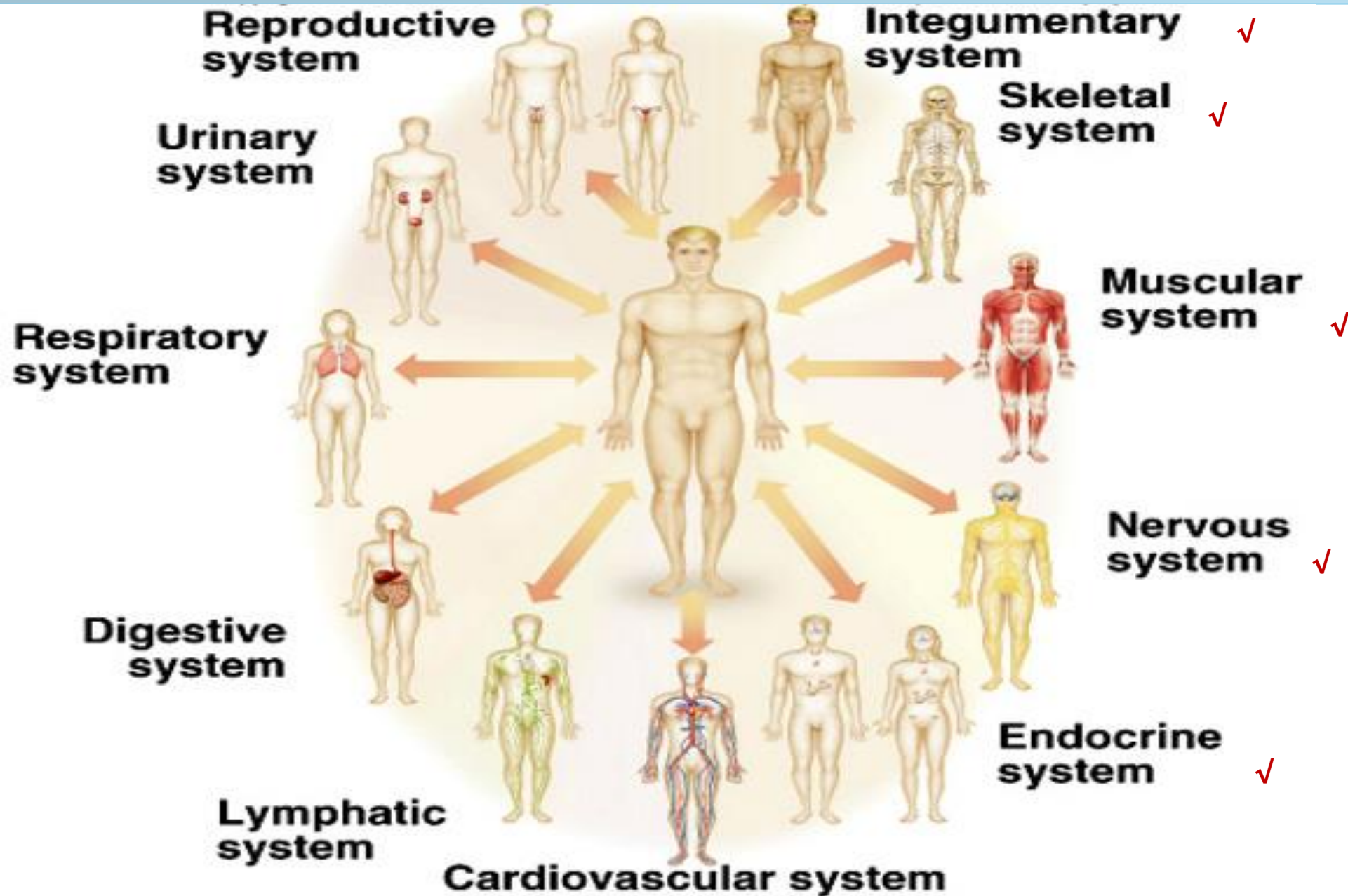


HUMAN ANATOMY & PHYSIOLOGY (3)

URINARY SYSTEM

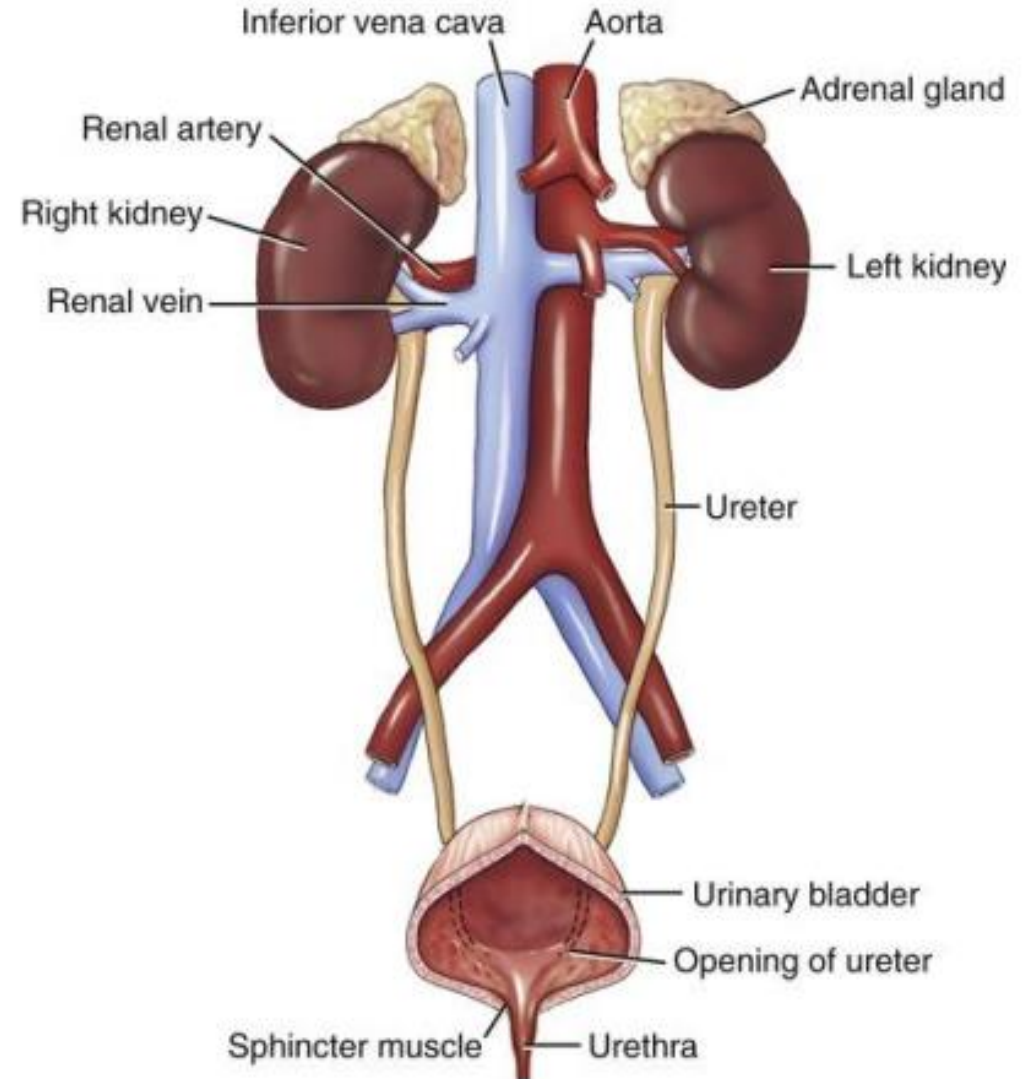
Monday, November 17, 2025

11 ORGAN SYSTEMS OF THE HUMAN BODY



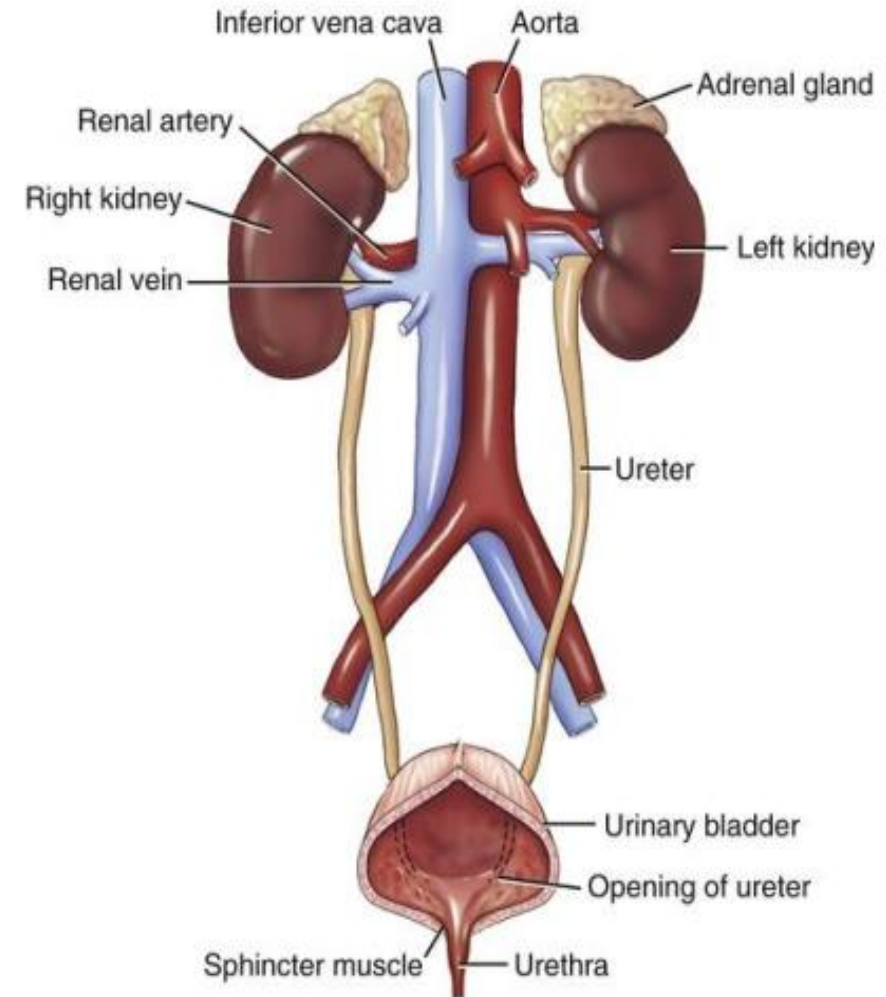
10. URINARY SYSTEM

1. Urinary system filters blood, removes waste and excess water.
2. The organs of the urinary system are:
 - a) **Two kidneys** (blood-filtering organs).
 - b) **Two ureters** (ducts that connect your kidneys to your bladder)
 - c) **A bladder** (an organ that holds urine).
 - d) **A urethra** (a tube connected to your bladder that allows urine to leave your body).



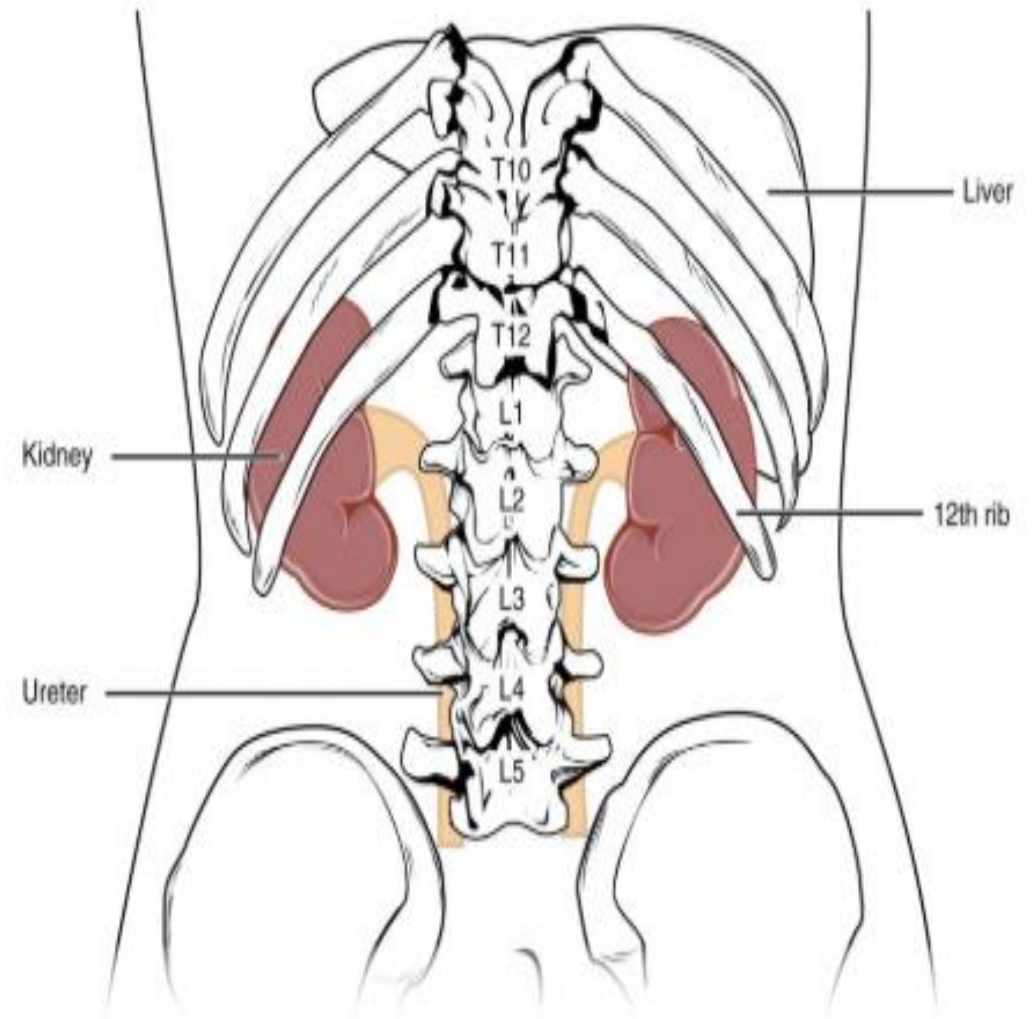
HOW THE URINARY SYSTEM WORKS

1. Blood enters each kidney through lots of little arteries.
2. Kidneys filter the blood, separating toxins from nutrients.
3. Vitamins, minerals, nutrients and proteins return back to your bloodstream.
4. Waste products and urine move from your kidneys through your ureters and to your bladder.
5. **Bladder stores urine.**
6. **Urine leaves your body through your urethra.**

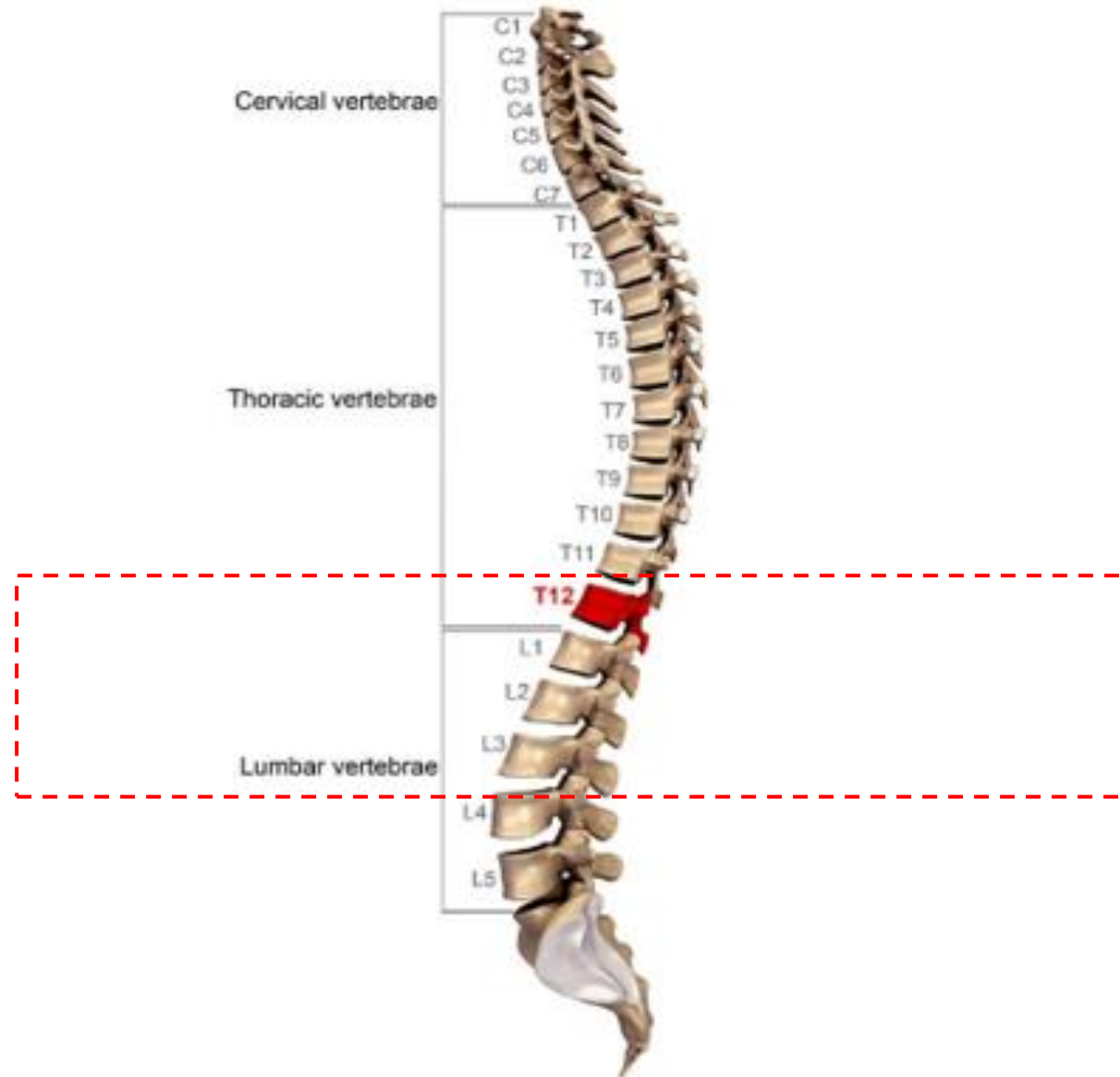


EXTERNAL ANATOMY OF THE KIDNEY

- **Left kidney is located at about the T12 to L3 vertebrae, whereas the right kidney is lower due to slight displacement by the liver.**
- **Upper portions of the kidneys are somewhat protected by the eleventh and twelfth ribs.**
- **Each kidney weighs about 125–175 g in males and 115–155 g in females.**



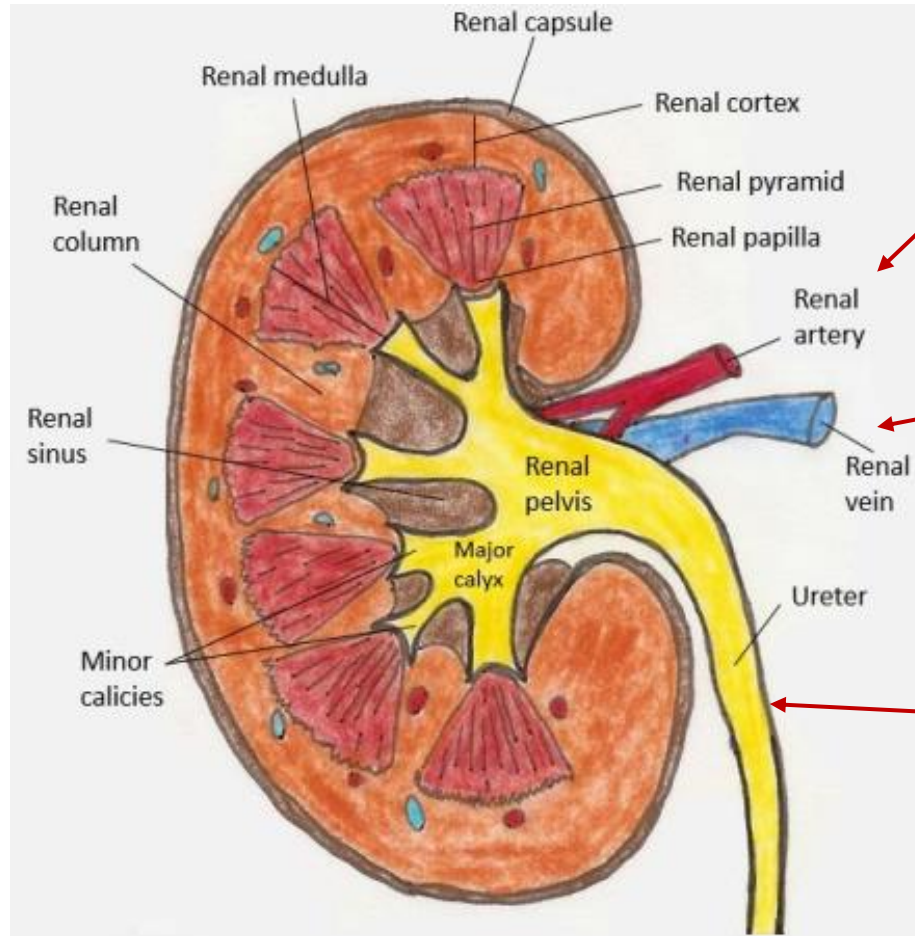
Thoracic vertebrae T12



INTERNAL ANATOMY OF THE KIDNEY

A frontal section through the kidney reveals an outer region called the **renal cortex** and an inner region called the **medulla**.

The **renal columns** are connective tissue extensions that radiate downward from the cortex through the medulla to separate the most characteristic features of the medulla, the **renal pyramids** and **renal papillae**.



Renal Artery
Systemic arterial blood enters the kidney.

Renal Vein
Systemic arterial blood leaves the kidney.

Ureters

- Carry urine kidneys to the bladder.
- Each ureter is about 20cm long.

FUNCTIONS OF THE KIDNEY /1

- 1. Regulation of Extracellular Fluid Volume:** If blood volume is too high, **for example after drinking a large amount of water**, then more filtrate is created and therefore more fluid volume is excreted as urine; if blood volume too low, fluid is conserved and urine excretion is decreased.
- 2. Regulation of Osmolarity, ie. number of particles of solute per litre of solution:** osmolarity of blood is significantly controlled by altering the amount of water that is excreted in the urine. If excessive water intake decreases plasma osmolarity below about 280 mOsM, the kidneys remove the excess water by producing dilute urine. If osmolarity of blood becomes hypertonic and goes up beyond 310 mOsM, the kidneys will act to conserve water, producing more concentrated urine.

FUNCTIONS OF THE KIDNEY /2

3. Maintenance of Ion Balance: The concentrations of ions in the blood play a very important role in **homeostasis (state of balance among all the body systems needed for the body to survive and function correctly)** and are therefore highly regulated.

The renal system plays a significant role in constantly establishing ion balance in body fluids. The main ions discussed are: Na^+ , K^+ , Cl^- , Ca^{2+} , H^+ , Mg^{2+} and PO_4^{3-}

FUNCTIONS OF THE KIDNEY /3

4. **Excretion of Metabolic Wastes Products:**

The renal system excretes normal metabolic waste products that are always normally accumulating in the body.

Substances like urea (a product of protein catabolism), **uric acid** (a product of nucleic acid catabolism) and **creatinine** (a waste product from muscle breakdown of a creatine) are continuously excreted.

FUNCTIONS OF THE KIDNEY /4

5. Excretion of Foreign Substances: Many unnatural toxins or foreign substances that may enter your body from a number of sources are removed.

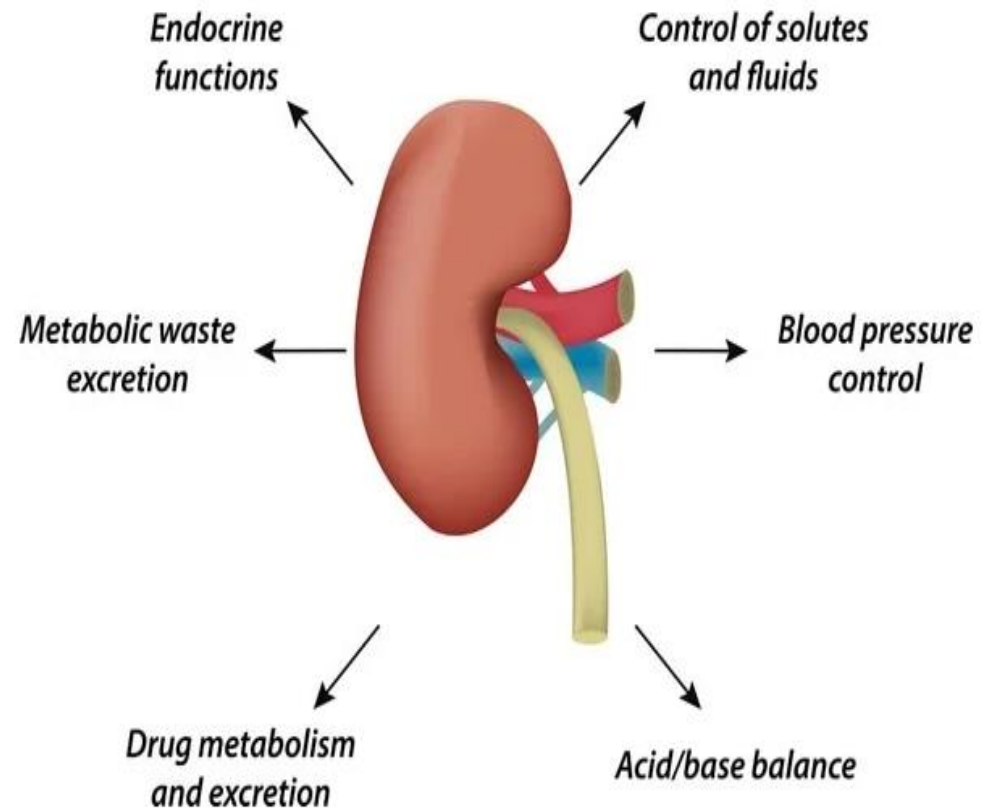
These substances include: Medications and other types of drugs; chemicals (pesticides, preservatives, additives, artificial colors, etc.); and even other organisms.

FUNCTIONS OF THE KIDNEY /5

6. Production of Hormones: The renal system is considered a secondary endocrine gland.

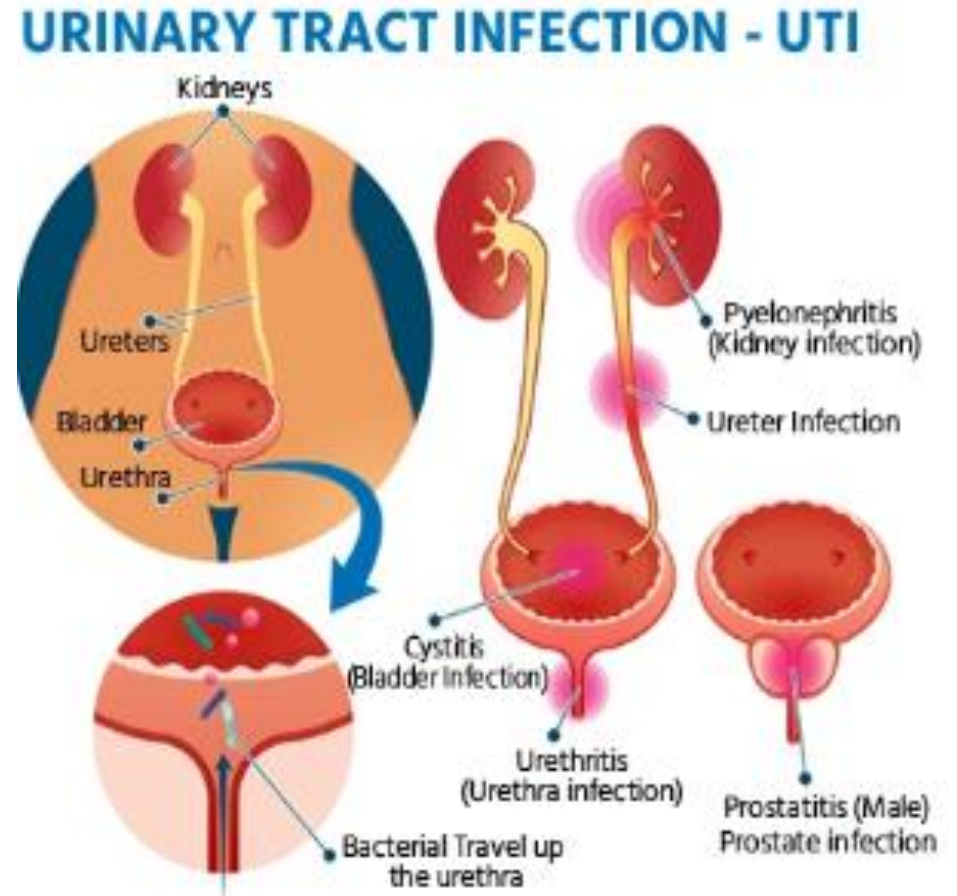
In addition to filtering the blood, it also releases **two hormones (Renin and Erythropoietin)** that play a critical role in homeostasis.

SUMMARY OF KIDNEY FUNCTIONS



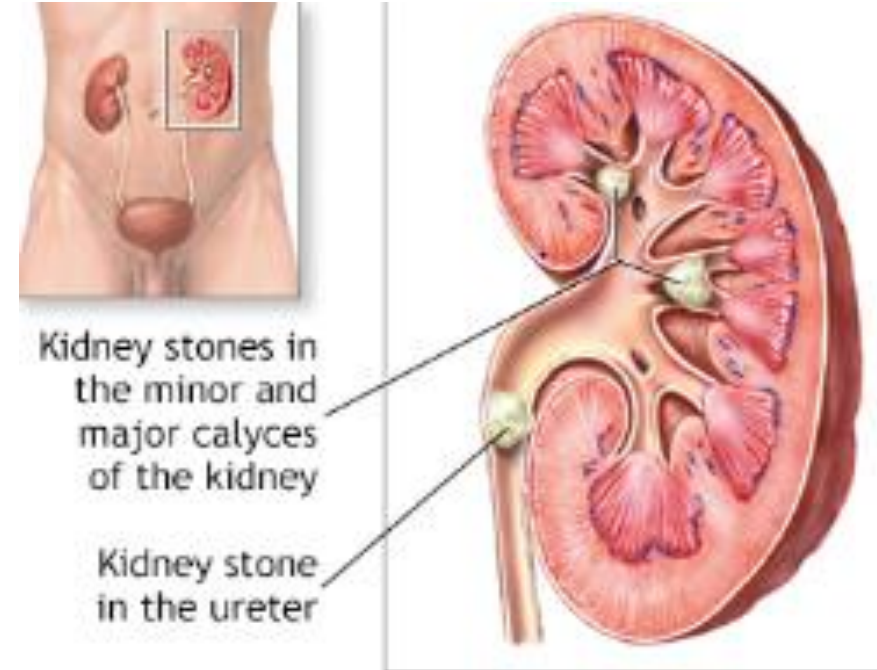
CONDITIONS & DISORDERS OF THE URINARY SYSTEM /01

1. **Urinary tract infections and sexually transmitted infections (STIs)** can cause issues with your kidneys, urethra or bladder.



CONDITIONS & DISORDERS OF THE URINARY SYSTEM /2

- 2. Kidney stones or ureteral stones** can cause severe pain and block the flow of urine.

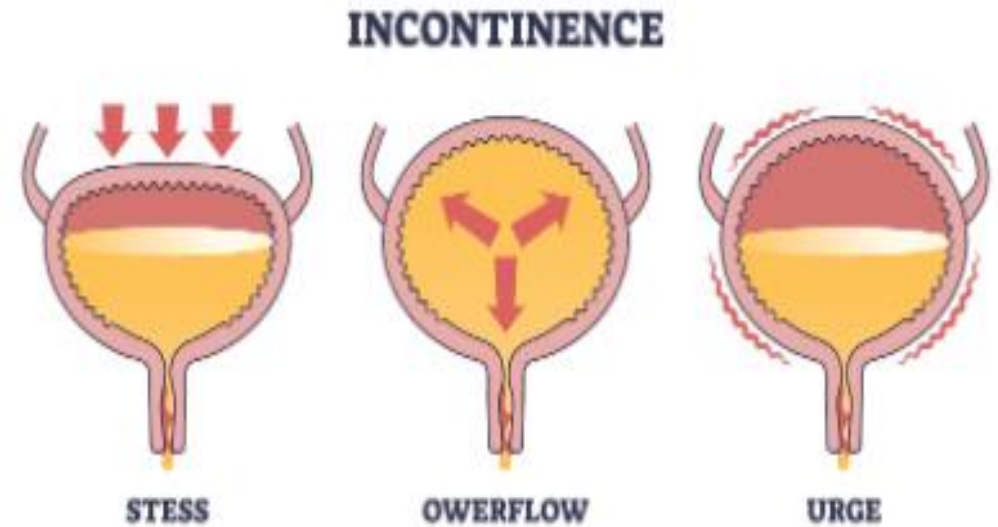


CONDITIONS & DISORDERS OF THE URINARY SYSTEM /3

3. Loss of bladder control or urinary incontinence (leakage), causes urine to leak when you don't want it to. It can be worse when you cough, laugh, sneeze or jump.

Overactive bladder happens when you feel the sudden urge to pee more often.

Urinary retention is a condition where your bladder doesn't completely empty each time.



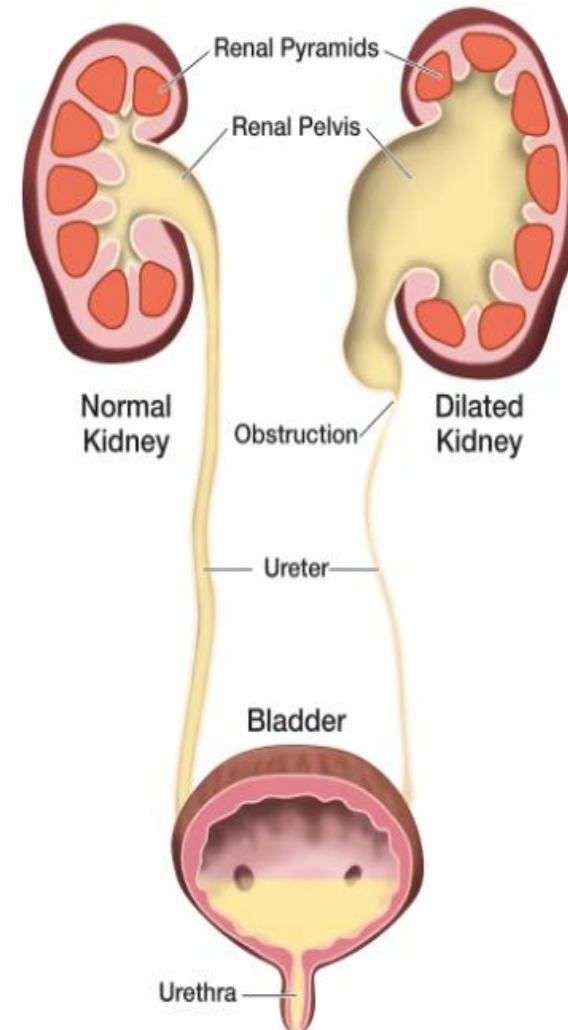
CONDITIONS & DISORDERS OF THE URINARY SYSTEM /4

4. Urinary tract obstructions:

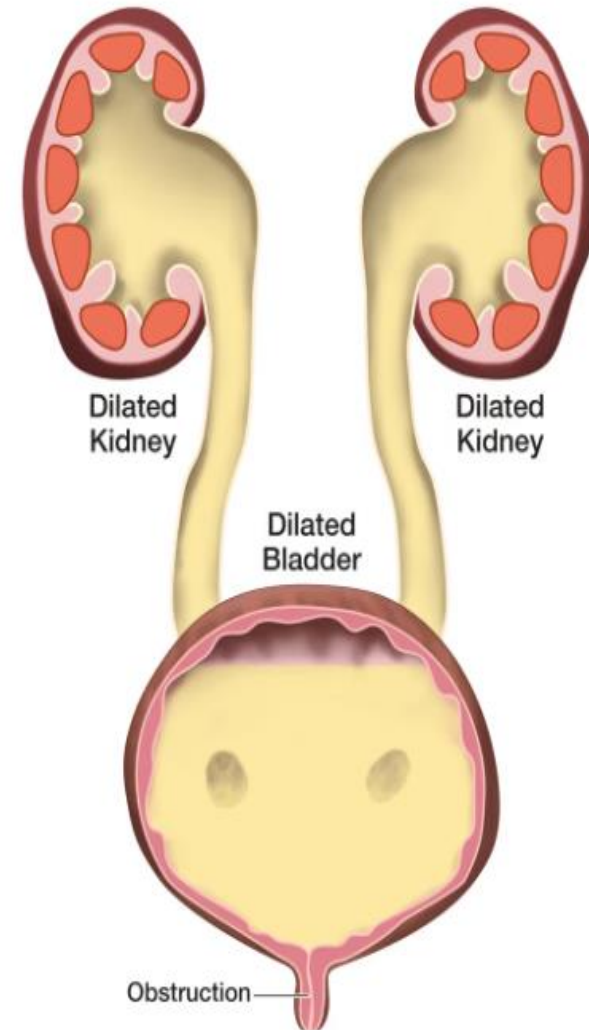
Growths or tumors in any part of your urinary tract can affect the flow of urine. An enlarged prostate can block your ureter so it's harder to pee.

Other causes of ureteral obstruction include pregnancy and gastrointestinal (GI) issues like Crohn's disease.

Upper Urinary Tract Obstruction



Lower Urinary Tract Obstruction



CONDITIONS & DISORDERS OF THE URINARY SYSTEM /5

5. **Kidney disease** is a common and serious condition that affects your urinary system.

The most common causes of chronic kidney disease (CKD) are high blood pressure and diabetes. Managing blood pressure and blood sugar is crucial to lowering your risk of kidney disease.

Kidney disease can lead to kidney failure. **Kidney failure may require dialysis or a kidney transplant.**

