

## The Digestive System and Body Metabolism

### Functions

- \_\_\_\_\_—taking in food
- Digestion—breaking food down both physically and chemically
- \_\_\_\_\_—movement of nutrients into the bloodstream
- Defecation—rids the body of indigestible waste

### Organs

- Two main groups
  - **Alimentary canal** (gastrointestinal or GI tract)—continuous coiled hollow tube
  - **Accessory** digestive organs

### Organs of the Alimentary Canal

- Mouth
- Pharynx
- Esophagus
- Stomach
- Small intestine
- Large intestine
- Anus

### Mouth (Oral Cavity) Anatomy

- Lips—protect the anterior opening
- \_\_\_\_\_—form the lateral walls
- Hard palate—forms the anterior roof
- Soft palate—forms the posterior roof
- Uvula—fleshy projection of the soft palate
- \_\_\_\_\_—space between lips externally and teeth and gums internally
- Oral cavity proper—area contained by the teeth
- Tongue—attached at hyoid bone and styloid processes of the skull, and by the lingual frenulum to the floor of the mouth
- Tonsils
  - Palatine
  - Lingual

### Mouth Physiology

- \_\_\_\_\_ (chewing) of food
- Mixing masticated food with saliva
- Initiation of swallowing by the tongue
- Allows for the sense of \_\_\_\_\_

### Pharynx Physiology

- Serves as a passageway for air and food
- Food is propelled to the esophagus by two muscle layers
  - Longitudinal inner layer
  - \_\_\_\_\_ outer layer

- Food movement is by alternating contractions of the muscle layers (\_\_\_\_\_)

### Esophagus Anatomy and Physiology

- Anatomy
  - About \_\_\_\_ inches long
  - Runs from pharynx to stomach through the diaphragm
- Physiology
  - Conducts food by peristalsis (slow rhythmic squeezing)
  - Passageway for food only (respiratory system branches off after the pharynx)

### Layers of Alimentary Canal Organs

- Four layers
  - \_\_\_\_\_
  - Submucosa
  - Muscularis externa
  - Serosa
- Mucosa
  - Innermost, moist membrane consisting of
    - Surface epithelium
    - Small amount of \_\_\_\_\_ tissue (lamina propria)
    - Small smooth muscle layer
- Submucosa
  - Just beneath the mucosa
  - Soft connective tissue with blood vessels, nerve endings, and \_\_\_\_\_
- Muscularis externa—smooth muscle
  - Inner circular layer
  - Outer longitudinal layer
- \_\_\_\_\_—outermost layer of the wall contains fluid-producing cells
  - Visceral peritoneum—outermost layer that is continuous with the innermost layer
  - Parietal peritoneum—innermost layer that lines the abdominopelvic cavity

### Alimentary Canal Nerve Plexuses

- Two important nerve plexuses serve the alimentary canal
- Both are part of the \_\_\_\_\_ nervous system
  - Submucosal nerve plexus
  - Myenteric nerve plexus
- Function is to regulate mobility and \_\_\_\_\_ activity of the GI tract organs

### Stomach Anatomy

- Located on the left side of the abdominal cavity
- Food enters at the \_\_\_\_\_ sphincter
- Food empties into the small intestine at the \_\_\_\_\_ sphincter (valve)
- Regions of the stomach
  - Cardiac region—near the heart
  - Fundus—expanded portion lateral to the cardiac region
  - Body—midportion
  - Pylorus—funnel-shaped terminal end
- \_\_\_\_\_—internal folds of the mucosa
- External regions
  - Lesser curvature—concave \_\_\_\_\_ surface
  - Greater curvature—convex lateral surface

- Layers of peritoneum attached to the stomach
  - Lesser omentum—attaches the liver to the lesser curvature
  - Greater omentum—attaches the greater curvature to the posterior body wall
    - Contains \_\_\_\_\_ to insulate, cushion, and protect abdominal organs
    - Has lymph nodules containing \_\_\_\_\_.

#### Stomach Physiology

- Temporary storage tank for food
- Site of food breakdown
- Chemical breakdown of protein begins
- Delivers \_\_\_\_\_ (processed food) to the small intestine

#### Structure of the Stomach Mucosa

- Mucosa is simple \_\_\_\_\_ epithelium
- Mucous neck cells—produce a sticky \_\_\_\_\_ mucus
- Gastric glands—situated in gastric pits and secrete gastric juice
- Chief cells—produce protein-digesting enzymes (pepsinogens)
- Parietal cells—produce \_\_\_\_\_ acid
- Enteroendocrine cells—produce gastrin

#### Small Intestine

- The body's major \_\_\_\_\_ organ
- Site of nutrient \_\_\_\_\_ into the blood
- Muscular tube extending from the pyloric sphincter to the ileocecal valve
- Suspended from the posterior abdominal wall by the mesentery

#### Subdivisions of the Small Intestine

- \_\_\_\_\_
  - Attached to the stomach
  - Curves around the head of the pancreas
- \_\_\_\_\_
  - Attaches anteriorly to the duodenum
- \_\_\_\_\_
  - Extends from jejunum to large intestine

#### Chemical Digestion in the Small Intestine

- Chemical digestion begins in the small intestine
  - Enzymes are produced by
    - Intestinal cells
    - \_\_\_\_\_
  - Pancreatic ducts carry enzymes to the small intestine

- Bile, formed by the \_\_\_\_\_, enters via the bile duct

### Small Intestine Anatomy

- Three structural modifications that increase surface area
  - \_\_\_\_\_—tiny projections of the plasma membrane (create a brush border appearance)
  - Villi—fingerlike structures formed by the mucosa
  - Circular folds (plicae circulares)—deep folds of mucosa and submucosa

### Large Intestine

- Larger in \_\_\_\_\_, but shorter in length, than the small intestine
- Frames the internal abdomen

### Large Intestine Anatomy

- \_\_\_\_\_
  - Ascending—travels up right side of abdomen
  - Transverse—travels across the abdominal cavity
  - Descending—travels down the left side
  - Sigmoid—enters the pelvis
- Rectum and anal canal—also in pelvis
- Anus—opening of the large intestine
  - External anal sphincter—formed by \_\_\_\_\_ muscle and under voluntary control
  - Internal involuntary sphincter—formed by \_\_\_\_\_ muscle
  - These sphincters are normally closed except during defecation
- No villi present
- Goblet cells produce alkaline mucus which lubricates the passage of feces
- Muscularis externa layer is reduced to three bands of muscle called teniae coli

### Accessory Digestive Organs

- Teeth
- \_\_\_\_\_ glands
- Pancreas
- Liver
- Gallbladder

### Teeth

- Function is to \_\_\_\_\_ (chew) food
- Humans have two sets of teeth
  - Deciduous (baby or “milk”) teeth
    - \_\_\_\_\_ teeth are fully formed by age two
- Permanent teeth
  - Replace deciduous teeth between the ages of \_\_\_\_\_ and \_\_\_\_\_
  - A full set is \_\_\_\_\_ teeth, but some people do not have wisdom teeth (third molars)
  - If they do emerge, the wisdom teeth appear between ages of 17 and 25

### Classification of Teeth

- Incisors—cutting
- \_\_\_\_\_—tearing or piercing
- Premolars—grinding
- Molars—grinding

### Regions of a Tooth

- \_\_\_\_\_—exposed part
  - Enamel—hardest substance in the body
  - Dentin—found deep to the enamel and forms the bulk of the tooth
  - Pulp cavity—contains connective tissue, blood vessels, and nerve fibers
  - Root canal—where the pulp cavity extends into the root
- \_\_\_\_\_
  - Region in contact with the gum
  - Connects crown to root
- \_\_\_\_\_
  - Cementum—covers outer surface and attaches the tooth to the periodontal membrane

### Salivary Glands

- \_\_\_\_\_ pairs of salivary glands empty secretions into the mouth
  - Parotid glands
  - Submandibular glands
  - Sublingual glands

### Saliva

- Mixture of \_\_\_\_\_ and serous fluids
- Helps to form a food \_\_\_\_\_
- Contains salivary amylase to begin starch digestion
- Dissolves chemicals so they can be tasted

### Pancreas

- Found posterior to the parietal peritoneum
- Extends across the abdomen from spleen to duodenum
- Produces a wide spectrum of digestive \_\_\_\_\_ that break down all categories of food
- Enzymes are secreted into the duodenum
- Alkaline fluid introduced with enzymes neutralizes acidic chyme coming from stomach
- Hormones produced by the pancreas
  - \_\_\_\_\_
  - Glucagon

### Liver

- Largest \_\_\_\_\_ in the body
- Located on the right side of the body under the diaphragm
- Consists of four lobes suspended from the diaphragm and abdominal wall by the falciform ligament

- Connected to the \_\_\_\_\_ via the common hepatic duct

## Bile

- Produced by cells in the liver
- Composition is
  - Bile salts
  - Bile pigments (mostly \_\_\_\_\_ from the breakdown of hemoglobin)
  - Cholesterol
  - Phospholipids
  - Electrolytes
- Function—emulsify fats by physically breaking large fat globules into smaller ones

## Gallbladder

- Sac found in hollow \_\_\_\_\_ of liver
- When no digestion is occurring, bile backs up the cystic duct for storage in the gallbladder
- When digestion of fatty food is occurring, bile is introduced into the duodenum from the gallbladder
- Gallstones are crystallized \_\_\_\_\_ which can cause blockages

## Functions of the Digestive System

- Ingestion—getting food into the mouth
- \_\_\_\_\_—moving foods from one region of the digestive system to another
  - Peristalsis—alternating \_\_\_\_\_ of contraction and relaxation that squeezes food along the GI tract
  - Segmentation—moving materials back and forth to aid with mixing in the small intestine
- Food breakdown as \_\_\_\_\_ digestion
  - Examples:
    - Mixing food in the mouth by the tongue
    - Churning food in the stomach
    - Segmentation in the small intestine
  - Mechanical digestion prepares food for further degradation by enzymes
- Food breakdown as \_\_\_\_\_ digestion
  - Enzymes break down food molecules into their building blocks
  - Each major food group uses different enzymes
    - \_\_\_\_\_ are broken to simple sugars
    - \_\_\_\_\_ are broken to amino acids
    - \_\_\_\_\_ are broken to fatty acids and alcohols
- Absorption
  - End products of digestion are absorbed in the blood or lymph
  - Food must enter mucosal cells and then into blood or lymph capillaries
- Defecation
  - Elimination of indigestible substances from the GI tract in the form of feces