patient body.

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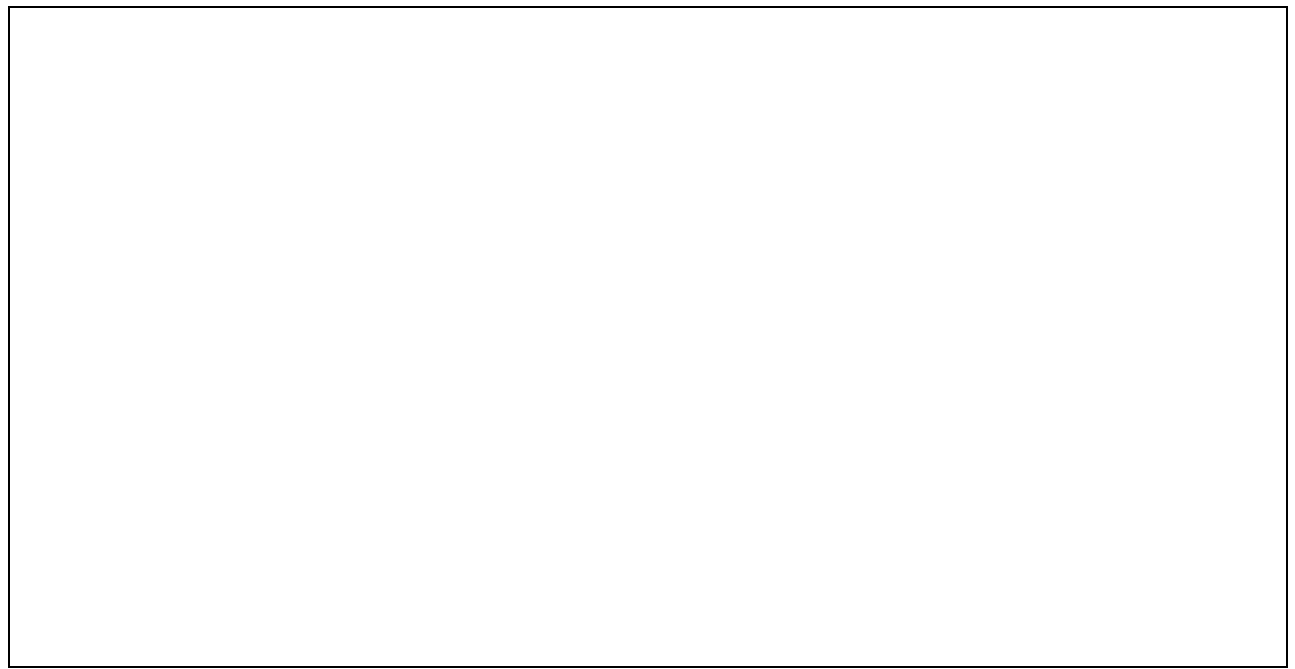
(Try this: How is a normal kidney different from an artificial kidney?)

### **Excretion in plants**

Plants excrete various metabolite wastes through various methods.

- Oxygen, a waste product of photosynthesis is released through stomata.
- Excess water is removed by transpiration. Through stomata.
- Some waste products may get stored in the leaves which fall off.
- Many waste products are stored in vacuoles.
- Some waste products are stored as resins and gums in old xylem.
- Some essential oils like Sandal oil, Lavender oil etc. are the waste produce in plants.
- Plants excrete some waste materials into the soil around them.

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