YAKEEN NEET 2.0

2026

1 Aug 2025

Excretory Products and their Elimination

ZOOLOGY | Lecture – 1

By- SAMAPTI MAM

Topics to be covered

1. EXCRETORY PRODUCTS AND EXCRETORY STRUCTURE, HUMAN EXCRETORY SYSTEM(INTRO)
2.
3.
4.

MY TELEGRAM

Excretory Products & its elimination:

- Substances like NH_3, Urea, Uric Acid, CO_2, H_2O, ions like Na^+, K^+, Cl^-, Sulphate, phosphate are present / accumulated due to metabolic activities or excess ingestion

↓

These needs to be COMPLETLY or PARTIALLY removed

↓

'EXCRETION'

- Major Nitrogenous wastes
  - → NH_3
  - → Urea
  - → Uric acid.

• On the basis of Excretory products eliminated, animals are categorised as:

Ammonotelic	Ureotelic	Uricotelic
• Animals that eliminate NH_3 (It is usually elimin-ated as Ammonium ion across Gill surface / Body surface)	• Animals that eliminate UREA	• Animals that eliminate Uric-Acid.
• MOST TOXIC, requires max. H_2O for its removal	• MODERATELY TOXIC, requires less H_2O for its removed (*It is 1 LAKH TIMES LESS TOXIC than NH_3)	• LEAST TOXIC, requires least H_2O for its removal (* It is eliminated as 'PELLET' or 'PASTE')
eg: Aquatic AMPHIBIANS. Aquatic INSECTS. BONY FISHES	eg: TERRESTRIAL AMPHIBIAN, MAMMALS, MARINE (Cartilagenous) FISH.	eg: TERRESTRIAL INSECTS, REPTILES, BIRDS, LAND SNAILS

Animals accumulate ammonia, urea, uric acid, carbon dioxide, water and ions like Na^+, K^+, Cl^-, phosphate, sulphate, etc., either by metabolic activities or by other means like excess ingestion. These substances have to be removed totally or partially. In this chapter, you will learn the mechanisms of elimination of these substances with special emphasis on common nitrogenous wastes. Ammonia, urea and uric acid are the major forms of nitrogenous wastes excreted by the animals. Ammonia is the most toxic form and requires large amount of water for its elimination, whereas uric acid, being the least toxic, can be removed with a minimum loss of water.

The process of excreting ammonia is *Ammonotelism*. Many bony fishes, aquatic amphibians and aquatic insects are ***ammonotelic*** in nature. Ammonia, as it is readily soluble, is generally excreted by diffusion across body surfaces or through gill surfaces (in fish) as ammonium ions. Kidneys do not play any significant role in its removal. Terrestrial adaptation necessitated the production of lesser toxic nitrogenous wastes like urea and uric acid for conservation of water. Mammals, many terrestrial amphibians and marine fishes mainly excrete urea and are called ***ureotelic*** animals. Ammonia produced by metabolism is converted into urea in the liver of these animals and released into the blood which is filtered and excreted out by the kidneys. Some amount of urea may be retained in the kidney matrix of some of these animals to maintain a desired osmolarity. Reptiles, birds, land snails and insects excrete nitrogenous wastes as uric acid in the form of pellet or paste with a minimum loss of water and are called ***uricotelic*** animals.

Excretory Structures: Excretory + Osmoregulatory (Osmoregulation: H_2O - ionic balance maintain)

1) Protonephridia / Flame cells: Platyhelminthes: eg: Planaria, Protochordate: Subphylum Cephalochorodate: eg: Branchiostoma / Amphioxus / Lancelet, some Annelids, Rotifers (Zooplankton)

2) Nephridia: Some Annelids eg earthworm

3) Antennary gland / Green glands: In some Arthropoda: Subphylum Crustacean: eg Prawn.

4) Malphigian tubules: In some Arthropods: Class INSECTA: eg Cockroach

5) KIDNEYS: Vertebrates: Fish, Amphibian, Reptilia, Birds, Mammals.

A survey of animal kingdom presents a variety of excretory structures. In most of the invertebrates, these structures are simple tubular forms whereas vertebrates have complex tubular organs called kidneys. Some of these structures are mentioned here. Protonephridia or flame cells are the excretory structures in Platyhelminthes (Flatworms, e.g., *Planaria*), rotifers, some annelids and the cephalochordate – *Amphioxus*. Protonephridia are primarily concerned with ionic and fluid volume regulation, i.e., osmoregulation. Nephridia are the tubular excretory structures of earthworms and other annelids. Nephridia help to remove nitrogenous wastes and maintain a fluid and ionic balance. Malpighian tubules are the excretory structures of most of the insects including cockroaches. Malpighian tubules help in the removal of nitrogenous wastes and osmoregulation. Antennal glands or green glands perform the excretory function in crustaceans like prawns.

Human Excretory System: It consists of:

- A pair of Kidney
- A pair of Ureter
- A Urinary Bladder
- A Urethra

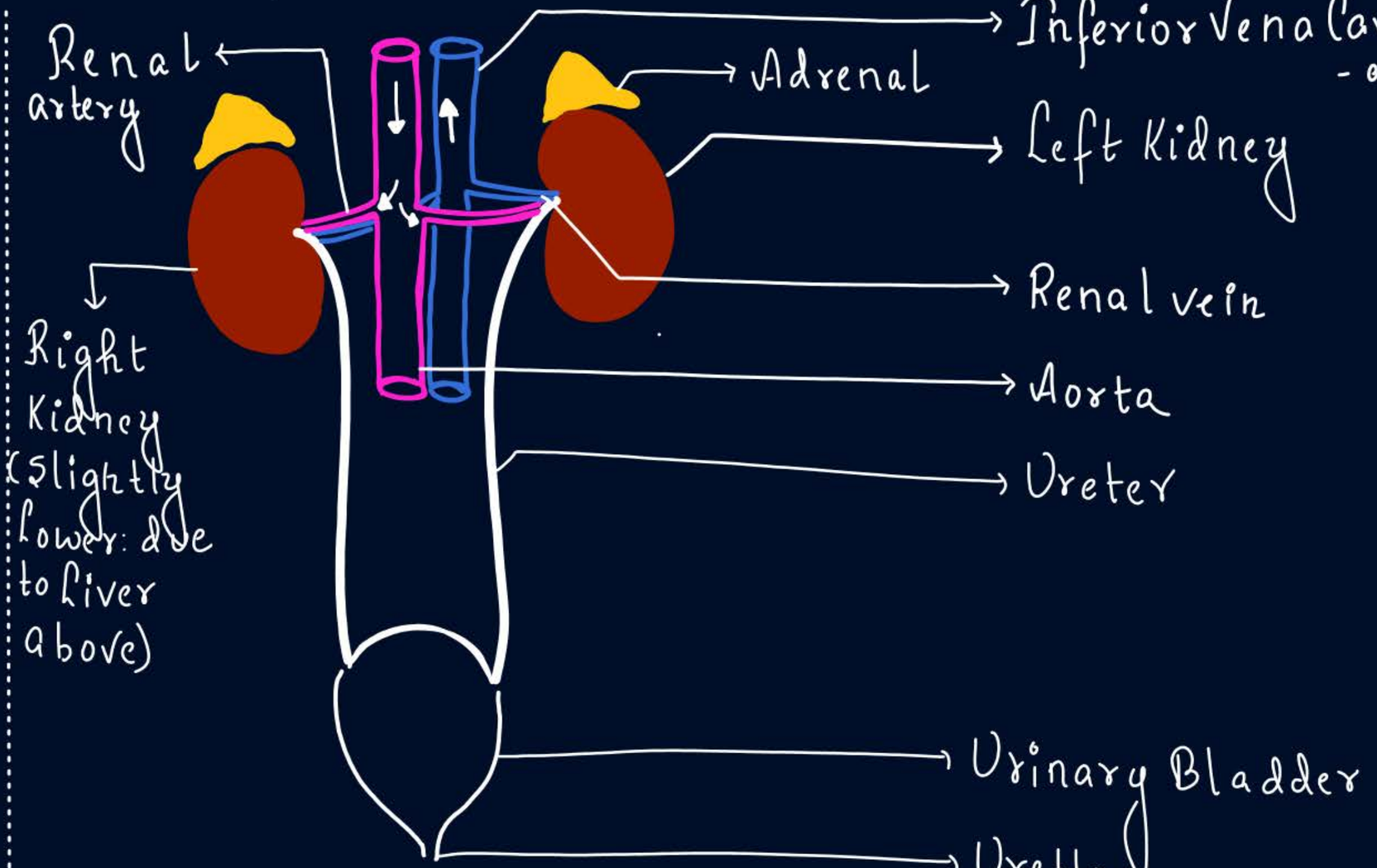


fig: Human excretory system.

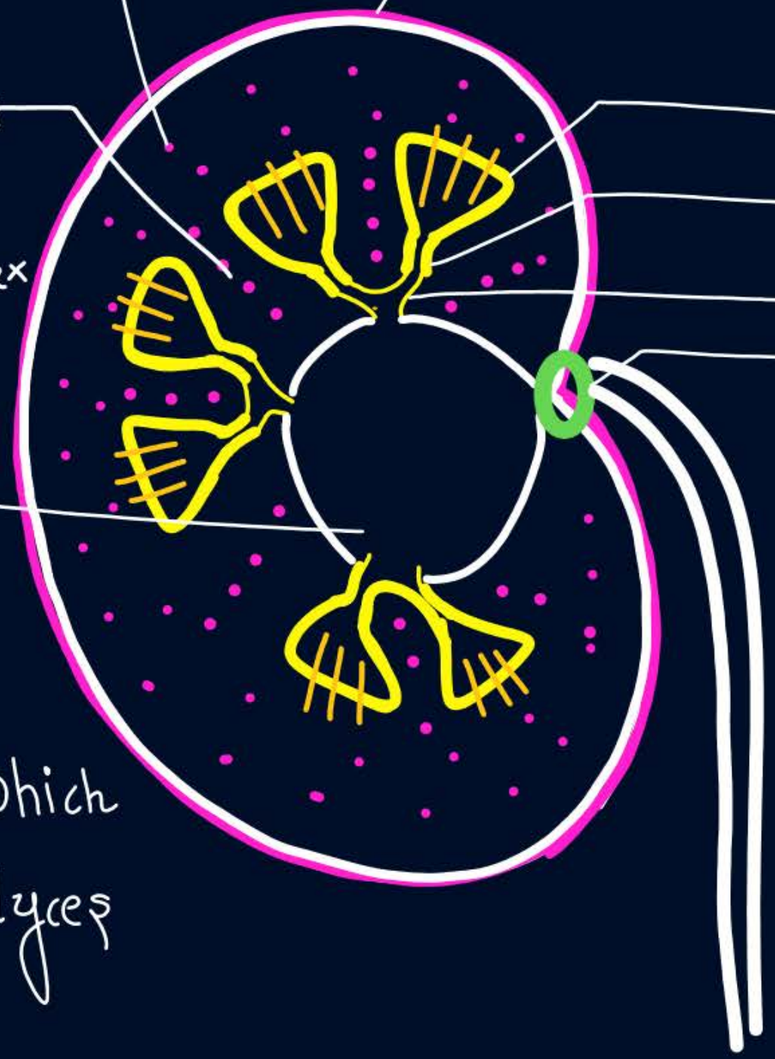
① KIDNEY:

* Reddish Brown: Bean shaped

- Length: 10-12 cm
- Width: 5-7 cm
- Thickness: 2-3 cm
- Weight: 120 – 170 g
- Location: B/w Last thoracic Vertebrae (T-12) & third Lumbar (L-3) closer to Dorsal Wall of Body

- Kidney
  - outer covering: Renal capsule (tough layer: Connective tissue)
  - It is divided
    - outer CORTEX
    - inner MEDULLA.

Longitudinal Section of KIDNEY:



Renal Capsule

Cortex

Medulla is divided into these

Renal column of Bertinii
→ Extension of Cortex b/w medullary PYRAMID

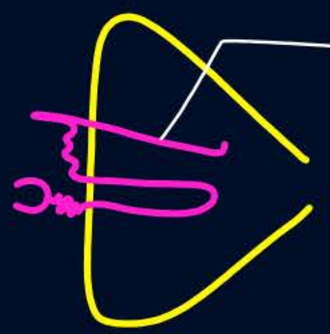
Medullary Pyramids

Minor Calyces

Major Calyces

Hilum: A notch present at concave part for entry/exit of Blood vessel, Ureter etc

Renal Pelvis
↓
A Broad funnel shaped region which opens into Calyces



Nephron

16.1 Human Excretory System

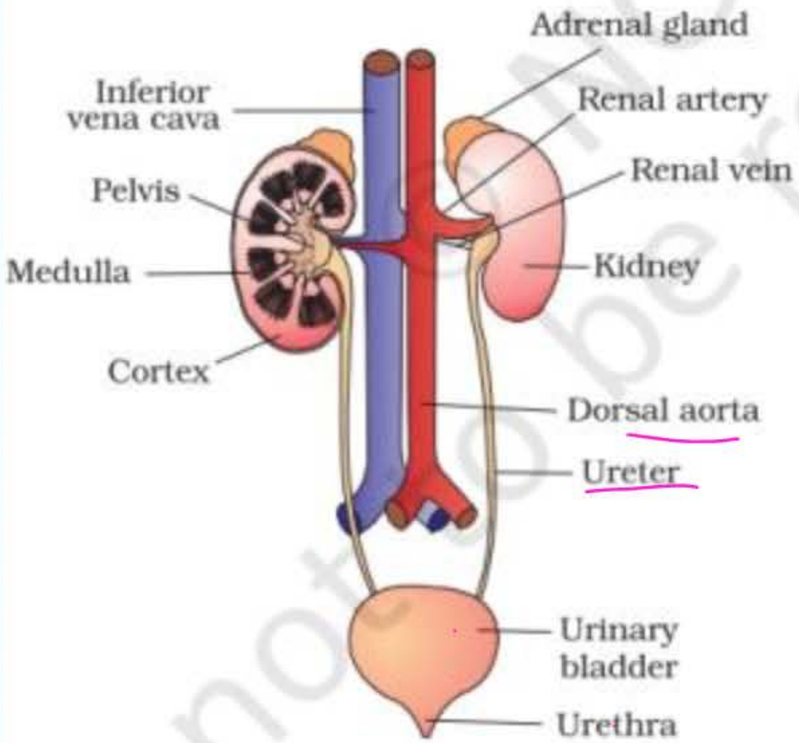


Figure 16.1 Human Urinary system

In humans, the excretory system consists of a pair of kidneys, one pair of ureters, a urinary bladder and a urethra (Figure 16.1). Kidneys are reddish brown, bean shaped structures situated between the levels of last thoracic and third lumbar vertebra close to the dorsal inner wall of the abdominal cavity. Each kidney of an adult human measures 10-12 cm in length, 5-7 cm in width, 2-3 cm in thickness with an average weight of 120-170 g. Towards the centre of the inner concave surface of the kidney is a notch called hilum through which ureter, blood vessels and nerves enter. Inner to the hilum is a broad funnel shaped space called the renal pelvis with projections called calyces. The outer layer of kidney is a tough capsule. Inside the kidney, there are two zones, an outer *cortex* and an inner *medulla*. The medulla is divided into a few conical masses (medullary pyramids) projecting into the calyces (sing.: calyx). The cortex extends in between the

medullary pyramids as renal columns called **Columns of Bertini** (Figure 16.2).

Each kidney has nearly one million complex tubular structures called **nephrons** (Figure 16.3), which are the functional units. Each nephron has two parts – the glomerulus and the renal tubule. Glomerulus is a tuft of capillaries formed by the afferent arteriole – a fine branch of renal artery. Blood from the glomerulus is carried away by an efferent arteriole.

The renal tubule begins with a double walled cup-like structure called **Bowman's capsule**, which encloses the glomerulus. Glomerulus alongwith Bowman's capsule, is called the malpighian body or renal corpuscle (Figure 16.4). The tubule continues further to form a highly coiled network – **proximal convoluted tubule**

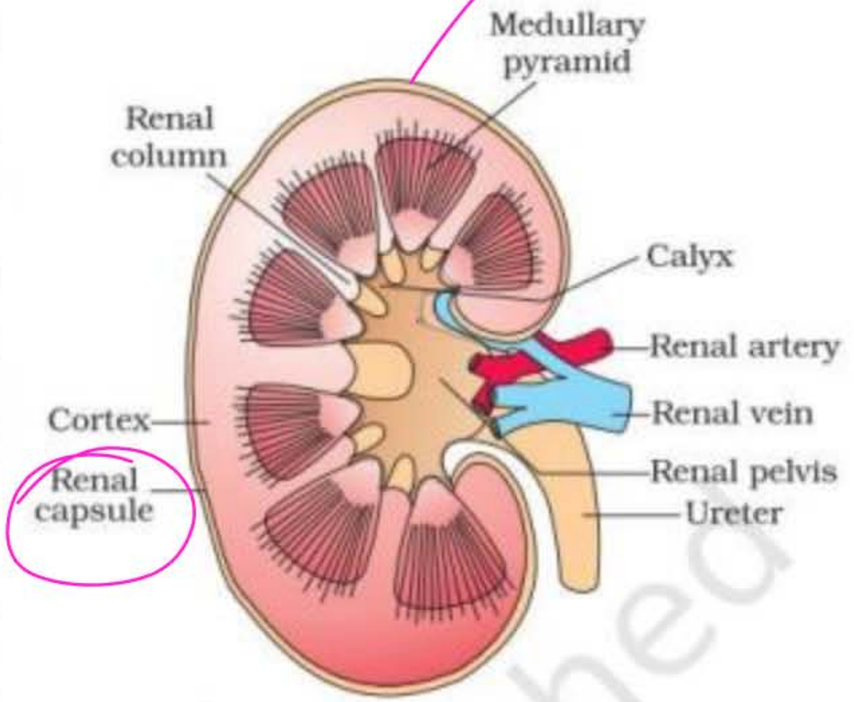


Figure 16.2 Longitudinal section (Diagrammatic) of Kidney

Note: Each kidney: 1 million Nephron / Uriniferous tubule.

② Ureter:

Homework

- REVISE CLAASNOTES / ZOOLOGY MED EASY

Special Announcement

YAKEEN NEET Batch Students

REAL TEST

REAL TEST SERIES-2026 IS LIVE

NTA Simulation Like Never Before!

Dropper NEET RTS 2026			
Total Tests	Online	Offline	Rankers Booklet
23	13	10	14

Scan To Enroll

- Happening in 250+ Cities.
- All India Ranking & Performance Analysis

- Paper Discussion with Faculties
- Real Exam Pressure & Setup

Samapti Sinha Mahapatra

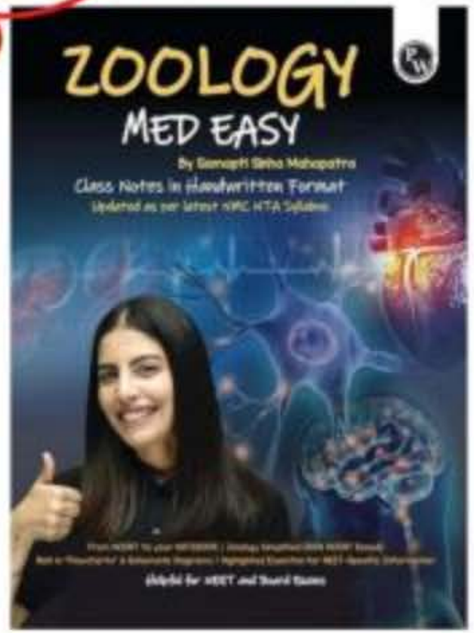
PW Zoology Med Easy For NEET and Board Exams 2024-25 | Flowcharts, Schematic Diagrams Samapti Sinha Mahapatra Handwritten Notes

20 May 2024

ISBN-13: 978-9360345068 ISBN-10: 9360345067

#1 Best Seller in AIIMS & NEET Exams

14% off



Zoology Med Easy 2.0

↓

PW Store / Amazon

THANK YOU