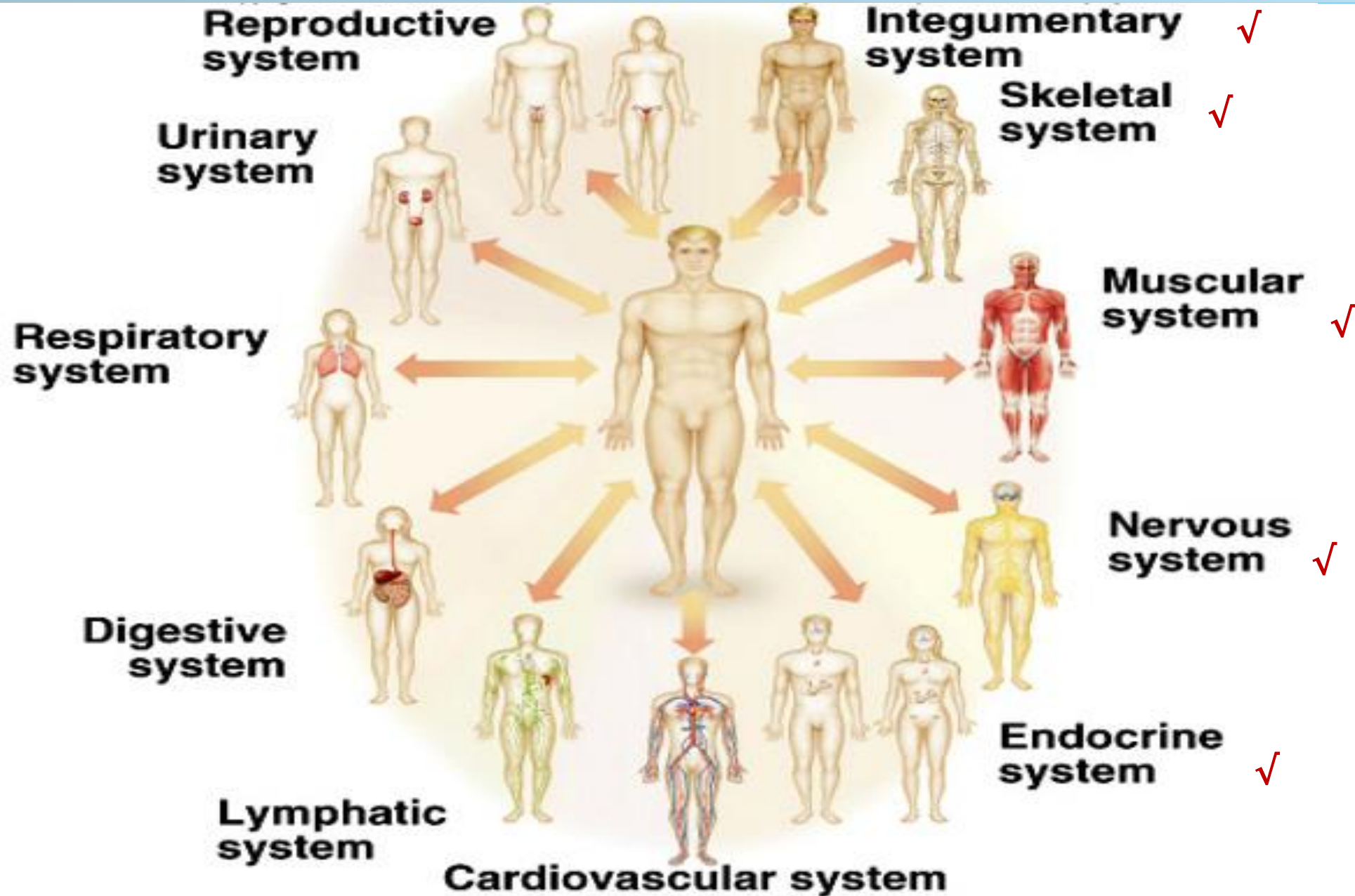


# **HUMAN ANATOMY & PHYSIOLOGY (2)**

**CARDIOVASCULAR, REPIRATORY, LYMPATIC,  
DIGESTIVE, URINARY**

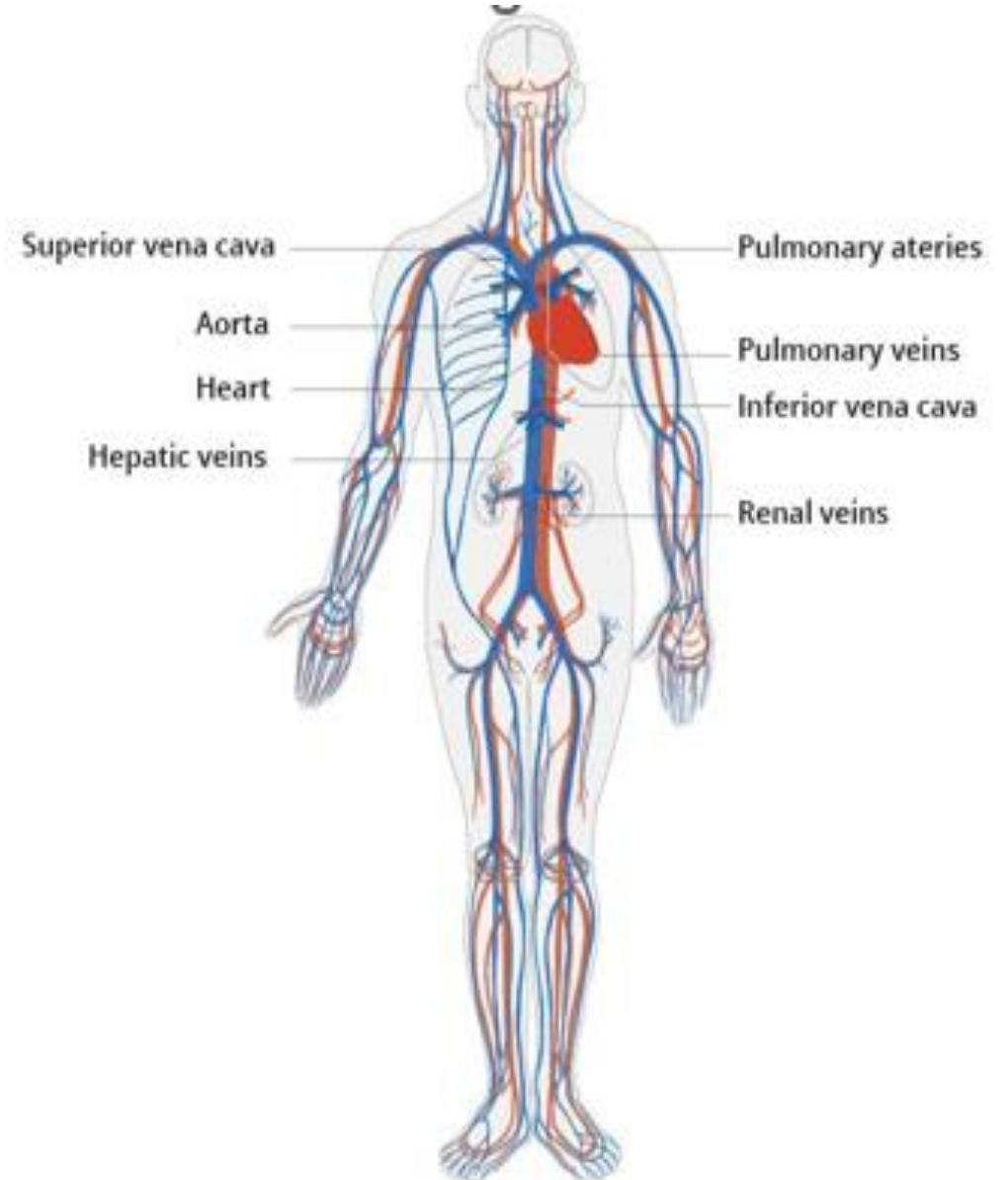
**Monday, September 22, 2024**

# 11 ORGAN SYSTEMS OF THE HUMAN BODY



# 6. CARDIOVASCULAR SYSTEM

- 1. Cardiovascular system** includes the heart, blood vessels, and blood which is circulated throughout the entire body .
- 2. Function of the cardiovascular system are:**
  - 1. Supplies your body's organs with oxygen and nutrients**
  - 2. Keep your temperature at a normal level**



# BLOOD CIRCULATION OVERVIEW

- 1. Blood** is pumped from the left ventricle of the heart to capillaries in the periphery via the arterial vessels of the **systemic (or greater) circulation** and returns via the veins to the right heart.
- It is then expelled from the right ventricle to the lungs via the **pulmonary (or lesser) circulation** and returns to the left heart.
- Total Blood volume is roughly 4–5L** (7% of the fat-free body mass)
- Approx 80% of the blood** circulates through the veins, right heart and pulmonary vessels, which are jointly referred to as **the low-pressure system**.

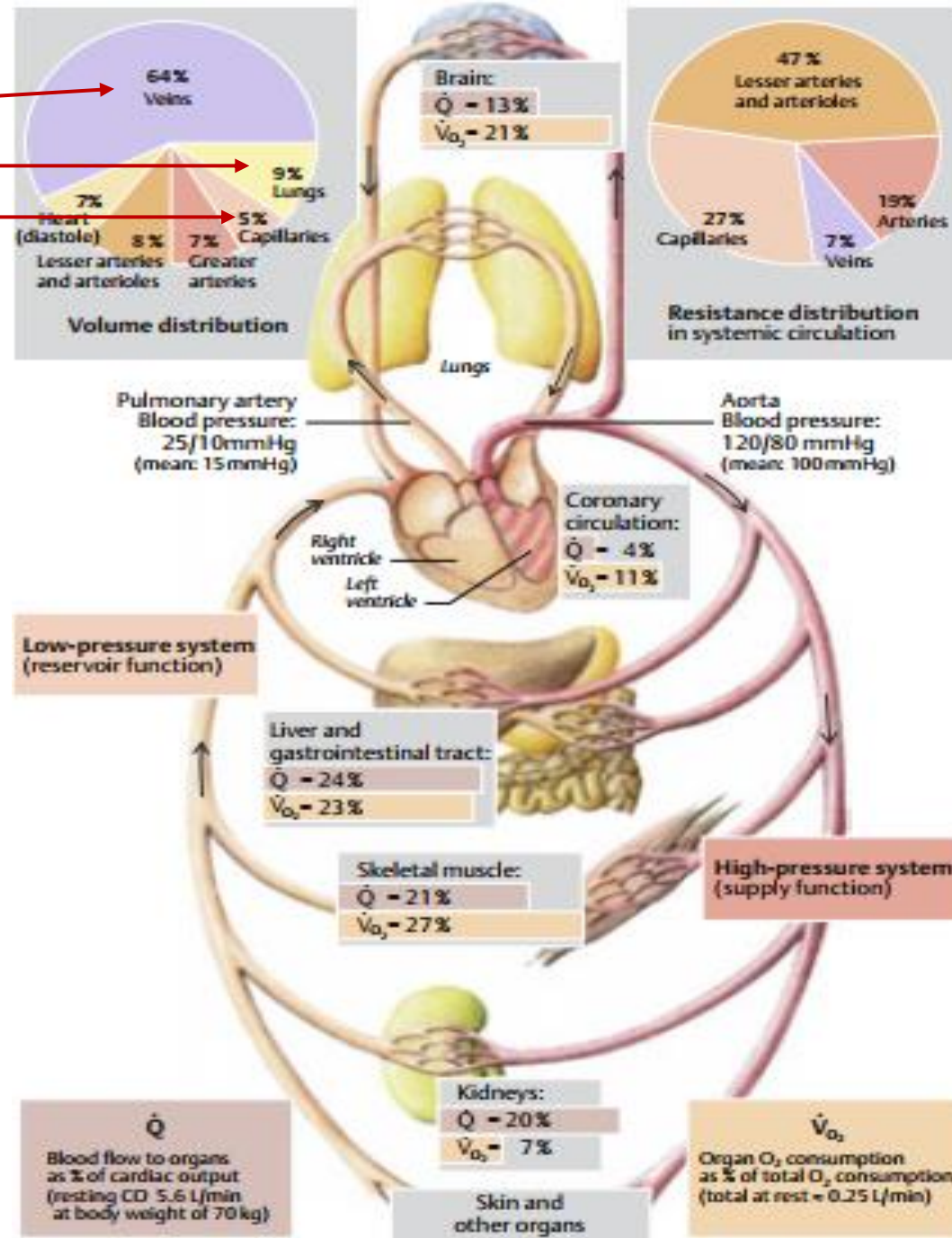
## Low-pressure system

Veins: 64%

Lungs: 9%

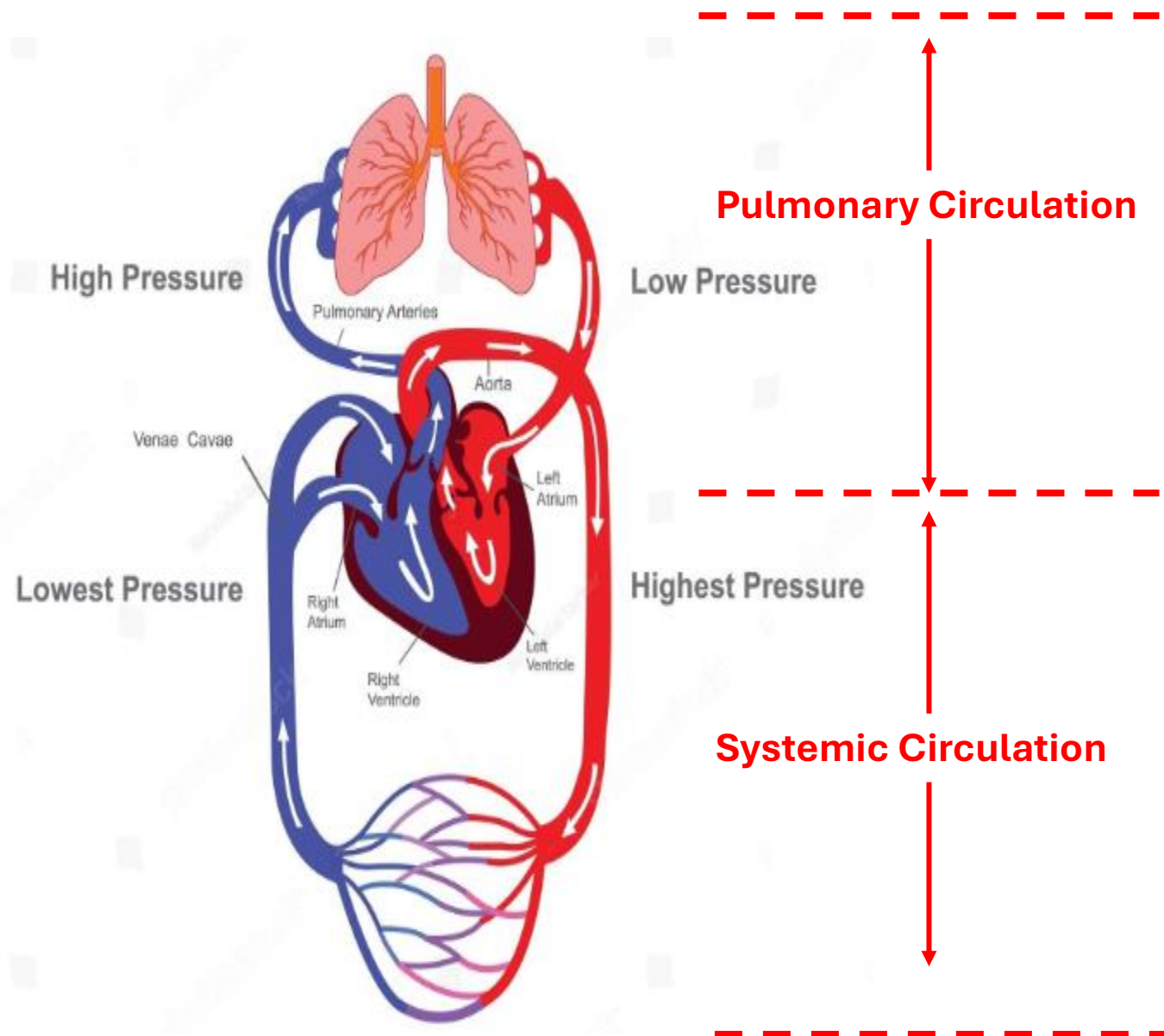
Capillaries: 5%

**Total: 78%**



# 6.1 CIRCULATION PROCESSES

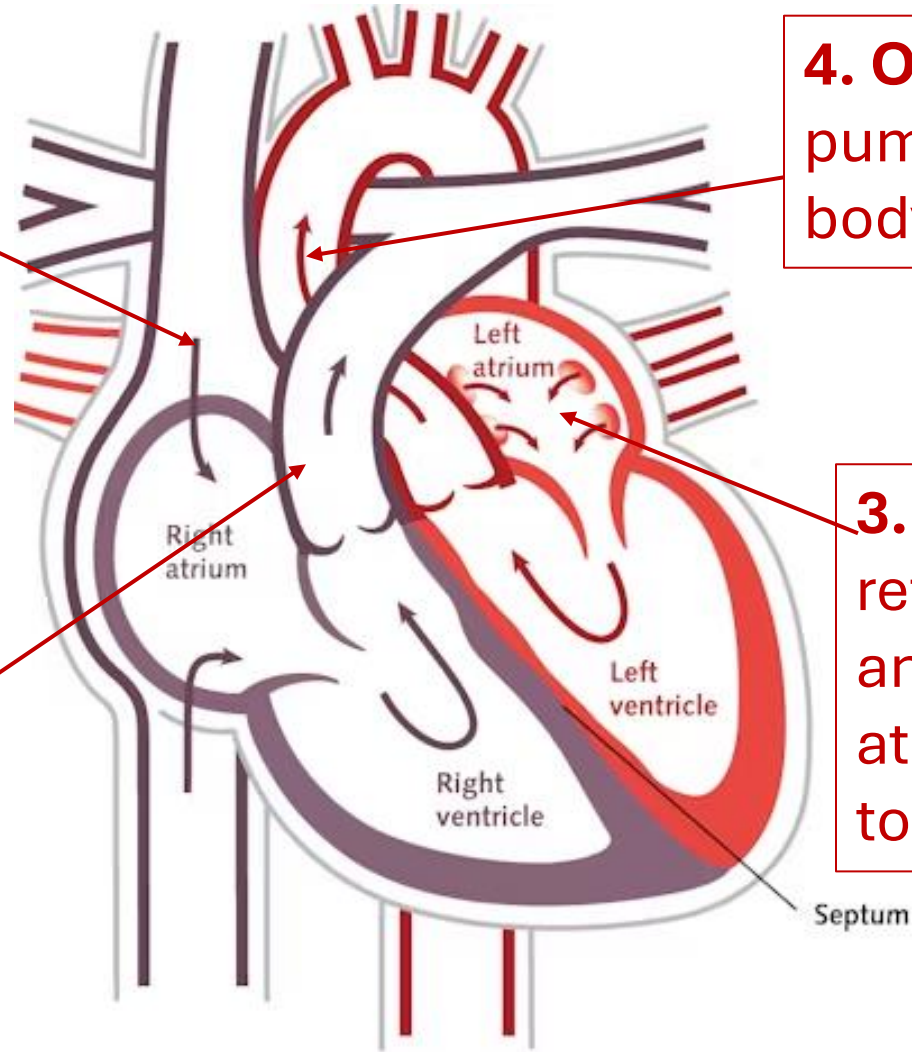
- 1. Pulmonary circulation:** Blood without oxygen comes into the right side of your heart and is sent to the lungs to get oxygen and get rid of carbon dioxide. Then the oxygenated blood comes back through the left side of your heart.
- 2. Systemic circulation:** Blood that has just gotten oxygen from the lungs and returned through your heart's left side is pushed out to the rest of your body's cells so they can receive oxygen and nutrients.



# PULMONARY CIRCULATION

**1. Oxygen-poor blood** enters the right atrium and then flows to the right ventricle.

**2. Oxygen-poor blood** is pumped to the lungs through the pulmonary arteries.



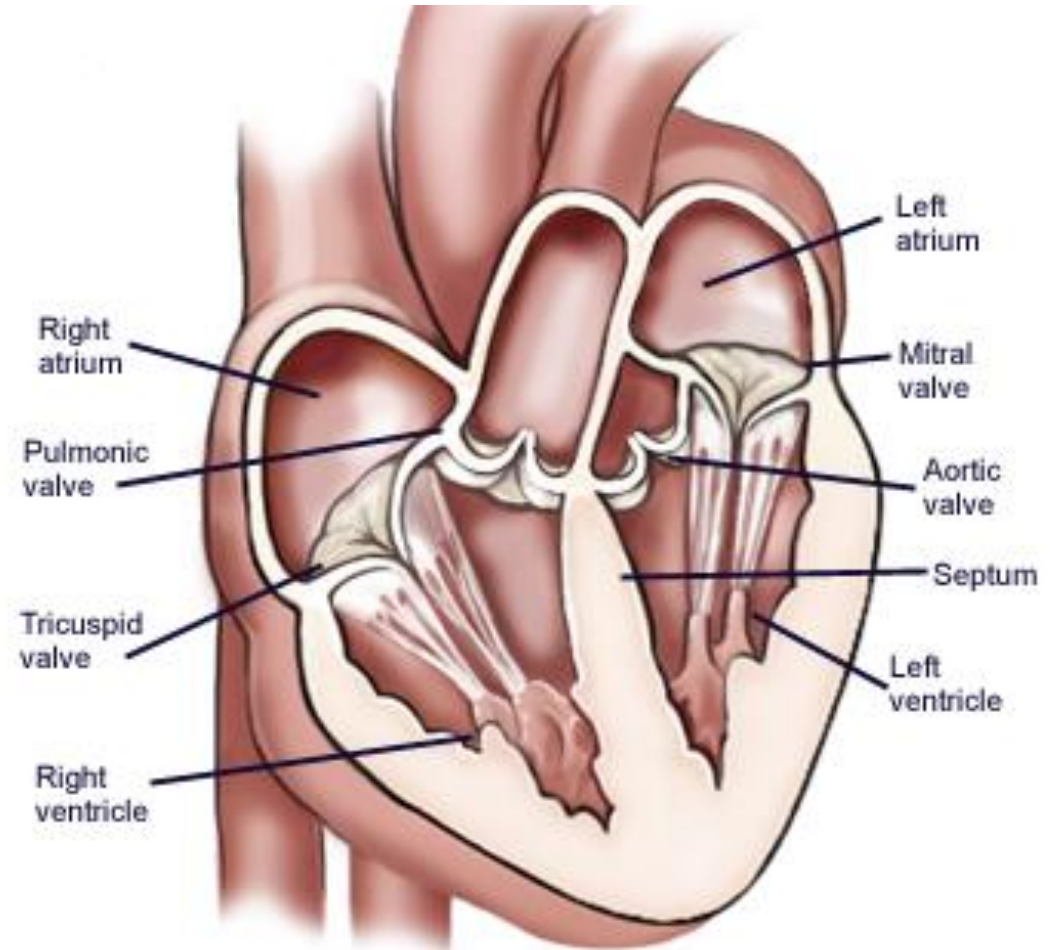
**4. Oxygen-rich blood** is pumped to the rest of the body through the aorta.

**3. Oxygen-rich blood** returns from the lungs and enters the left atrium and then flows to the left ventricle.

## 6.2 VALVES IN THE HUMAN HEART

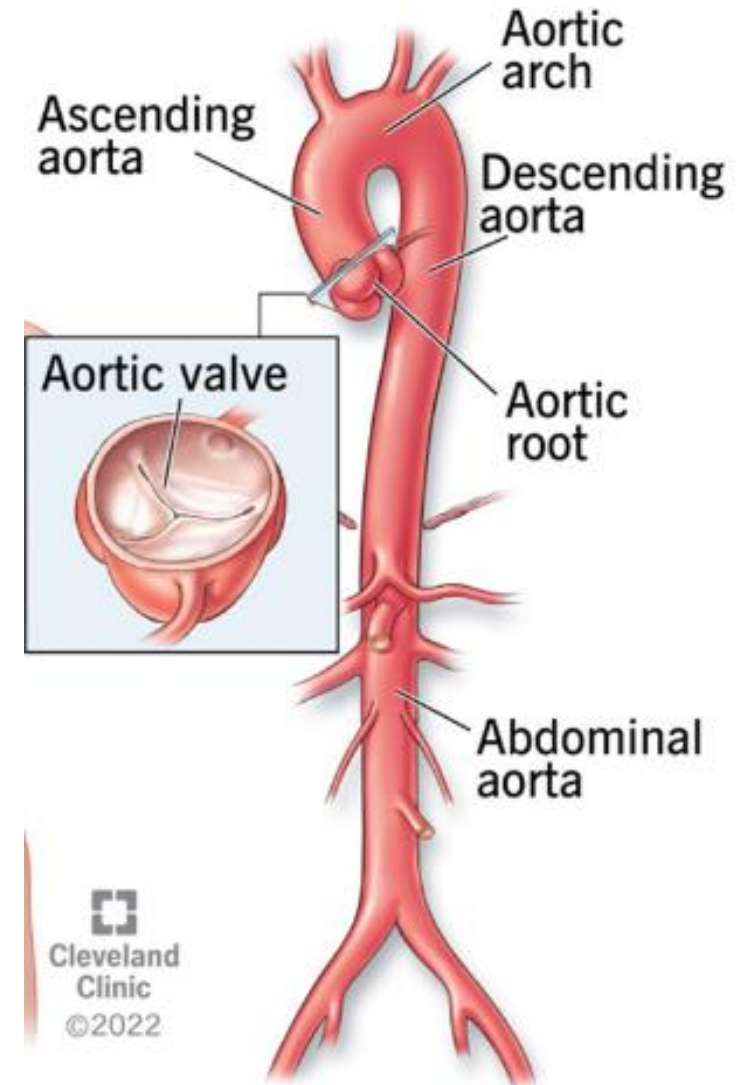
1. **Four valves** in your heart make sure blood flows in only one direction through your heart. Your heart's valves are:

1. **Mitral** (between your left atrium and left ventricle).
2. **Tricuspid** (between your right atrium and right ventricle).
3. **Aortic** (between your left ventricle and aorta).
4. **Pulmonary** (between your right ventricle and pulmonary artery).



## 6.3 AORTA

1. **Aorta** is a cane-shaped artery which starts in the lower-left chamber of your heart (ventricle) and extends up toward your head a short distance before curving down.
2. The aorta passes through your chest and abdominal cavities and ends at your pelvis.
3. Pairs of smaller blood vessels branch off from various points of the aorta.
4. **Aorta** is the largest blood vessel in your body. It's more than 1 foot long and one inch in diameter at its widest point.
5. **Aorta's main function** is to deliver oxygen-rich blood to the rest of the body. It also delivers nutrients and hormones.



### **Ascending aorta:**

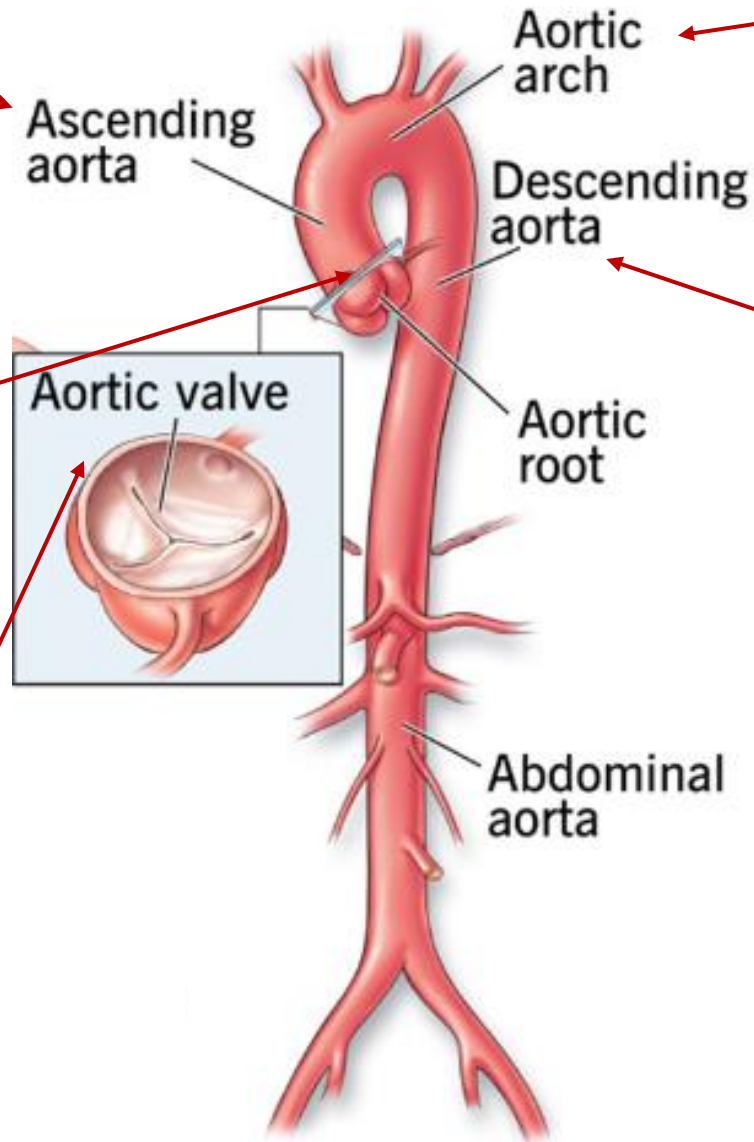
Upward curve that occurs shortly after the aorta leaves the heart.

### **Aortic root**

1. attaches to the heart.
2. It is the widest part of the aorta.

### **Aortic valve**

- Three flaps of tissue (leaflets) that snap open and shut to release oxygen-rich blood from the heart.



### **Aortic arch**

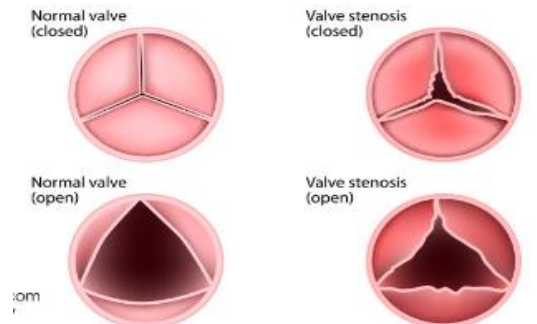
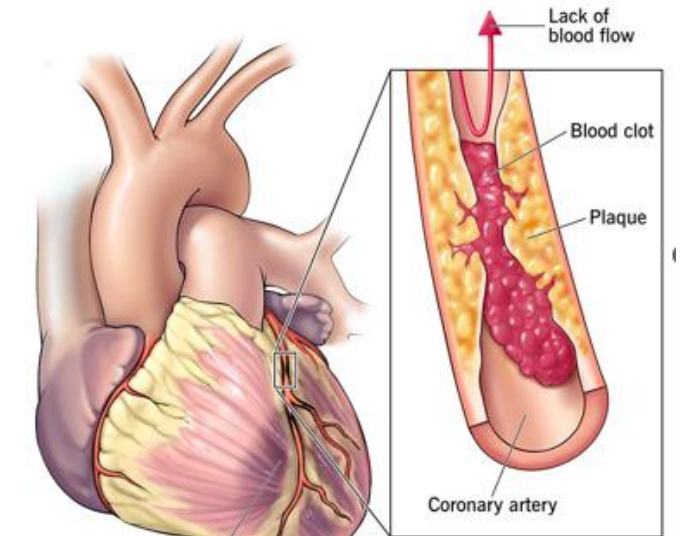
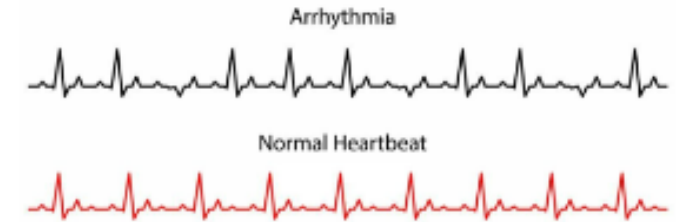
1. Curved segment that gives the aorta its cane-like shape.
2. It bridges the ascending and descending aorta.

### **Descending aorta**

Long, straight segment that runs from your chest (thoracic aorta) to your abdominal area (abdominal aorta).

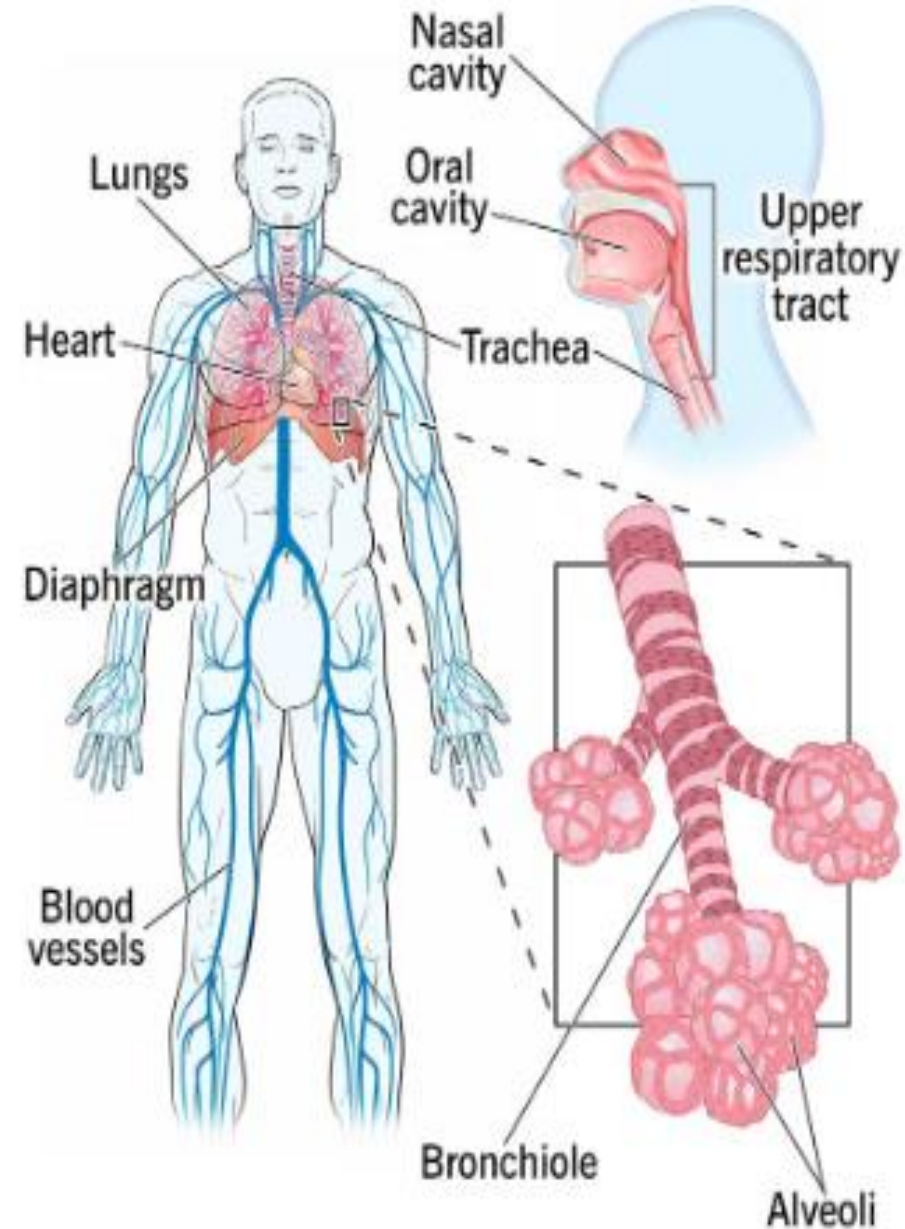
## 6.2 SOME CONDITIONS & DISORDERS OF THE CARDIOVASCULAR SYSTEM

- 1. Arrhythmia (abnormal heart rhythm)** refers to the condition where the heart is beating too fast when you're at rest or just not beating in a regular pattern.
- 2. Heart attack (myocardial infarction)** is a medical emergency where your heart muscle begins to die due to low blood flow. A blockage in the arteries that supply blood to your heart usually causes this. If a healthcare provider doesn't restore blood flow quickly, a heart attack can cause permanent heart damage and death.
- 3. Heart valve disease** refers to any of several conditions that prevent one or more of the valves in your heart from working correctly.



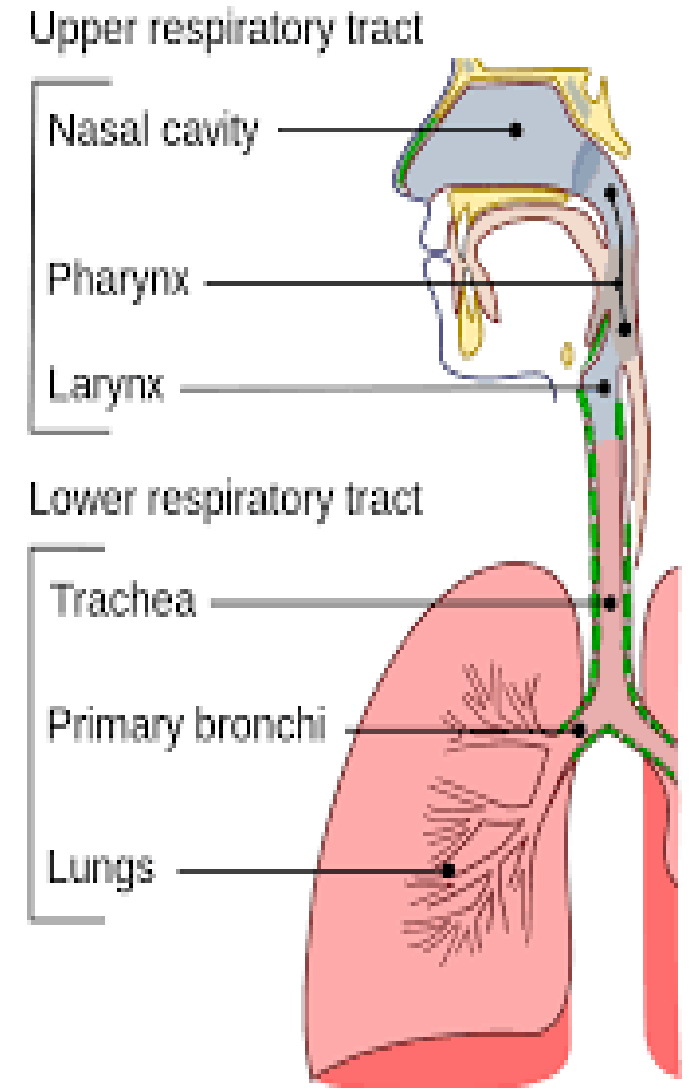
# 7. RESPIRATORY SYSTEM

- 1. Respiratory system** is made up of your lungs, airways (trachea, bronchi and bronchioles), diaphragm, voice box, throat, nose and mouth.
- 2. The respiratory system** works with the circulatory system to provide this oxygen and to remove the waste products of metabolism.
- 3. Other functions:**
  - Warms and adds moisture to the air you breathe in to match the temperature & humidity level required.
  - Helps protect you from harmful particles and germs
  - It allows body to smell and speak.
  - Too much carbon dioxide lowers blood's pH, making it acidic. By removing  $\text{CO}_2$ , respiratory system helps maintain the **acid-base balance**.



# 7.1 UPPER RESPIRATORY TRACT

- 1. Upper respiratory tract starts** with the nose and mouth, where air is pulled to your body. Other parts of your upper respiratory tract include your nasal cavity, sinuses (hollow areas in your cheeks and forehead) and larynx.
- 2. Functions of upper respiratory tract:**
  - a) draws air into your body and helps move it toward your lungs.
  - b) It adds moisture to the air breathe.



# 7.2 UPPER RESPIRATORY TRACT

## **Nasal Cavity**

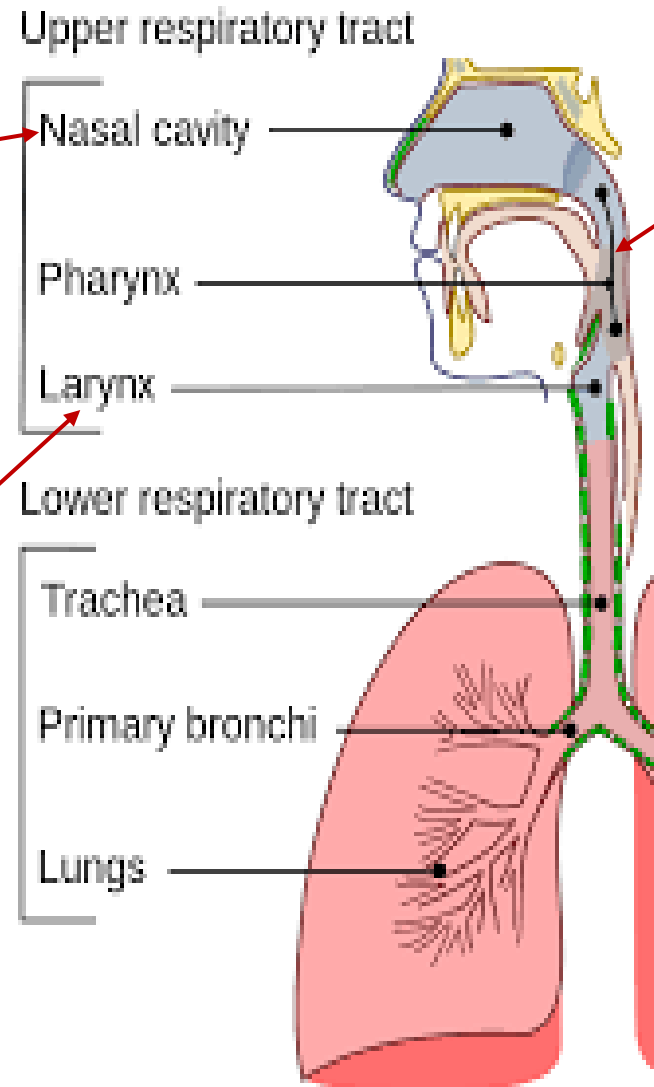
The role of the nasal cavity is:

1. humidify and warm the inspired air.
2. remove minute airborne particles and other debris before the air reaches the lower airways.

## **Larynx**

The function of the larynx in humans and other vertebrates is:

1. to protect the lower respiratory tract from aspirating food into the trachea while breathing.
2. functions as a voice box for producing sounds, i.e., phonation.



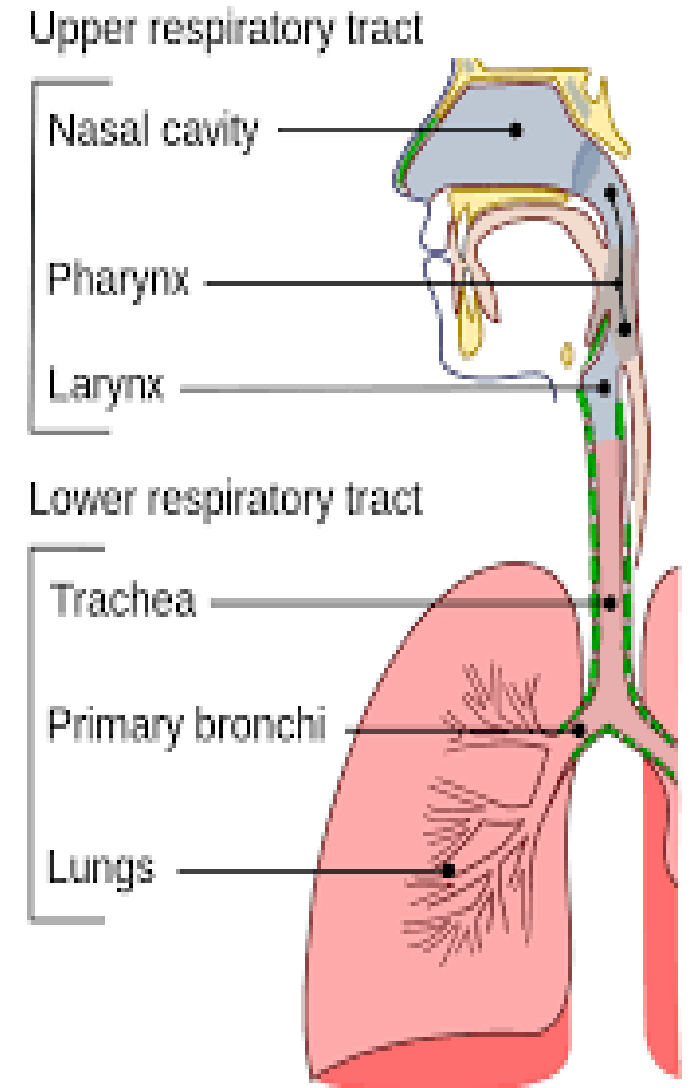
## **Pharynx:**

The role of the pharynx is to:

1. Route air coming in your nose and mouth down to your larynx (voice box), which, in turn, moves air to your trachea and lungs.
2. Deliver food and liquid to your esophagus, which sends them on to your stomach.

## 7.3 LOWER RESPIRATORY TRACT

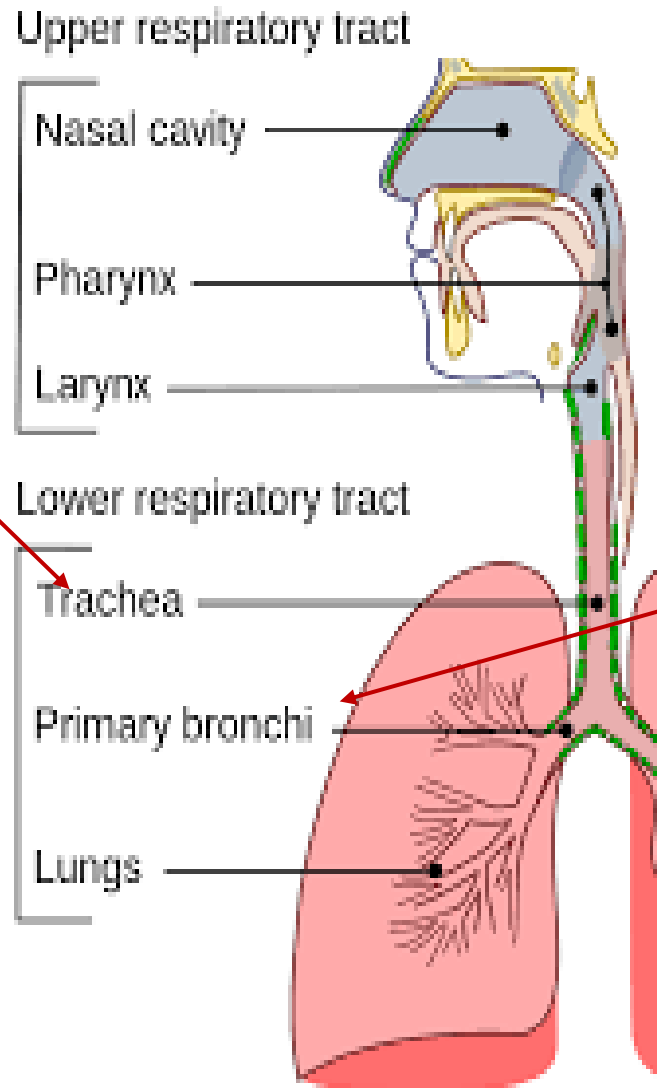
- 1. Lower respiratory tract** include the windpipe (trachea) and within the lungs, the bronchi, bronchioles, and alveoli. Deep in the lungs, each bronchus divides into secondary and tertiary bronchi, which continue to branch to smaller airways called the bronchioles..
- 2. Functions of lower respiratory tract:**
  - a) draw in air from the upper respiratory system
  - b) absorb the oxygen
  - c) release carbon dioxide.



# 7.4 LOWER RESPIRATORY TRACT

**Trachea** has three functions:

1. Provide a safe, sturdy passageway for air to travel from the mouth or nose to the lungs.
2. Prevent the passage of foreign objects into the respiratory system.
3. Regulate the temperature and humidity of air passing into the lungs



**Bronchi** carry air to and from your lungs.

**Bronchi** help moisturize the air you breathe and screen out foreign particles.

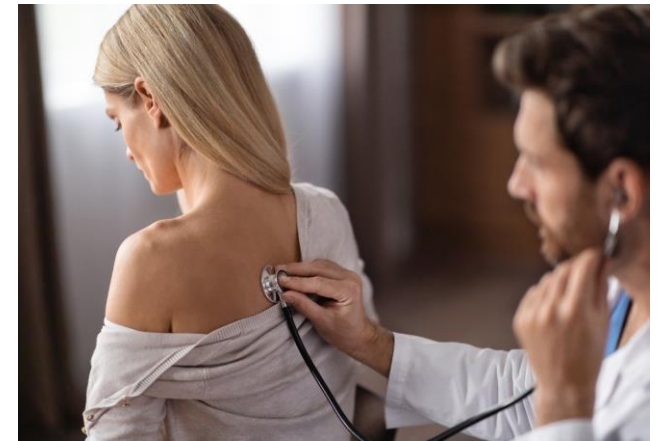
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**Bronchi** are lined with cells that create mucus. The mucus keeps your airways moist. It also traps bacteria, viruses, fungi and other particles to protect your lungs and prevent infection.

## 7.5 CONDITIONS & DISORDERS OF THE RESIRATORY SYSTEM

1. **Asthma:** Chronic inflammation in your airways that makes it difficult to breathe.
2. **Bronchiectasis:** When your bronchi widen and scar, causing you to cough up mucus.
3. **Bronchitis:** Inflammation or infection in your bronchi that may be short-term (acute) or long-lasting (chronic).
4. **Bronchiolitis:** A viral lung infection of the bronchioles.
5. **Bronchopulmonary dysplasia:** A breathing condition that occurs when an infant's lungs do not develop properly.

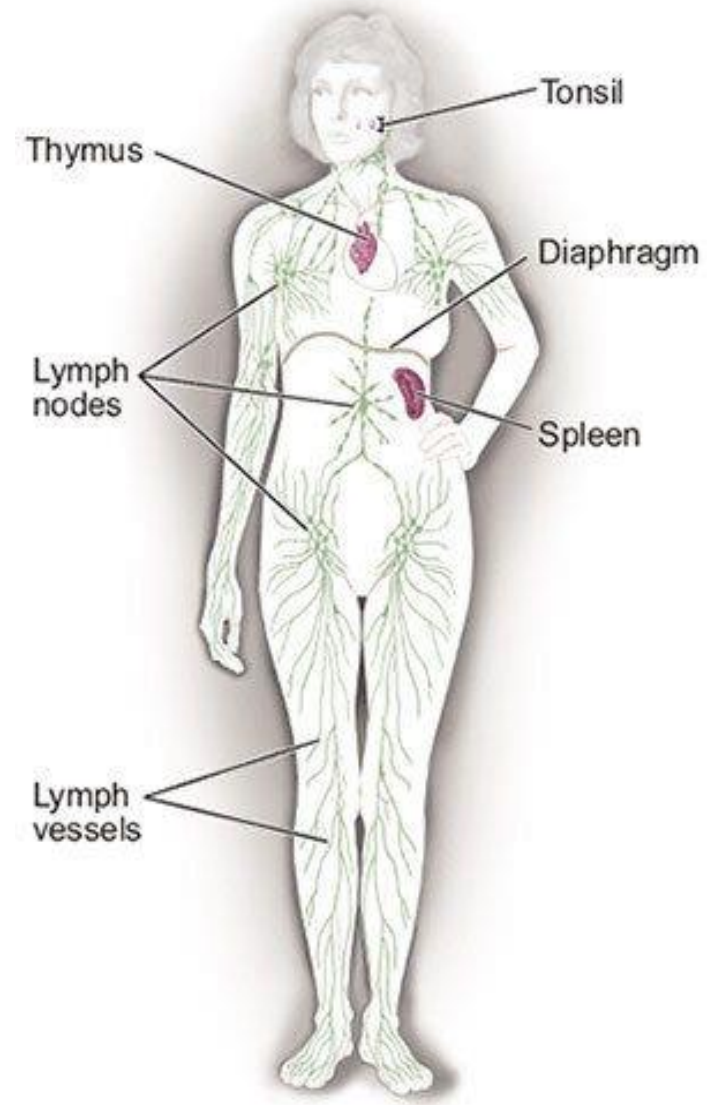
## 7.6 RESPIRATORY SYSTEM MEDICAL SPECIALISTS

1. **Dentistry** also known as **dental medicine** and **oral medicine**, is the branch of medicine focused on the teeth, gums, and mouth.
2. **Maxillofacial surgery** is a special type of dentistry. It involves operations to correct diseases, injuries and defects of your face, jaw or mouth.
3. **Ear, nose, and throat doctor (ENT) also called otolaryngologists** specializes in everything having to do with those parts of the body including surgery.
4. **Pulmonologist** diagnoses and treats diseases of the respiratory system. You might hear these healthcare providers called lung doctors, lung specialists or chest doctors.



# 8. LYMPHATIC SYSTEM

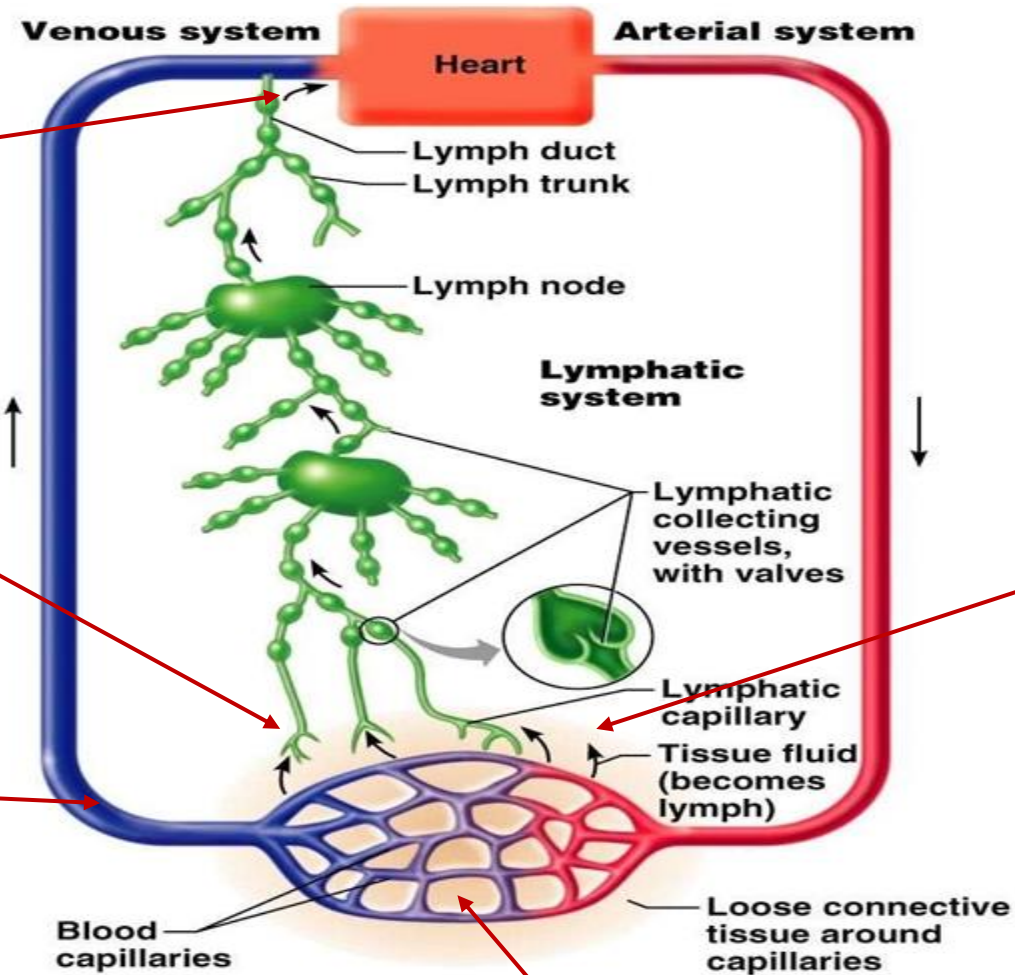
1. **Lymphatic system (or lymphoid system)** is a group of organs, vessels and tissues that protect you from infection and keep a healthy balance of fluids throughout your body.
2. It consists of a large network of lymphatic vessels, lymph nodes, lymphoid organs, lymphatic tissue and lymph.
3. **Functions of the lymphatic system are:**
  - a) **Collecting excess fluid from your body's tissues** and returning it to your bloodstream. Lymphatic system also **filters out waste products and abnormal cells** from this fluid.
  - b) **Helping your body absorb fats.** Most nutrients can travel through tiny openings (pores) in the walls of your capillaries, and your body can then absorb and use them. But certain fats and other molecules are too large to travel in this way. The lymphatic system collects such nutrients from the intestines into the bloodstream.
  - c) **Protecting your body against invaders.** The lymphatic system immune system produces and releases lymphocytes (a type of white blood cell) and other immune cells. These cells look for and destroy invaders, e.g. bacteria, viruses, parasites and fungi.



**6. Lymph is emptied** into the subclavian veins and re-enters the blood circulation system.

**5. Lymphatic capillaries** pick up this remaining 3 litres of fluid (now called lymph) from the tissues.

**4. About 17 liters of plasma** return to your bloodstream in this way.



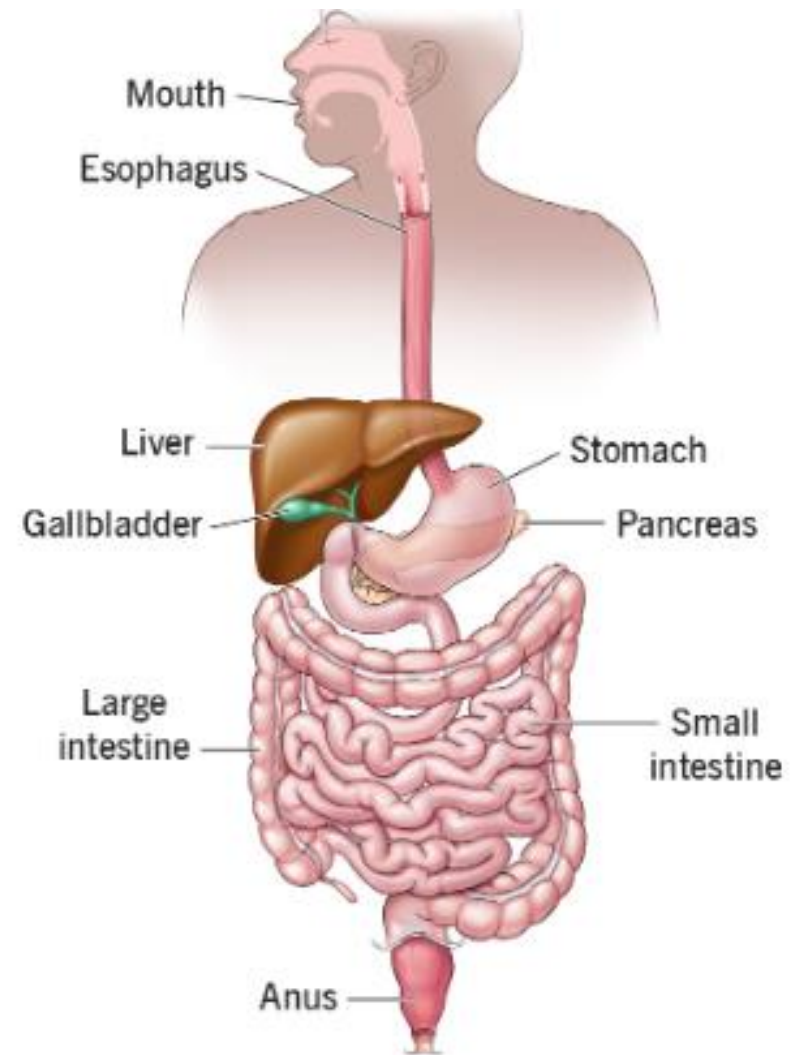
**1. Every day, about 20 liters of plasma** (the liquid part of your blood) flow out of tiny pores in the thin walls of your capillaries.

**2. The tissues soak up the nutrients** while leaving behind waste.

**3. Plasma picks up the waste and returns** it to the bloodstream the same way it came, i.e by flowing back through the pores in your capillary walls.

# 9. DIGESTIVE SYSTEM

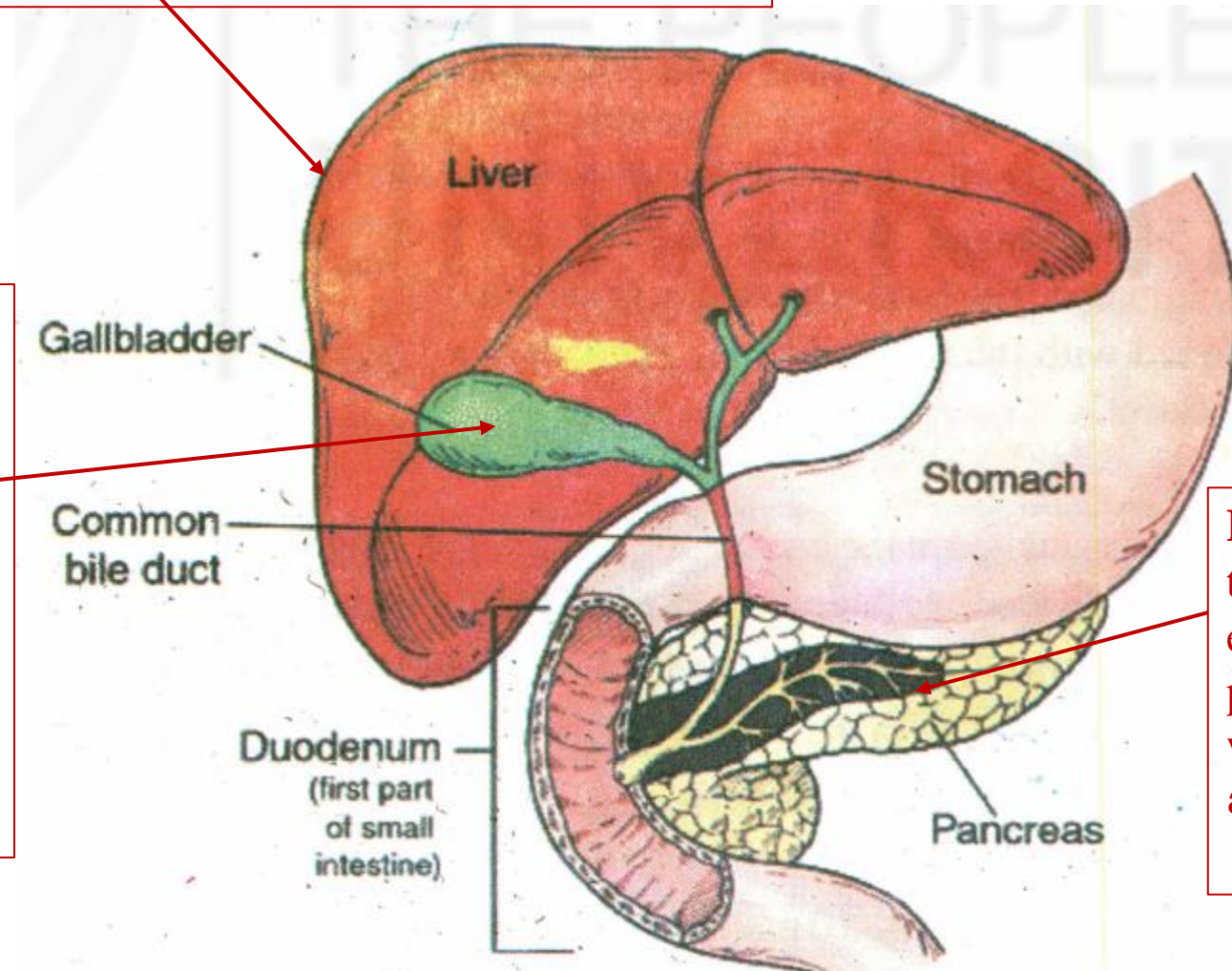
- 1. Digestive system** is a network of organs that help you digest and absorb nutrition from your food. It includes:
  - a) Gastrointestinal (GI) tract
  - b) Biliary system.
- 2. Gastrointestinal tract (GI)** is a series of hollow organs that are all connected to each other, leading from your mouth to your anus.
- 3. Biliary system** is a network of organs that deliver bile and enzymes through the bile ducts to the GI tract . Biliary system includes your liver, gallbladder, pancreas and bile ducts.



# THE BILLIARY ORGANS-LIVER, GALL BLADDER & PANCREAS

- **Liver** is the largest gland in the body situated in the upper most part of the abdominal cavity on the right side below the diaphragm.
- **Bile** is formed in the liver cells and passes through the bile duct to the gall bladder.

1. **Gall bladder** acts as a store house of bile.
2. With the help of contraction of gall bladder the bile is poured into the middle part of the small intestines which helps in dissolving the fats during digestion.



**Pancreas** is responsible for the production of insulin and exocrine function is production of pancreatic juice which helps in digestion. It is about 7 inches long.

# DIGESTIVE CONDITIONS & DISORDER – SHORT TERM /01

Short-term or temporary conditions that affect the digestive system include:

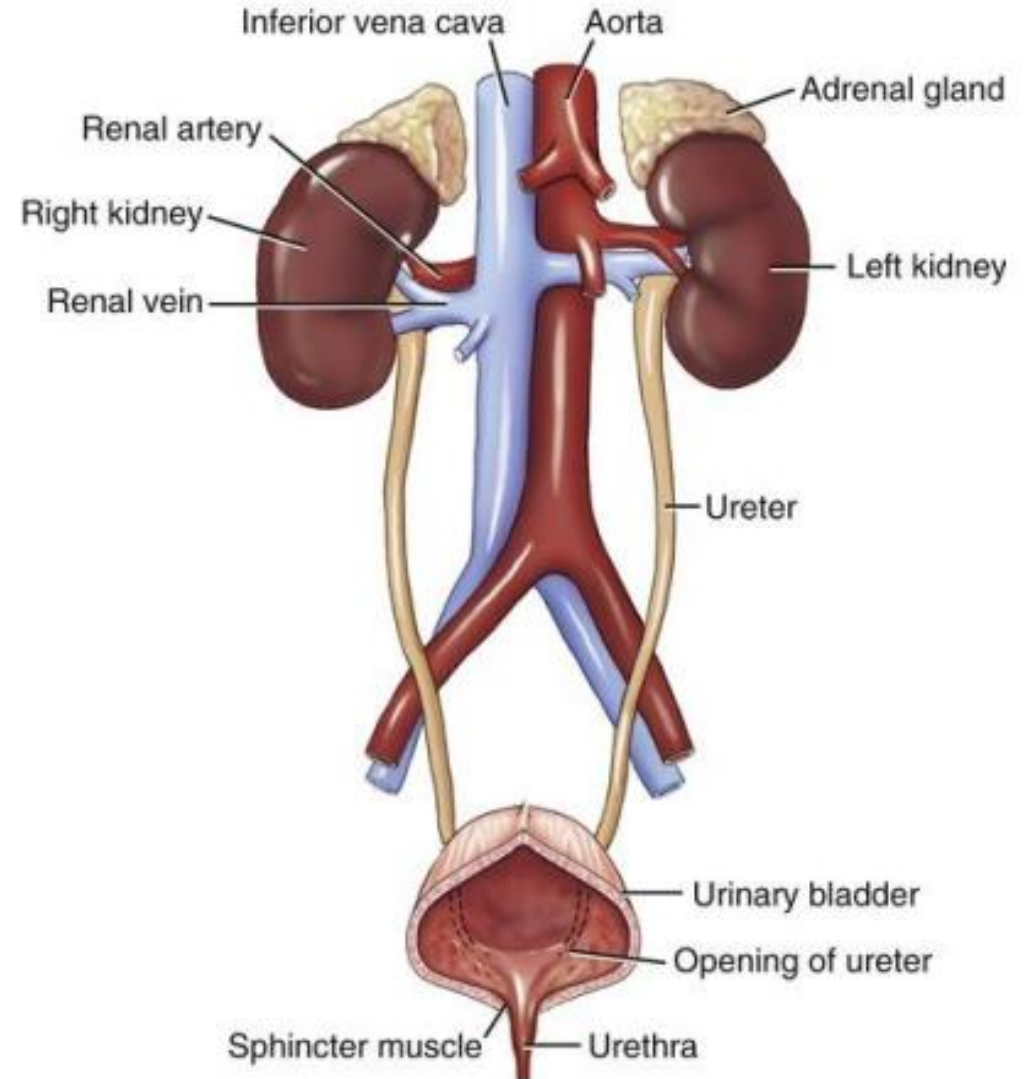
- 1. Constipation:** Constipation generally happens when you go poop (have a bowel movement) less frequently than you normally do. When you're constipated, your poop is often dry and hard and it's difficult and painful for your poop to pass.
- 2. Diarrhea:** Diarrhea is when you have loose or watery poop. Diarrhea can be caused by many things, including bacteria.
- 3. Heartburn:** Although it has "heart" in its name, heartburn is actually a digestive issue. Heartburn is an uncomfortable burning feeling in your chest that can move up your neck and throat. It happens when acidic digestive juices from your stomach go back up your esophagus.
- 4. Hemorrhoids:** Hemorrhoids are swollen, enlarged veins that form inside and outside of your anus and rectum. They can be painful, uncomfortable and cause rectal bleeding.

# DIGESTIVE CONDITIONS & DISORDER – SHORT TERM /02

- 6. Stomach flu (gastroenteritis):** The stomach flu is an infection of the stomach and upper part of the small intestine usually caused by a virus. It usually lasts less than a week. Millions of people get the stomach flu every year.
- 7. Ulcers:** An ulcer is a sore that develops on the lining of the esophagus, stomach or small intestine. The most common causes of ulcers are infection with a bacteria called *Helicobacter pylori* (H. pylori) and long-term use of anti-inflammatory drugs such as ibuprofen.
- 8. Gallstones:** Gallstones are small pieces of solid material formed from digestive fluid that form in your gallbladder, a small organ under your liver.

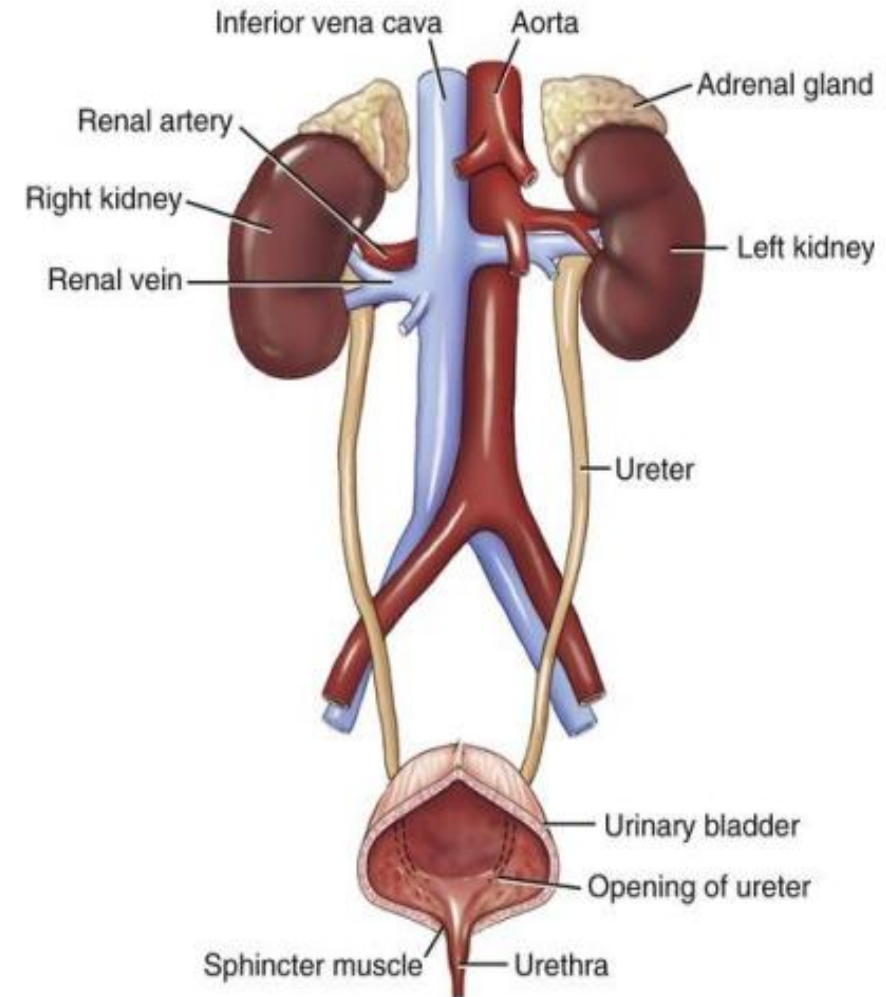
# 10. URINARY SYSTEM

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).



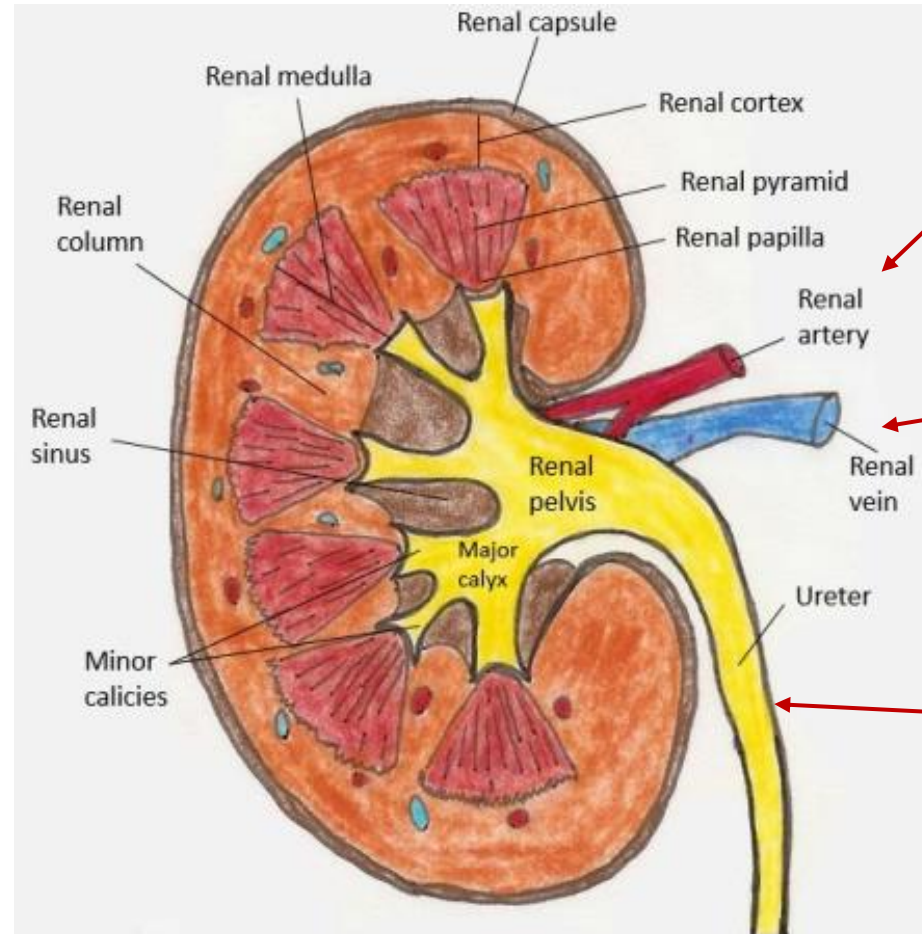
# HOW THE URINARY SYSTEM WORKS

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.



# THE KIDNEY

1. Each kidney is about as big as your fist.
2. Kidney filter about 113.6 to 141.95 liters of blood per day
3. They produce about 0.95 to 1.95 liters of urine each day.



## **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 liter 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:  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Cl}^-$ ,  $\text{Ca}^{2+}$ ,  $\text{H}^+$ ,  $\text{Mg}^{2+}$  and  $\text{PO}_4^{3-}$

# 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

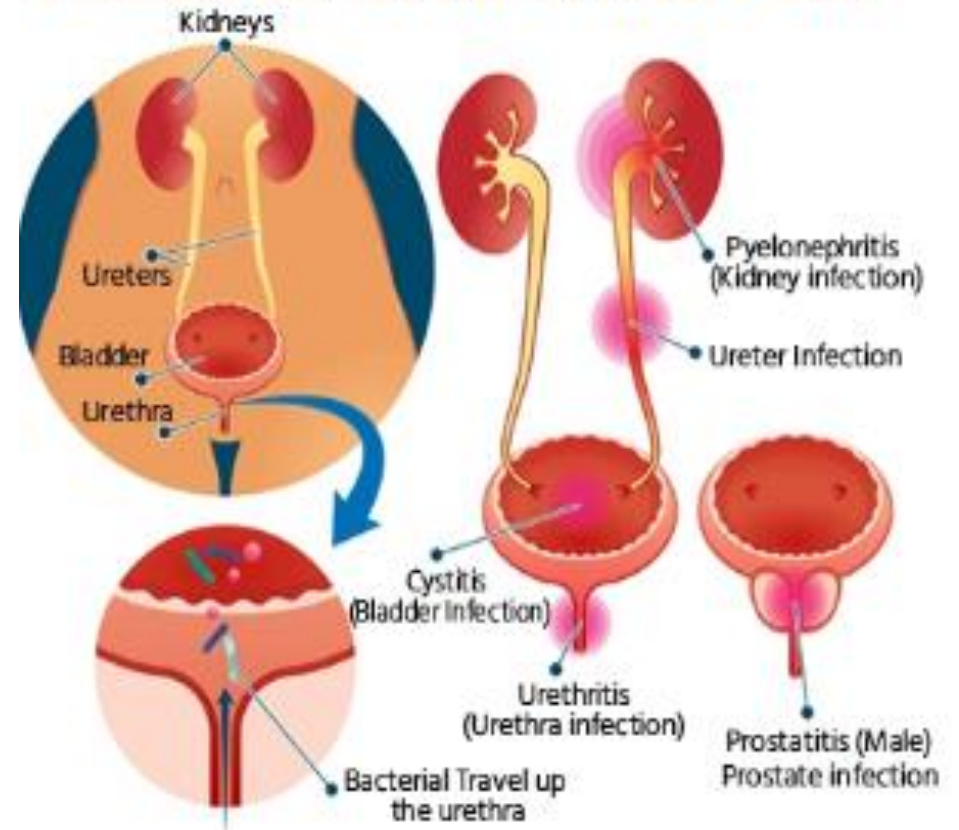
**6. Production of Hormones:** The renal system is considered a secondary endocrine gland.

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

# CONDITIONS & DISORDERS OF THE URINARY SYSTEM /01

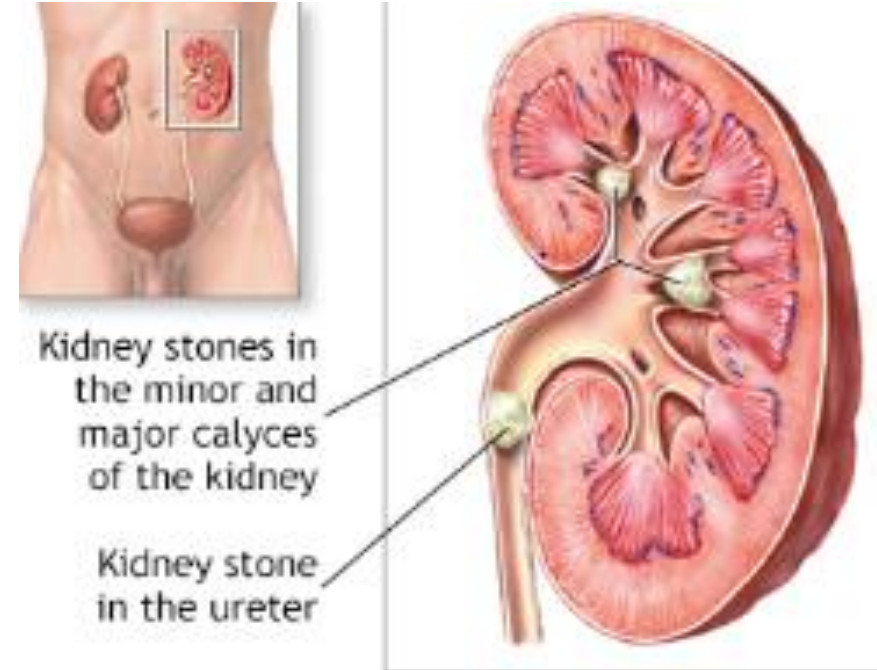
1. **Urinary tract infections and sexually transmitted infections (STIs)** can cause issues with your kidneys, urethra or bladder.

## URINARY TRACT INFECTION - UTI



# CONDITIONS & DISORDERS OF THE URINARY SYSTEM /2

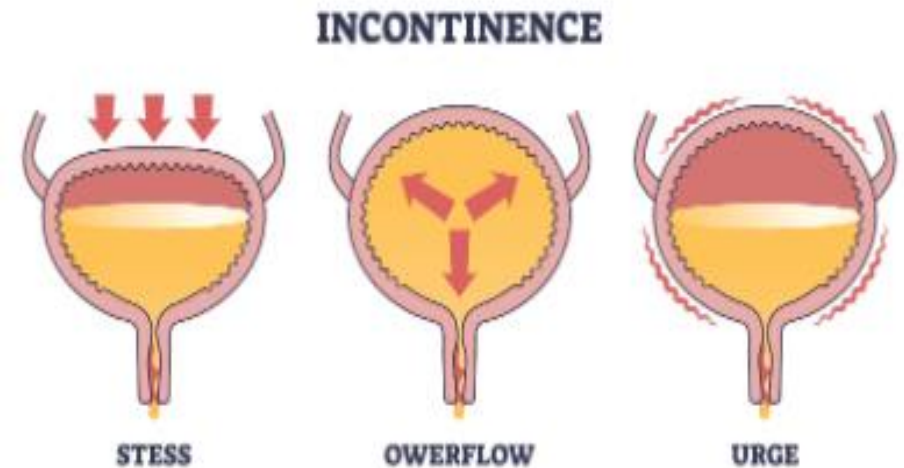
- 2. Kidney stones or ureteral stones** can cause severe pain and block the flow of pee.



# 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.



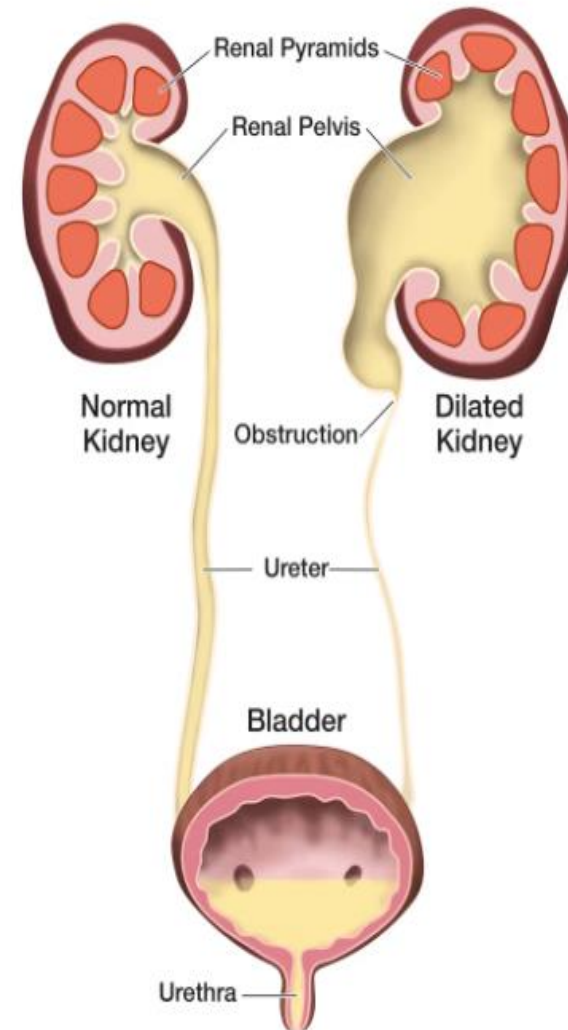
# CONDITIONS & DISORDERS OF THE URINARY SYSTEM /4

## 4. Urinary tract obstructions:

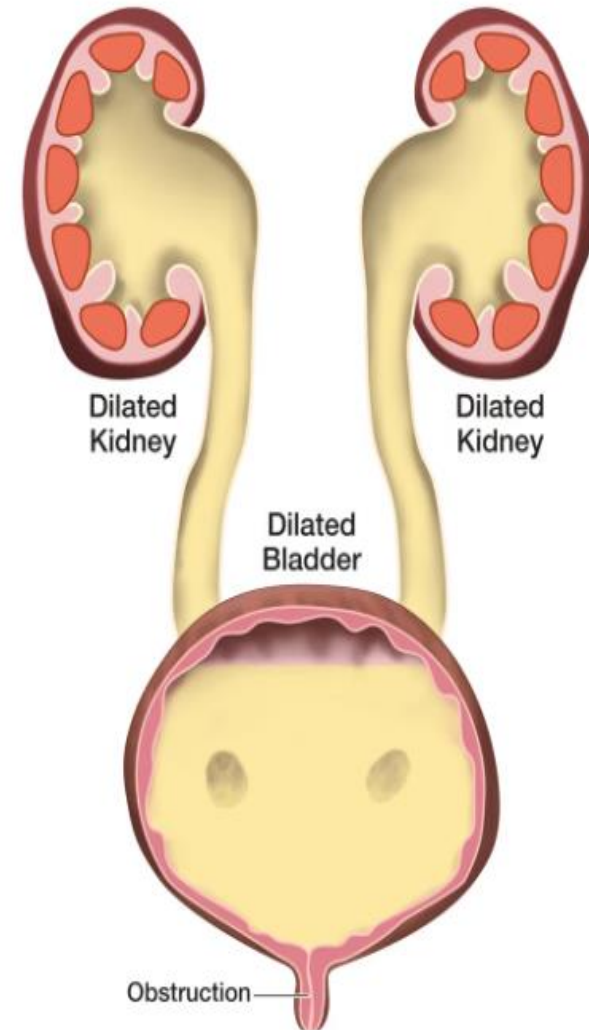
Growths or tumors in any part of your urinary tract can affect the flow of urine. An enlarged prostate can block your ureter so it's harder to pee.

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.**

