Anatomy & Physiology (Part 1)
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Overview

Homeostasis
Osmoregulation
Digestion
Respiratory System
Circulatory System
Homeostasis

- The ability for the body to maintain its internal environment
  - e.g., temperature, blood pressure, respiration, heart beat, water balance (osmoregulation)
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Osmoregulation

- The human excretory system is made up of the kidneys, ureter, urinary bladder, and urethra.
- The kidneys filter blood and form urine, which is stored in the bladder until it is eliminated through the urethra.
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Osmoregulation

- Renal Artery
  - Delivers blood through many branches to microscopic filtering units called nephrons
- Renal Vein
  - Returns filtered blood from the kidney to the body’s circulation
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Osmoregulation

- Nephron
  - Bowman’s Capsule
    - Glomerulus (capillary bed)
  - Proximal Convoluted Tubule
  - Loop of Henle
  - Distal Convoluted Tubule
  - Collecting Duct
- Nephron removes wastes as urine which is delivered to the collecting duct for removal from the kidney
Digestion

- Foods are ingested
- Carbohydrates, proteins, lipids, and nucleic acids are broken down to their basic building blocks
  - Carbohydrates > simple sugars
  - Proteins > amino acids
  - Lipids > fatty acids
  - Nucleic acids > nucleotides
- These basic building blocks are transported via the blood to every cell in the body
- Body cells use these building blocks to make their own carbohydrates, proteins, lipids, and nucleic acids
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Digestion
- Oral cavity (mouth)
- Pharynx (throat)
- Esophagus
- Stomach
- Small Intestine
  - Duodenum
  - Jejunum
  - Ileum
- Large Intestine (colon)
  - Ascending colon
  - Transverse colon
  - Descending colon
  - Sigmoid colon
  - Rectum
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Digestion
- Oral cavity (mouth)
  - Digestion begins here
  - Teeth grind food down and mix in saliva
  - Amylase in the saliva starts breaking down carbohydrates
  - Tongue throws the food into the pharynx
- Pharynx
  - Funnels food down to the esophagus
Digestion

- Esophagus
  - Propels food down to the stomach by peristalsis
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Digestion

- **Stomach**
  - Stores pre-digested food
  - Stomach acids begin protein breakdown
  - Acids act to destroy microorganism attempting to enter the body
  - Feeds food into the small intestine
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Digestion

- Small Intestine
  - Duodenum
  - Jejunum
  - Ileum
    - Most of the nutrients in food are absorbed into the bloodstream here
    - Pancreas supplies digestive enzymes to properly digest sugars, proteins, fats, and nucleic acids
    - Gall bladder supplies bile to help break down fats
    - Liver detoxifies the blood on its way to the body from the small intestine
    - Digested food moves on to the large intestine
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Digestion

- Large Intestine (Colon)
  - Ascending colon
  - Transverse colon
  - Descending colon
  - Sigmoid colon
  - Rectum
  - Water, salts, vitamins are absorbed here
  - Bacteria (normal flora) line the large intestine to aid in digestion and help with your immune system
  - Rectum stores post-digested food and voids same from the body via a defecation reflex
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Respiration

- Air enters the respiratory system through the nasal cavity, and then passes through the pharynx and the trachea into the lungs.
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Respiration

- At the lung
  - Gases are exchanged between the air in the lungs and the blood at the alveoli
    - Carbon dioxide leaves blood for the alveoli
    - Oxygen leaves the alveoli for the blood

- At the cells
  - Carbon dioxide leaves the cells for the blood
  - Oxygen leaves the blood for the cells
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Circulation

- The heart is divided into four chambers, two atria, and two ventricles
- Each chamber is separated by one-way valves
- The right side of the heart receives deoxygenated blood from the body and pumps it to the lungs
- The left side of the heart pumps blood to the rest of the body
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Circulation

- **Cardiac Cycle**
  - In each cardiac cycle, a series of contractions (systoles) and relaxations (diastoles) pumps blood through the heart and through the body.
  - During cardiac diastole, blood flows into the heart while all chambers are relaxed.
  - Then the ventricles remain relaxed while atrial systole pushes blood into the ventricles.
  - Once the atria relax again, ventricle systole pushes blood out of the heart.
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Circulation

- **Blood Vessels**
  - The arteries of the body, indicated in red, start at the aortic arch and branch to supply the organs and muscles of the body with oxygenated blood.
  - The veins of the body, indicated in blue, return blood to the heart.
  - The pulmonary arteries are blue to reflect the fact that they are deoxygenated, and the pulmonary veins are red to reflect that they are oxygenated.