

LIFE PROCESSES Part - 4

CLASS X | BIOLOGY

EXCRETION

So for an organism to lead a normal life, the toxic wastes produced in its body must be removed continuously.

The biological removal of toxic wastes from the body of an organism is called excretion.

It takes place in plants as well as animals.

For example- Aquatic animals excrete waste in the form of ammonia, while birds and insects excrete mainly uric acid. Humans produce urea as the major excretory product

Unicellular organisms:

Remove these wastes by simple diffusion from the body surface into the surrounding water.

E.g. *Amoeba* and *Paramecium*.

Multicellular organisms:

There are specialised organs to perform excretion.

E.g. Nephridia in Earthworm

Kidneys in birds and Humans

Excretory Organs in Different Animals

Plasmalemma	Protozoans like <i>Amoeba</i> .
General body surface	Porifera (sponges) and coelenterates (<i>Hydra</i>).
Flame cells	Platyhelminthes (<i>Taenia</i> and <i>Fasciola</i>).
Nephridia	Annelida (earthworm).
Malpighian tubules	Arthropods (cockroach).

EXCRETORY ORGANS IN HUMAN BEINGS OTHER THAN KIDNEYS

SKIN

Help eliminate toxic through sweat

LUNGS

Help to eliminate Carbon Dioxide

LIVER

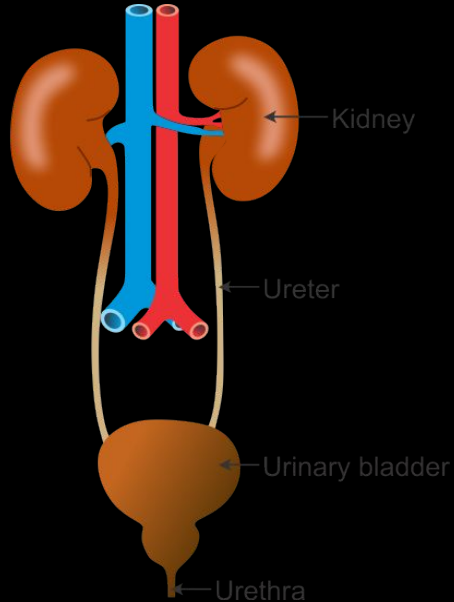
breaks down many substances in the blood, including toxins. The liver also excretes bilirubin a waste product of hemoglobin catabolism — in bile. Bile then travels to the small intestine, and is eventually excreted in feces by the large intestine.

Excretory System in Human

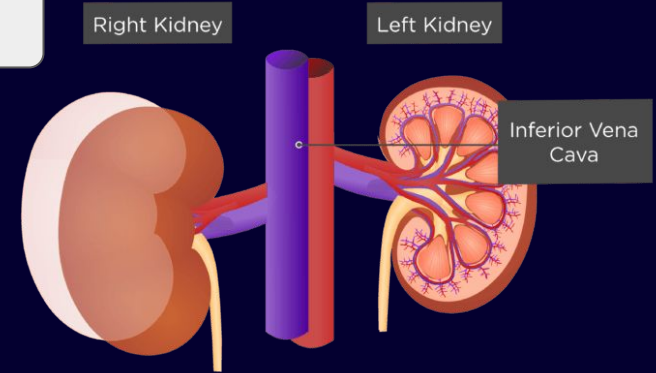
Pair of
Kidneys &
Ureters

Urinary
Bladder

Urethra



KIDNEYS



- They are the main excretory organ of the body.
- Each kidney has tiny filtration units called **nephrons**.

FUNCTIONS

1. Regulation of osmolarity.
2. Regulation of ion concentration in the body.
3. Regulation of pH.
4. Hormone secretion.

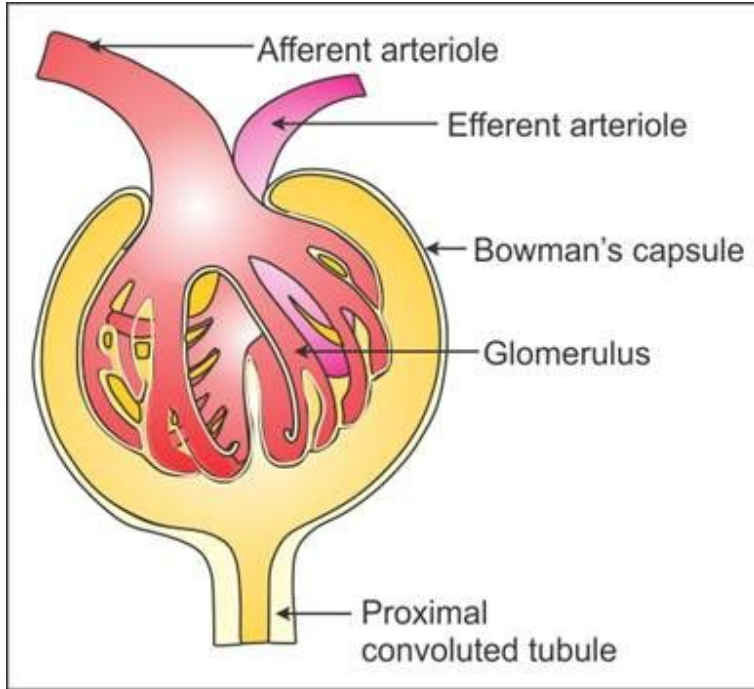
Ureter: One from each kidney, opens into urinary bladder.

Ureters are tubes which carry urine from the kidneys to the bladder.

Bladder: A bag which stores urine till the time we got to toilet. It is muscular sac like structure.

Urethra is a tube. The urine collected in the bladder is passed out from the body through the urethra.

Nephron : Functional Unit of Kidney



It has 2 main parts: Renal Corpuscles and Renal Tubule

1. A Renal corpuscle :

It is the initial filtering component. It is further divided into:

A) Bowman's Capsule:

It is a cup shaped parts which surrounds the glomerulus.

B) Glomerulus:

It is the network known as a *tuft*, of filtering capillaries located in the Bowman's capsule.

2. Renal Tubule

The renal tubule is a long and convoluted structure that emerges from the glomerulus. It has three parts:

Proximate Convoluted Tubule : Site of maximum reabsorption of essential substances like glucose, proteins, amino acids, electrolytes and water.

Loop of Henle: U-shaped tube that extends from PCT. Consists of a descending limb and an ascending limb

Distal Convoluted Tubule: Last part of the nephron. Reabsorption of Na^+ and water takes place in DCT. Thus, it maintains the pH and sodium-potassium level in the blood cells

The amount of filtrate produced by the kidneys every minute is known as Glomerular Filtration Rate (GFR).

Glomerular filtration-

- Glomerular filtration occurs in the glomerulus where blood is filtered.
- This process occurs across the three layers- epithelium of Bowman's capsule, endothelium of glomerular blood vessels, and a membrane between these two layers.

All the constituents of the plasma reach the Bowman's capsule, except proteins. This process is also known as **Ultrafiltration**.

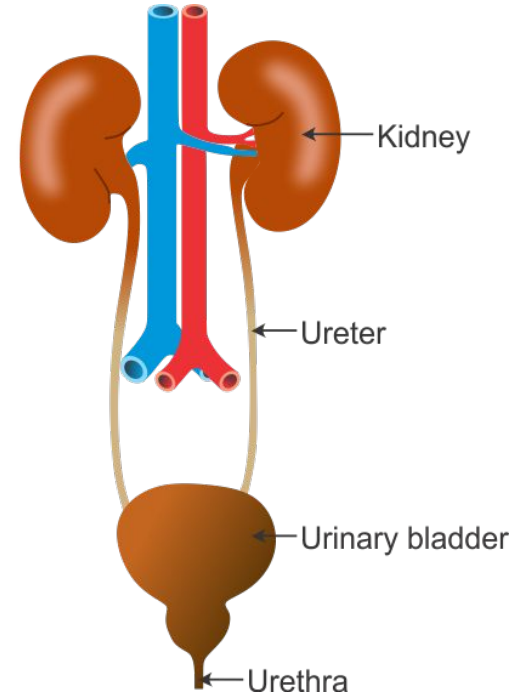
Selective Reabsorption-

Glomerular filtrate enters the tubule where essential substances such as glucose, amino acids, salts and a major amount of water, are selectively reabsorbed as the urine flows along the tube.

Tubular secretion-

When the filtrate goes to the distal part urea, potassium ion and some hydrogen ions are secreted in the form of urine. **This helps in OSMOREGULATION.**

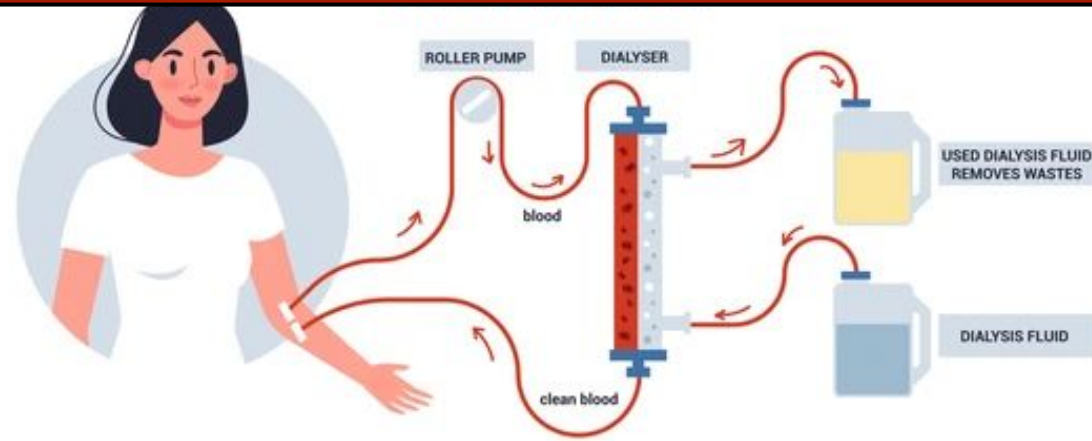
- The urine forming in each kidney eventually enters a long tube, the **ureter**, which connects the kidneys with the urinary bladder.
- Urine is stored in the **urinary bladder** until the pressure of the expanded bladder leads to the urge to pass it out through the urethra.
- The bladder is muscular, so it is under nervous control, and we can thus control the urge to urinate.



Artificial Kidney (Hemodialysis)

Several factors like infections, injury or restricted blood flow to kidneys reduce the activity of kidneys. This leads to accumulation of poisonous wastes in the body, which can even lead to death. *In case of kidney failure, an artificial kidney can be used. An artificial kidney is a device to remove nitrogenous waste products from the blood through dialysis.*

Artificial kidneys contain a number of tubes with a semi-permeable lining, suspended in a tank filled with dialysing fluid. This fluid has the same osmotic pressure as blood, except that it is devoid of nitrogenous wastes. The patient's blood is passed through these tubes. During this passage, the waste products from the blood pass into dialysing fluid by diffusion. The purified blood is pumped back into the patient. This is similar to the function of the kidney, but it is different since there is no reabsorption involved. Normally, in a healthy adult, the initial filtrate in the kidneys is about 180 L daily. However, the volume actually excreted is only a litre or two a day, because the remaining filtrate is reabsorbed in the kidney tubules.



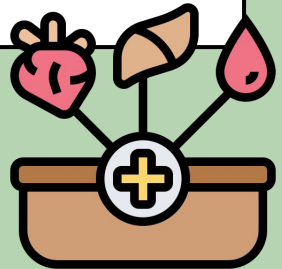
Organ donation

Organ donation is a generous act of donating an organ to a person who suffers from non-function of organ(s).

Donation of an organ may be done by the consent of the donor and his/her family. Anyone regardless of age or gender can become an organ and tissue donor. Organ transplants can save or transform the life of a person.

Transplantation is required because recipient's organ has been damaged or has failed by disease or injury.

In organ transplantation the organ is surgically removed from one person (organ donor) and transplanted to another person (the recipient). Common transplantations include corneas, kidneys, heart, liver, pancreas, lungs, intestines and bone marrow. Most organ and tissue donations occur just after the donor has died or when the doctor declares a person brain dead. But some organs such as kidney, part of a liver, lung, etc., and tissues can be donated while the donor is alive



EXCRETION IN PLANTS

Gaseous Waste Products:

- Such as CO_2 , and water vapours.
- They are excreted through stomata and lenticels.

Liquid Waste Products:

- They can get rid of excess water by transpiration.

Many plant waste products are stored in cellular vacuoles.

Waste products may be stored in leaves that fall off.

Other waste products are stored as resins and gums, especially in old xylem.

Plants also excrete some waste substances into the soil around them.



thank you

Q U E S T I O N S

1. Why is diffusion insufficient to meet the oxygen requirements of multicellular organisms like humans?
2. What criteria do we use to decide whether something is alive?
3. What are outside raw materials used for by an organism?
4. What processes would you consider essential for maintaining life?



Q U E S T I O N S

1. What are the differences between autotrophic nutrition and heterotrophic nutrition?
2. Where do plants get each of the raw materials required for photosynthesis?
3. What is the role of the acid in our stomach?
4. What is the function of digestive enzymes?
5. How is the small intestine designed to absorb digested food?



Q U E S T I O N S

1. What advantage over an aquatic organism does a terrestrial organism have with regard to obtaining oxygen for respiration?
2. What are the different ways in which glucose is oxidised to provide energy in various organisms?
3. How is oxygen and carbon dioxide transported in human beings?
4. How are the lungs designed in human beings to maximise the area for exchange of gases?

Q U E S T I O N S

1. What are the components of the transport system in human beings?
What are the functions of these components?
2. Why is it necessary to separate oxygenated and deoxygenated blood in mammals and birds?
3. What are the components of the transport system in highly organised plants?
4. How are water and minerals transported in plants?
5. How is food transported in plants?

Q U E S T I O N S

1. Describe the structure and functioning of nephrons.
2. What are the methods used by plants to get rid of excretory products?
3. How is the amount of urine produced regulated?

EXERCISES

- The kidneys in human beings are a part of the system for
 - nutrition.
 - respiration.
 - excretion.
 - transportation.
- The xylem in plants are responsible for
 - transport of water.
 - transport of food.
 - transport of amino acids.
 - transport of oxygen.
- The autotrophic mode of nutrition requires
 - carbon dioxide and water.
 - chlorophyll.
 - sunlight.
 - all of the above.
- The breakdown of pyruvate to give carbon dioxide, water and energy takes place in
 - cytoplasm.
 - mitochondria.
 - chloroplast.
 - nucleus.
- How are fats digested in our bodies? Where does this process take place?
- What is the role of saliva in the digestion of food?
- What are the necessary conditions for autotrophic nutrition and what are its by-products?
- What are the differences between aerobic and anaerobic respiration? Name some organisms that use the anaerobic mode of respiration.
- How are the alveoli designed to maximise the exchange of gases?
- What would be the consequences of a deficiency of haemoglobin in our bodies?
- Describe double circulation of blood in human beings. Why is it necessary?
- What are the differences between the transport of materials in xylem and phloem?
- Compare the functioning of alveoli in the lungs and nephrons in the kidneys with respect to their structure and functioning.

thank you