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The Digestive System

- **Foundation Standard 1: Academic Foundation**

  Understand human anatomy, physiology, common diseases and disorders, and medical math principles.

1.13 Analyze basic structures and functions of human body systems

- Structures of the gastrointestinal tract
- Functions of the gastrointestinal tract
- Structures of the accessory organs
- Functions of the accessory organs
- Chemical digestion
- Mechanical digestion

1.21 Describe common diseases and disorders of each body system

- Etiology
- Pathology
- Diagnosis
- Treatment
- Prevention

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Digestion

- The breaking down of large food molecules into molecules small enough to be used by the body's cells for growth, repair, and energy production
- Digestive Processes:
  - Ingestion
  - Digestion
    - Mechanical Digestion
    - Chemical Digestion
  - Absorption
  - Defecation

1.13 Analyze basic structures and functions of human body systems (digestive).
j. Digestive (structures and functions of gastrointestinal tract, chemical and mechanical digestion, structures and functions of accessory organs)

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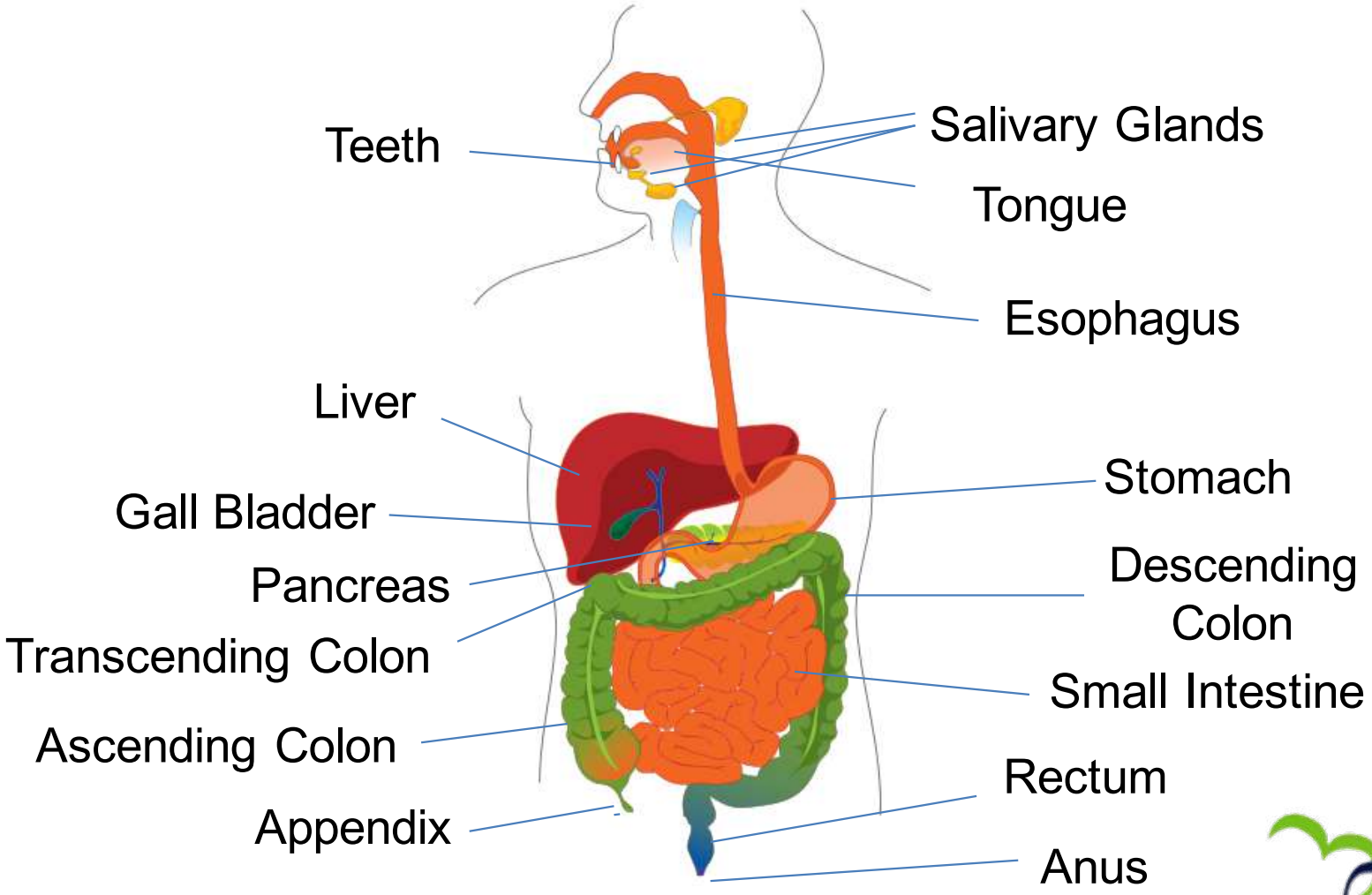
The Digestive System



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The Digestive System

- **Gastrointestinal Tract**
- **Alimentary Canal**
  - A continuous tube running through the ventral body cavity extending from the mouth to the anus.

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j. Digestive (structures)

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Digestion

The breakdown of food so that its nutrients can be used by the body for:

- **Energy**
- **Growth**
- **Cell repair**
- **Types of digestion**
  - Mechanical
  - Chemical

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j. Digestive (functions of gastrointestinal tract, chemical and mechanical digestion)

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The Digestive System

Organs of the Digestive System

- mouth
- pharynx
- esophagus
- stomach
- small intestine
- large intestine

Accessory Organs of the Digestive System

- teeth
- tongue
- salivary glands
- liver
- gallbladder
- pancreas

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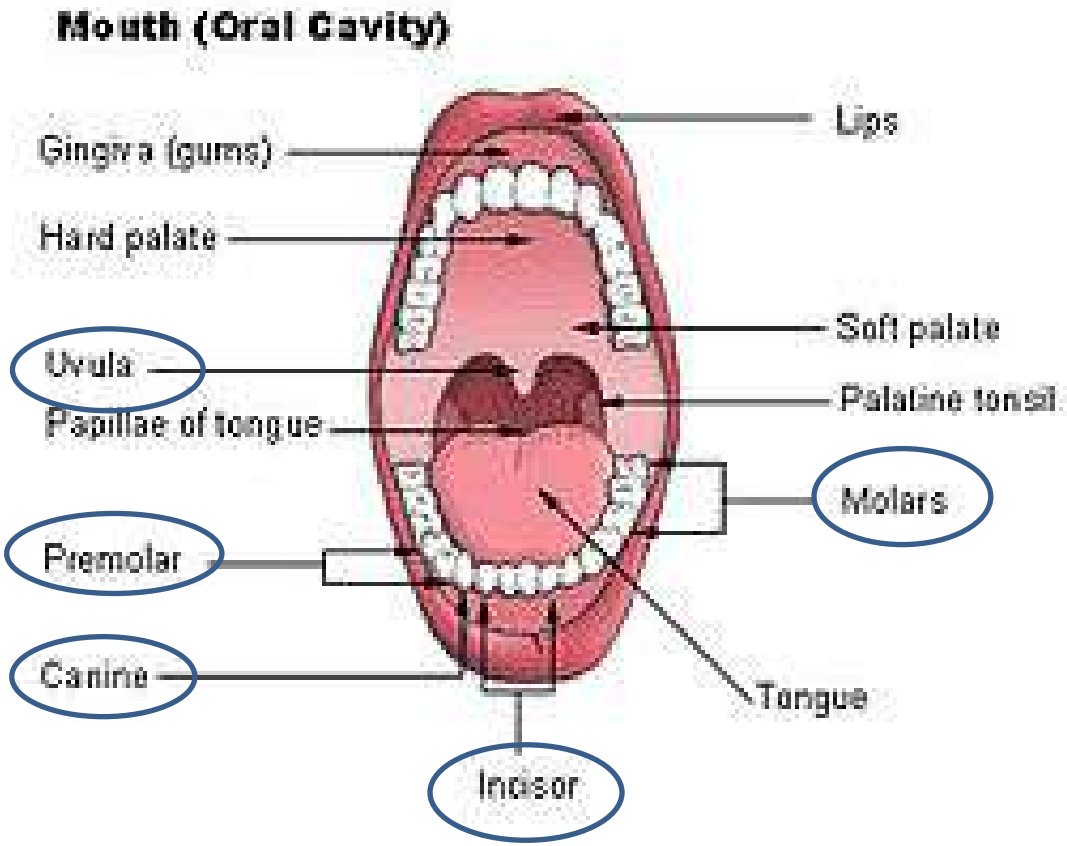
Mouth (Oral or Buccal Cavity)

- Teeth
- Hard Palate
- Soft Palate
  - Uvula
- Tongue
- Uvula
- Salivary glands



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Teeth

Accessory structures of the digestive system

- Deciduous teeth (baby teeth) - 20
- Permanent teeth - 32
  - ***Incisors (8)*** - 4 on top, 4 on bottom
    - ✓ chisel shaped - front of mouth
  - ***Canines (4)*** - 2 on top, 2 on bottom
    - ✓ sharp pointed tearing teeth
  - ***Premolars (8)*** - 4 on top, 4 on bottom
  - ***Molars (12)*** - 6 on top, 6 on bottom
    - ✓ broad, flat, crushing teeth

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Mechanical Digestion

- Starts in the mouth
- Chewing (***mastication***)
  - tongue manipulates and mixes the food
  - teeth grind up the food and mix it with saliva
- Produces a soft flexible mass of food called a ***bolus***.

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Chemical Digestion:

- **Salivary glands**
  - Secrete saliva
    - ✓ ***Salivary amylase*** digestive enzyme
  - Begins carbohydrate digestion in the mouth
  - Lysozyme
    - ✓ Destroys bacteria in the mouth

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Mechanical Digestion Swallowing

- **Deglutition**
  - Moving food from the mouth (pharynx) to the stomach through the esophagus
- **Peristalsis**
  - Contraction of the esophagus

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Stomach

Cardia

- Cardiac region, cardiac sphincter
- Area of the stomach that surrounds the lower esophageal sphincter.

Fundus

- Rounded, superior portion of the stomach to the left of the cardia.

Body

- Large central portion of the stomach

Pylorus

- Narrow, inferior region of the stomach
  - ***pyloric sphincter*** - opening to the duodenum

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Mechanical Digestion

- **Rugae** allow expansion of stomach
- **Maceration** - mixing waves that churns the food inside
- **Chyme** - food mixes with gastric juices and is converted into a thin liquid

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Chemical Digestion

- Secrete digestive enzymes and mucus
  - **Pepsin** - digestion of ***proteins***, chief cells
  - **Hydrochloric acid** (**HCl**) - activates other enzymes, parietal cells
  - **Intrinsic Factor** - needed to absorb Vitamin B_{12}
  - **Mucus** - protects the stomach mucosa from the acidic environment

1.13 Analyze basic structures and functions of human body systems (digestive,).
j. Digestive (chemical)

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Chemical Digestion:
Absorption - Stomach

- Does not participate in the absorption of food molecules into the blood.
- However, can absorb some substances through the stomach wall.
  - water
  - weak glucose concentrations
  - electrolytes
  - certain drugs (aspirin)
  - alcohol

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Small Intestine

- Chemical digestion of nutrients and absorption of nutrients is completed in the small intestines
  - Duodenum
  - Jejunum
  - Ileum

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a. j. Digestive (structures and functions of gastrointestinal tract, chemical and mechanical digestion)

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Small Intestine

Duodenum

- The beginning of the small intestine
- Attached to the stomach
- First 12 to 14 inches

Jejunum

- Portion of the small intestine after the duodenum
- Normally about 8 ft. long

Ileum

- Final portion of the small intestine
- About 12 ft. long
- Illeocecal valve (sphincter)
  - prevents backflow of feces

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j. Digestive (structures of gastrointestinal tract)

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Chemical Digestion

- ***Chemical digestion*** and ***absorption*** is ***completed***
- Result of the collective effort of pancreatic juice, bile, and intestinal juice.
- Results in ***absorption*** - passage of digested nutrients into the blood sugars and amino acids or lymph (lipids).

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Absorption

- Villi- folds in the intestinal walls of the mucosa layer of tissue .
- Microvilli- extensions of villi
  - Contain capillaries (absorb sugars and amino acids) and lacteals (absorb glycerol and fatty acids → chyle → lymph

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j. Digestive (functions of gastrointestinal tract)

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Pancreas

- Alkaline mixture of fluid and digestive enzymes from the acini cells.
- Pancreatic Digestive Enzymes:
  - Pancreatic Amylase – ***Carbohydrate*** digestion
  - Pancreatic Lipase - ***Fat*** digestion
  - Chymotrypsin –Trypsin – Carboxypeptidase - ***Protein*** digestion
  - Nucleases - ***Nucleic Acid*** digestion

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j. Digestive (chemical digestion, functions of accessory organs)

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Liver

Produces and secretes a liquid called ***bile***

- Yellowish, brownish, or olive green
- 1 quart daily
- Composed of bile salts and pigments (colors), lecithin, and several ions
- pH of 7.6 - 8.6
- Excretory product and digestive secretion
- Assists in the breakdown of ***fat*** molecules (***emulsification***)
- Principle bile pigment is ***bilirubin***

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j. Digestive (functions of accessory organs)

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Gallbladder

- A pear shaped sac
- About 7 - 10 cm long
- Located on the bottom surface of the liver
- Stores and concentrates bile until needed by the small intestine for the emulsification of fat

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j. Digestive (structures and functions of accessory organs)

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Large Intestine

- About 1.5 m (5 ft) in length
- **Cecum** - beginning of the large intestine
  - Vermiform ***Appendix***
- **Colon** - large tube-like portion of large intestine
  - ***ascending*** colon
  - ***transverse*** colon
  - ***descending*** colon
  - ***sigmoid*** colon
- **Rectum**
- **Anal canal → Anus**

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Large Intestine

- Completes absorption
- Absorption of water
- Manufacture certain vitamins
- Formation of feces
- Expulsion of feces from the body
  - Diarrhea - feces moves too fast, water not absorbed
  - Constipation - feces stays too long, too much water absorbed

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j. Digestive (functions of gastrointestinal tract,)

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Diseases and Disorders

- Appendicitis
- Cirrhosis of the liver
- Cholelithiasis
- Hepatitis
- Peptic Ulcers
- Inguinal Hernia

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Appendicitis

- Inflammation of the vermiform appendix.
- May be caused by an obstruction of the lumen of the appendix by fecal material, a foreign body, stenosis, a kinking of the organ, or carcinoma.

1.21 Describe common diseases and disorders of each body system (such as: hepatitis, ulcers).
a. Etiology, b. Pathology, c. Diagnosis, d. Treatment, e. Prevention

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Cirrhosis of the Liver

- Distorted or scarred liver tissue due to chronic inflammation.
- Commonly caused by hepatitis, chemical exposure, parasites, and alcoholism.
- Symptoms include: jaundice, bleeding, edema, and increased sensitivity to drugs and chemicals.

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Cholelithiasis (Gall Stones)

- Crystallization of bile in the gallbladder.
- Can block the bile duct causing intense pain (Cholecystitis)
- Usually treated with gall stone dissolving drugs, lithotripsy, or surgery

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Hepatitis

- Inflammation of the liver
- Can be caused by viruses, drugs, and certain chemicals including steroids and alcohol.
- Many different types of Hepatitis including:
  - Hepatitis A (food)
  - Hepatitis B (body fluids), can lead to cirrhosis and liver cancer
  - Hepatitis C (body fluids), can lead to cirrhosis and liver cancer

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Peptic Ulcers

- Crater-like lesions that develop in the gastrointestinal tract.
- Gastric Ulcers → Stomach
- Duodenal Ulcers → Duodenum
- Commonly caused by hypersecretion of gastric juices and acids.
- Contributing factors include:
  - stress, cigarette smoking, certain foods, some medications, and bacterial infections. (*Helicobacter pylori*)

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Inguinal Hernia

- Part of the intestine protrudes through a weak point or tear in the abdominal wall.
- This protrusion creates a bulge which can be painful.
- Some inguinal hernias occur at birth when the abdominal lining does not close properly.
- Other inguinal hernias occur later in life when muscles weaken or deteriorate.
- The most common treatment is surgery.

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