



FIRST AID LEVEL 3

SECTION 7: ANATOMY AND PHYSIOLOGY

Exit Outcomes

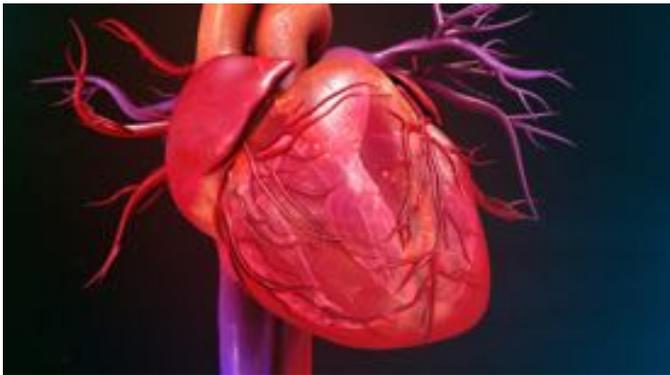
At the end of this section you will be able to:

- List three systems in the human body and describe their importance to a healthy body.
- Name five systems the brain controls.

7.1 ANATOMY

Human anatomy is the structure of the body's organs and how they are arranged to make up systems.

The heart, lungs, brain and skin make up the important organs for first aid.

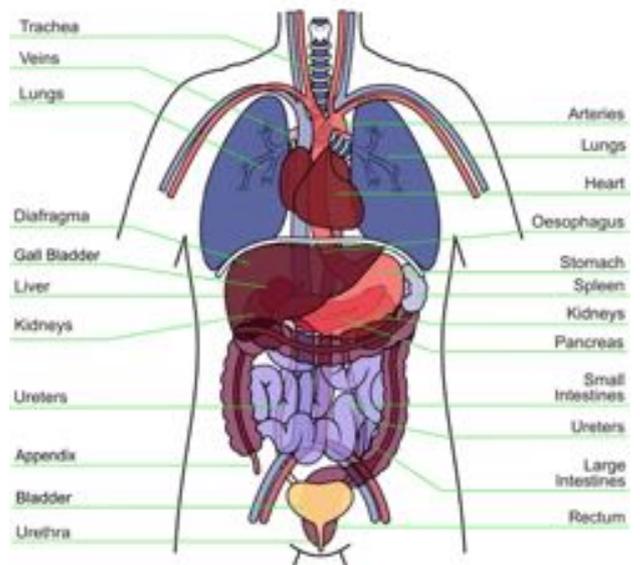


Human Heart



Human Lungs

HUMAN BODY ORGANS



Human Brain



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7.1.1 Body Systems

System	Organs Involved
Nervous system	Brain, spinal cord and nerves
Cardiovascular or circulatory system	Heart, blood vessels and blood
Respiratory system	Nose, mouth, trachea and lungs
Muscular system	Muscles
Digestive system	Mouth, throat, stomach, intestines, pancreas and liver
Urinary system	Kidneys and bladder
Skeletal system	Bones, joints and connective tissue
Integumentary system	Skin
Endocrine system	Hormones, pituitary, thyroid and adrenal glands
Lymphatic system	Lymphatic ducts, spleen, thymus gland and tonsils.



7.1.2 Body Cavities

Cavity	Organs
Cerebral cavity (or Cranium)	Brain
Thoracic cavity	Lungs, Heart, Major blood vessels, Trachea, Oesophagus
Abdominal cavity	Stomach, Pancreas, Liver, Intestines, Appendix, Gall bladder, Kidneys
Pelvic cavity	Bladder, Large intestine, Female reproductive organs
Spinal cavity	Spinal cord, Nerves



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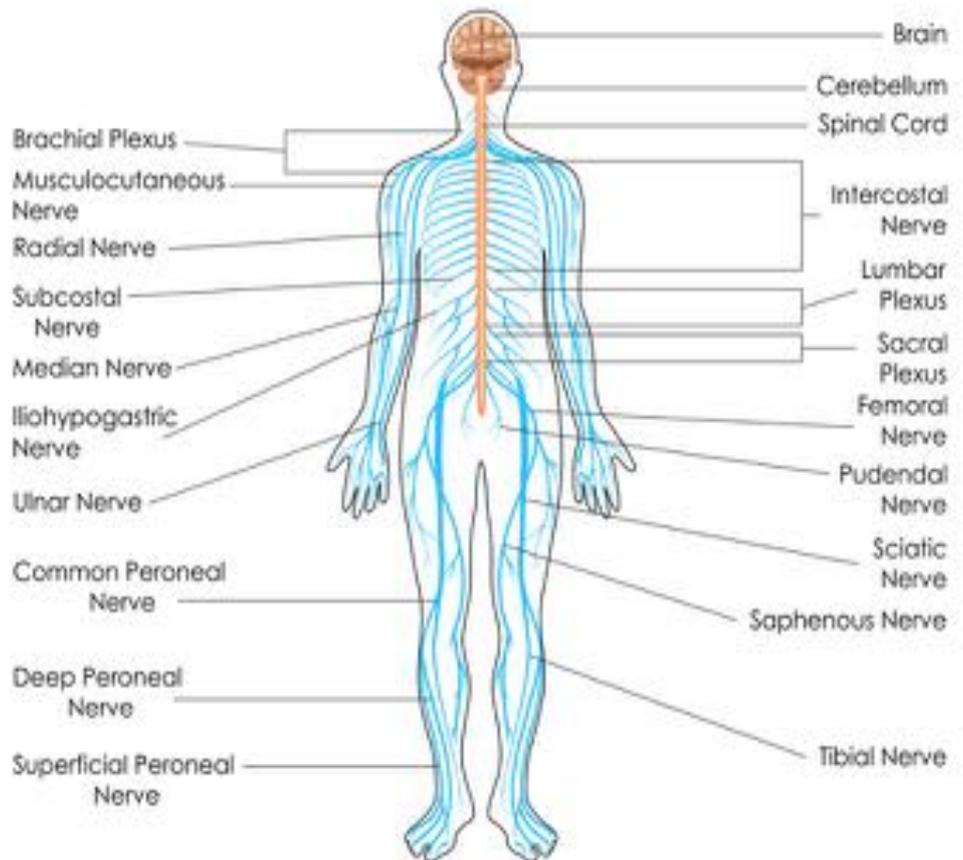
Functions of the Nervous System

The human brain controls the central nervous system (CNS) and the peripheral nervous system (PNS), by way of the twelve cranial nerves, connected to the Brain and Spinal cord.

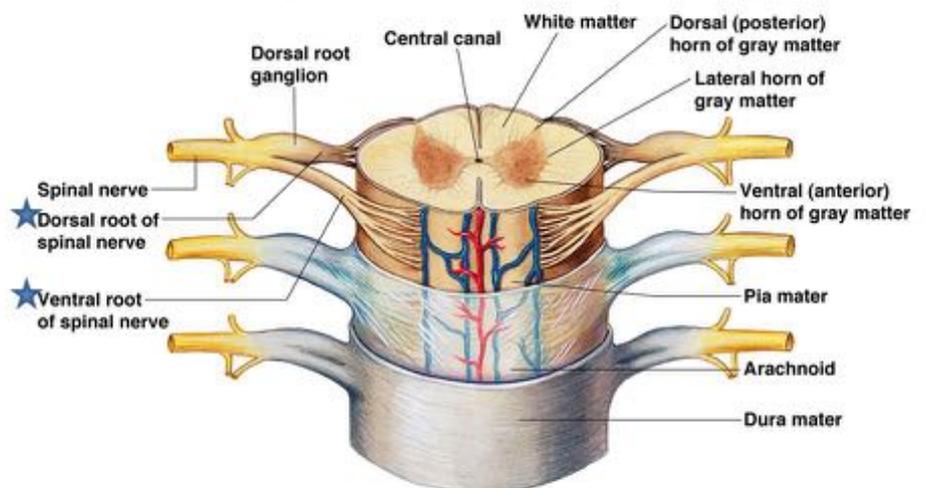
The **Autonomic Nervous System (ANS)** is the part of the peripheral nervous system that acts as a control system. The ANS affects heart rate, digestion, respiration rate, salivation, perspiration, diameter of the pupils, micturition (urination), and sexual arousal.

Whereas most of its actions are involuntary, some, such as breathing, work in tandem with the conscious mind. The ANS is usually divided into sensory (afferent) and motor (efferent) subsystems. It is classically divided into two subsystems: the parasympathetic nervous system and sympathetic nervous system.

NB: If the spinal cord is damaged through blunt force trauma, viz. a car accident, violent force, gunshot, or through an abuse of drugs, alcohol, or injected poison from a snakebite (neurotoxin-damages all nerves) it cannot be repaired.



Spinal Cord Anatomy





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7.2.2 Cardiovascular System

Structure

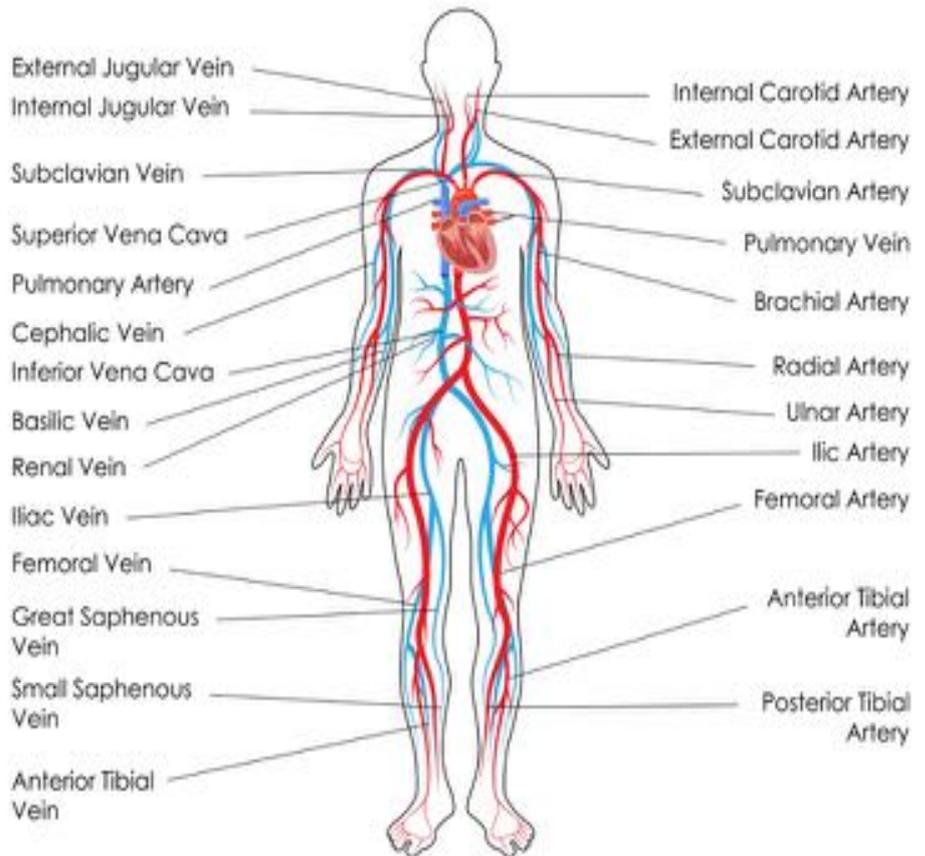
The cardiovascular (or circulatory) system consists of the heart which circulates the blood, the blood vessels that act as the passage ways for the blood and the blood itself which transports oxygen and nutrients to all the organs of the body.

Arteries are blood vessels that carry oxygenated blood and nutrients to all the body organs, tissues and cells. Veins are blood vessels that transport the blood back to the heart to receive more oxygen.

The heart is composed of cardiac muscle; an involuntary muscle tissue which is found only within this organ. The average human heart beating at 72 BPM and will beat approximately 2.5 billion times during a lifetime spanning 66 years.

In the human body, the heart is situated in the middle of the thorax. It is enclosed by a sac known as the pericardium and is surrounded by the lungs.

The heart consists of four chambers (2 Atria, 2 Ventricles). The heart receives its own supply of blood from the coronary arteries.

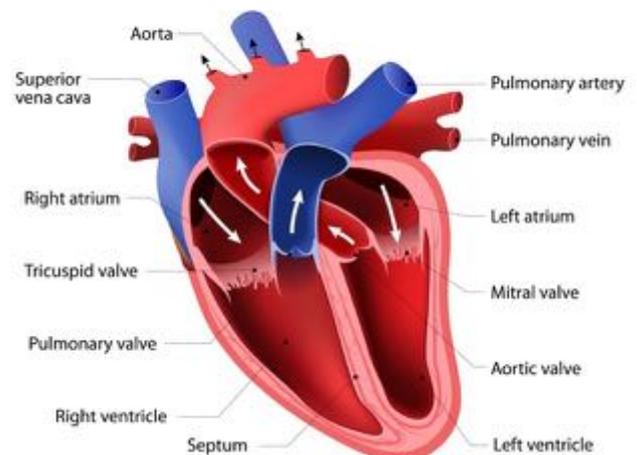


Function

The heart pumps blood 24 hours to and from all organs in the body in order to transport vital oxygen and nutrients. Blood also transports waste products, to be removed, and regulates body temperature.

When performing CPR rescuers must pause compressions to give breaths. During these pauses there is no blood flow to the heart muscle and brain. To minimize effects on blood flow, the rescuer should try to deliver the two breaths as efficiently and quickly as possible to minimize the time the compressions are interrupted.

Heart Anatomy





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7.2.3 Respiratory System

Structure:

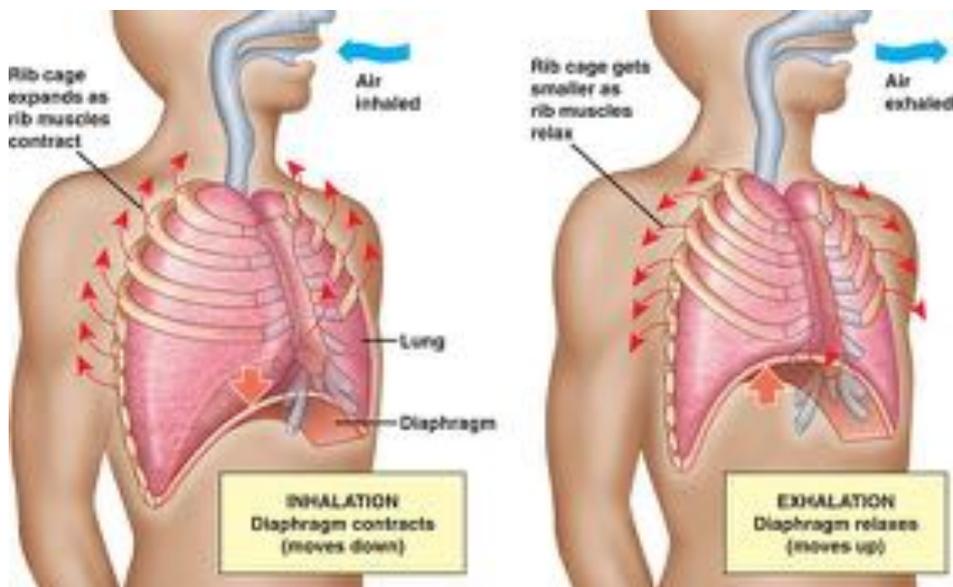
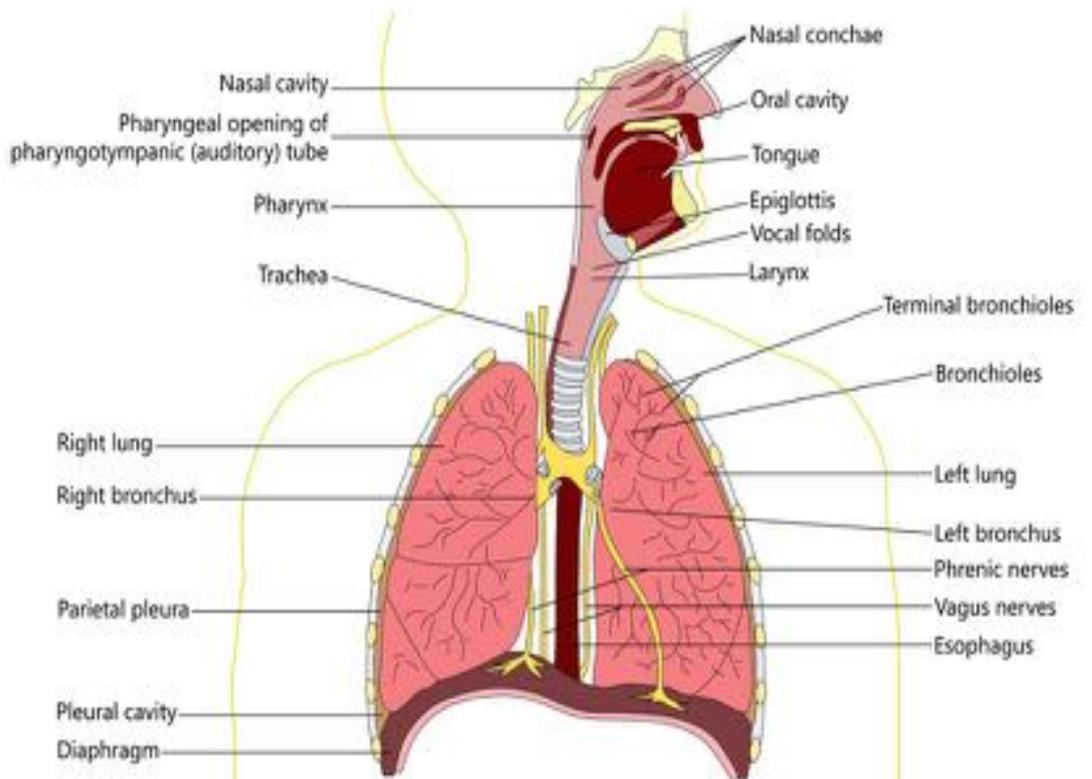
The nose, mouth, throat (Pharynx, Larynx), trachea, lungs, pulmonary circulation, diaphragm and intercostal muscles make up the respiratory system.

Function:

The lungs warm and humidify the air to 37°C (core body temperature). They allow vital oxygen to enter the body. The lungs also cleanse the air by removing waste gasses (carbon dioxide) through gaseous exchange at the space between alveoli and capillaries.

Respiration occurs under the control of the autonomic nervous system from the brain stem, the medulla oblongata and the pons.

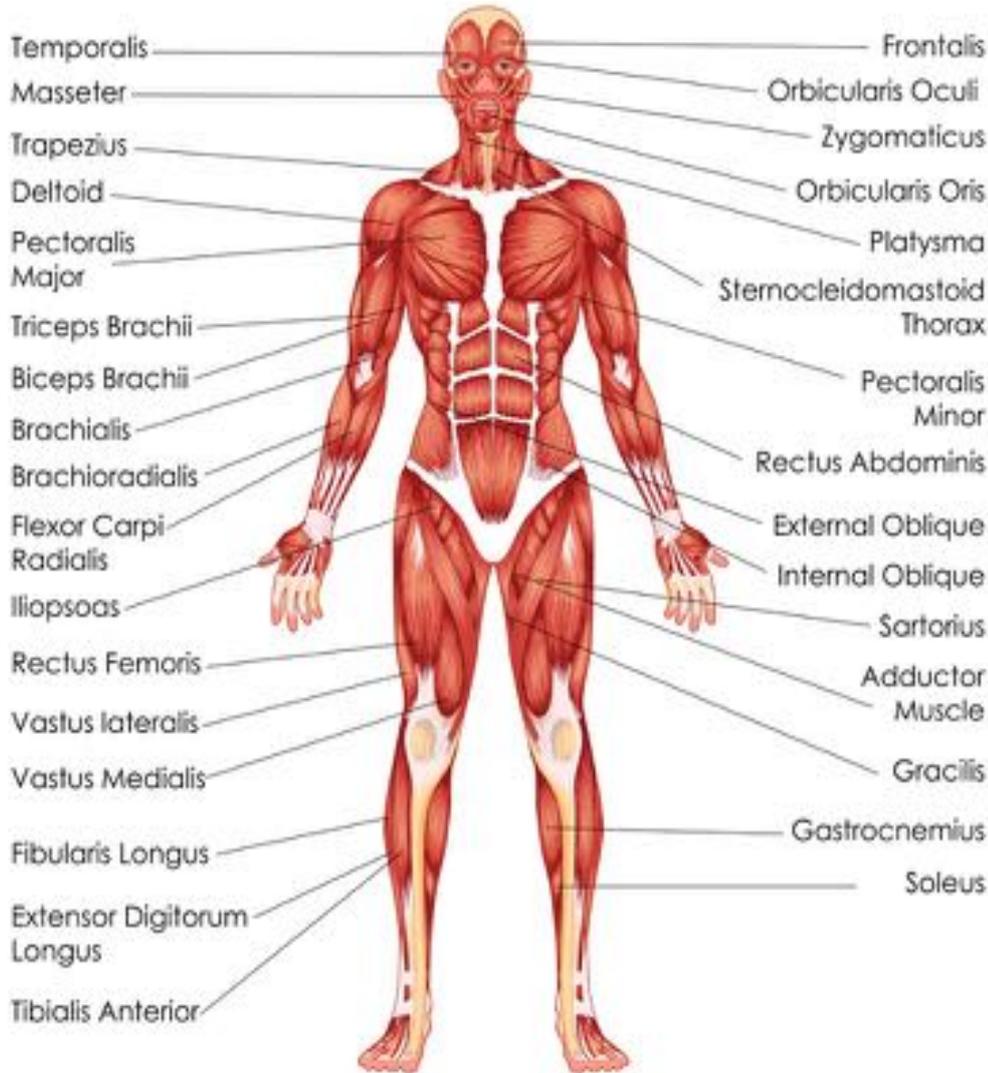
Coughing is of major importance, as it is the body's main method to remove dust, mucus, saliva, and other debris from the lungs.





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7.2.4 Muscular System



Structure

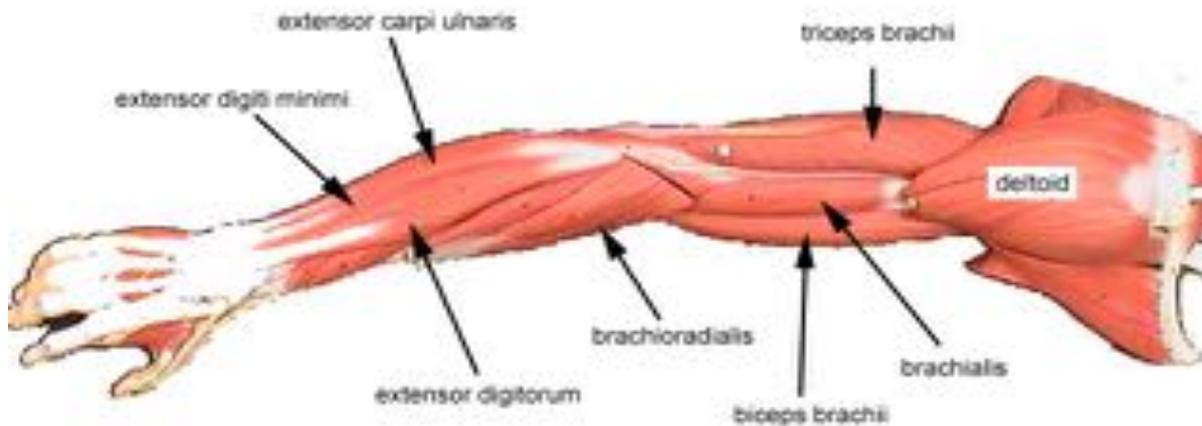
There are three distinct types of muscles: skeletal muscles (striated/Stripped) cardiac muscles, and smooth muscles (Blood vessels and hollow organs, e.g. stomach, intestines and bladder).

Function

Muscles provide strength, balance, posture, protection, movement and heat for the body to keep warm.

Muscle Facts

- Muscles make up 40% of your total body weight.
- Muscles make up 40% of your total body weight.
- It takes half as long to gain muscle than it does to lose it.



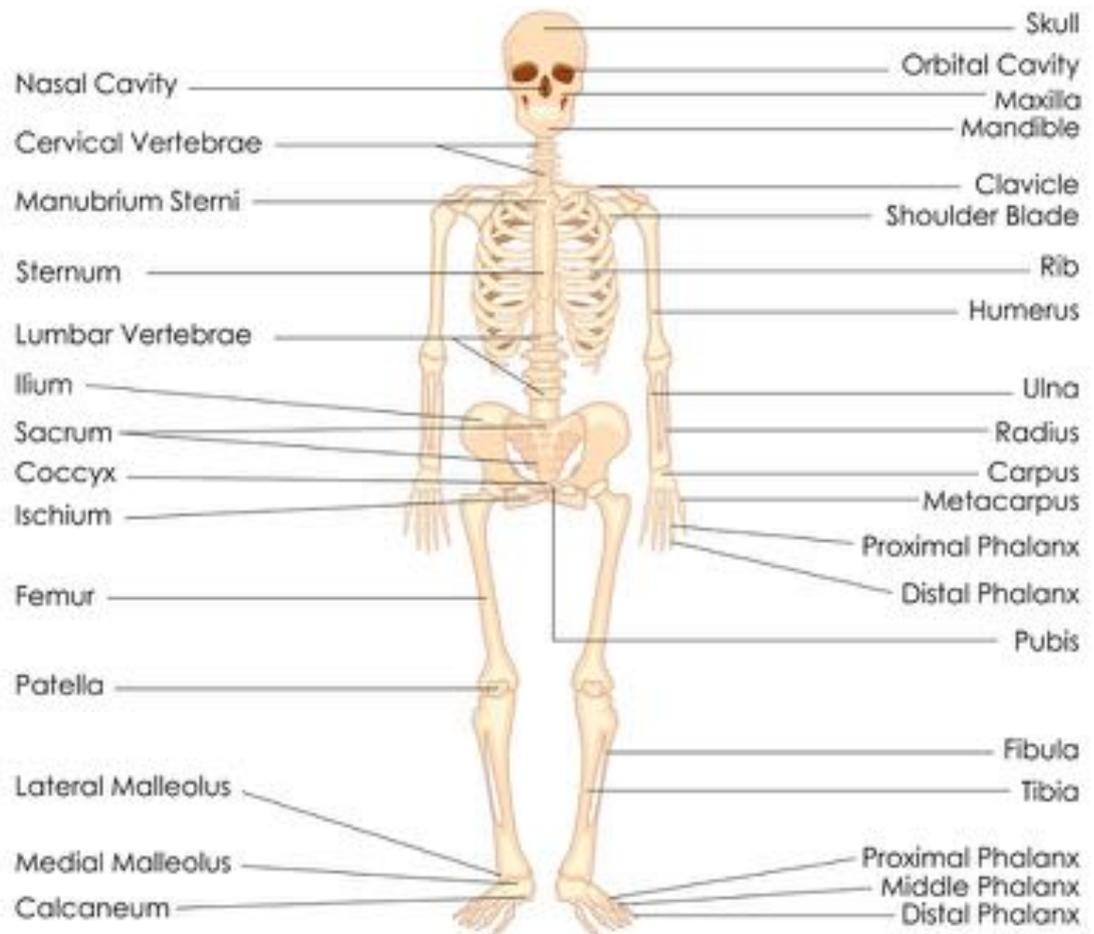


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7.2.5 Skeletal System

Structure

The average adult human skeleton has around 206 bones. These bones meet at joints, the majority of which are freely movable. The skeleton also contains cartilage for elasticity. Ligaments are strong strips of fibrous connective tissue that hold bones together at joints, thereby stabilizing the skeleton during movement.



The human skull shapes the head and face, protects the brain, and special sense organs for taste, smell, hearing, vision, and balance. It is constructed from 22 bones, 21 of which are locked together by immovable joints, to form a structure of great strength. The Skull is subdivided into 2 parts, the cranial bones and facial bones. The ribs are curved, flat bones with a slightly twisted shaft. The 12 pairs of ribs form a ribcage that protects the heart, lungs, major blood vessels, stomach, liver, and all other internal organs.

Function

The bones are also responsible for storage of minerals including Calcium (Ca) and Phosphorous (P). When required the bones release minerals into the blood- facilitating the balance of minerals.

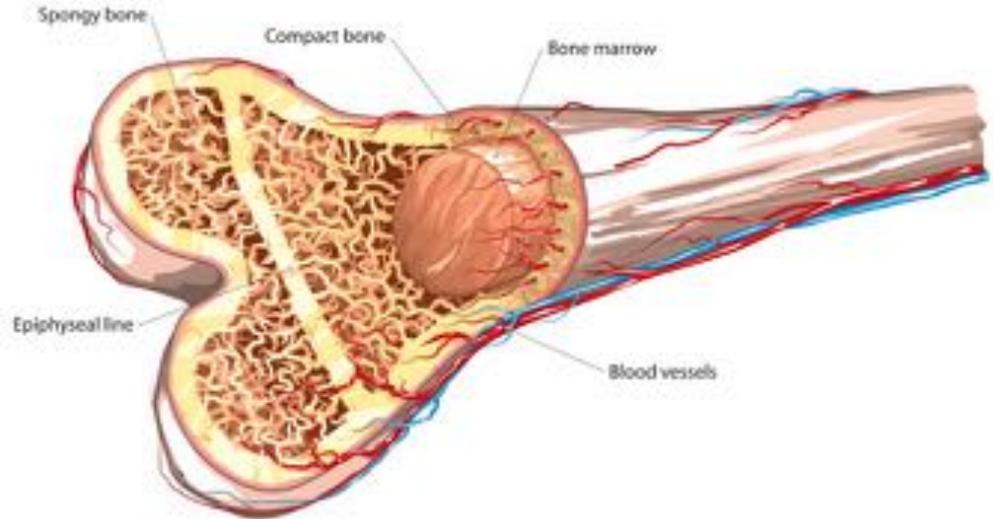




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Production of Bone Marrow

Bone marrow inside the flat bones such as the femur, hip, and shoulder blades, produces red blood cells, white blood cells and platelets (used to stop bleeding injuries). With increasing age some bone marrow changes from red to yellow bone marrow that consists mainly of adipose (fat) cells, and a therefore fewer blood cells.



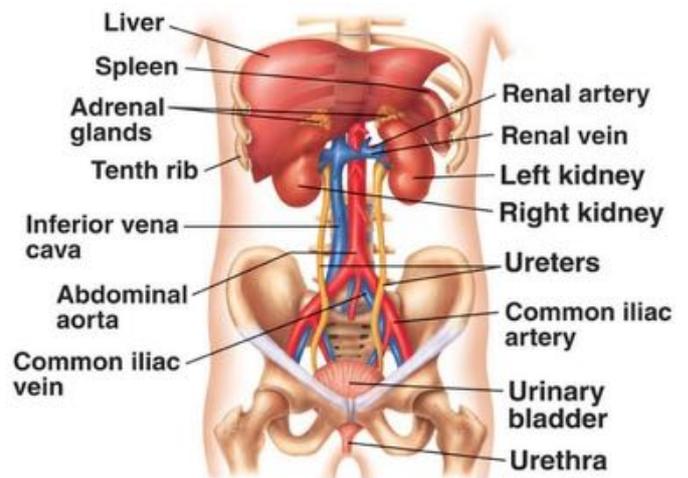
7.2.6 Urinary System

Structure

The kidneys and bladder make up the urinary system.

Function

The kidneys are the main excretory organs which maintain a vital balance of water, sodium, potassium, calcium and hydrogen ions in the blood. They also excrete a variety of metabolic waste products such as urea and uric acid. Approximately 1100mls of blood passes through the two kidneys every minute. They filter the blood and regulate the body's electrolytes and nutrients.



Facts about the urinary system

- The human bladder can stretch to hold about 400ml of urine.
- All the blood in our body is filtered 400 times through the kidneys every day.
- Nerves send signals to the brain when the bladder needs to be emptied, with this indication you will feel the urge to empty your bladder.
- The kidney can clean more than 1 million gallons of water in a lifetime, which is more than enough to fill a small lake.
- Urine is a blood by-product and is non-toxic. It contains 95% water, 2.5% urea and 2.5% of other mixtures of minerals, salts and enzymes.
- If one kidney fails to function and is removed, the other kidney can increase in size by 50% within two months to handle the entire task of filtration.



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7.2.7 Digestive System

Digestive System Organs	Secretions	Function
Mouth/Oral Cavity	Salivary Amylase secreted by the 3 salivary glands.	We chew food to break them down into smaller pieces. This provides greater surface area for the enzymes released by the salivary glands to break down carbohydrates in the food.
Oesophagus	None	The oesophagus helps move the food from the mouth down to the stomach. This it does by the process of peristalsis.
Stomach	Gastric acid, and other digestive enzymes e.g. pepsin, gastric amylase and gastric lipase	The muscles of the stomach mix the food with gastric juice and enzymes released into the stomach. The gastric juice maintains the acidic pH, so that digestion in the stomach can take place. Pepsin breaks down proteins (into amino acids), gastric amylase and gastric lipase, further breakdown carbohydrates and fats respectively.
Small Intestine	Bile and pancreatic enzymes secreted by the pancreas, intestinal enzymes.	It is in the small intestine that digestion is completed and all the nutrients (present in their simplest form) are absorbed by blood through the walls of the small intestine. Bile secreted by the pancreas liquifies fat, so that it can be absorbed. The pancreatic and intestinal enzymes complete the final stage of digestion of proteins, fats and carbohydrates.
Large Intestine/Colon	None	The large intestine is mainly involved with the absorption of water and electrolytes from the undigested substance that it receives from the small intestine. It also stores this undigested material until it is ready to be excreted from the body through the rectum and the anus.

