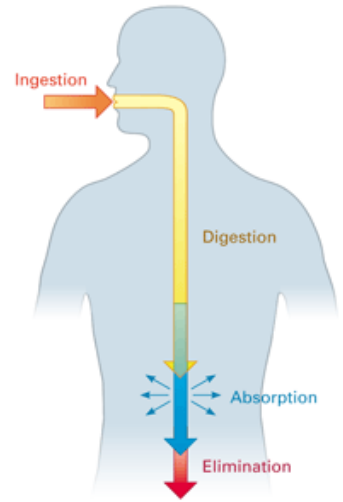


Name: _____

9.3 & 9.4 Intro to Digestion
p. 406 - 411

Four Steps in Digestion:

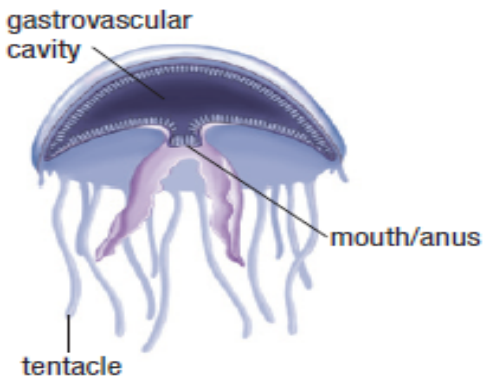
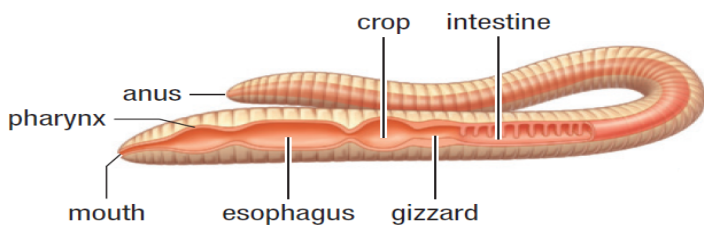
1. _____: The taking in of nutrients
2. **Digestion:** The physical and chemical _____ of complex food molecules into _____
3. _____: The transfer of digested nutrients from the digestive system to the bloodstream.
4. **Elimination/ Egestion:** The _____ of waste food materials from the body



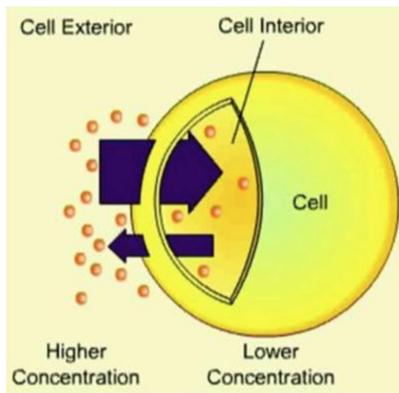
Specialized Systems

- Each animal species has _____ that enable it to obtain and digest and absorb food.
 - Flies have a sponge-like lobe to suck up _____
 - Butterflies have a _____ to suck nectar

Two Types of Digestive Systems: Incomplete and Complete

Incomplete Digestive System	Complete Digestive System
<p>→ A system with _____ opening. Considered a “_____” digestive cavity.</p>	<p>→ A system with _____ openings. Considered a “_____” digestive cavity.</p>
<div style="text-align: center;">  </div> <p>→ E.g: Jellyfish</p> <ul style="list-style-type: none"> • Nutrients are absorbed by cells _____ and _____ into all other cells • Diffusion: Nutrients move from areas of high concentration to areas of low concentration. • Through this process, _____, even those furthest from the cavity, receive nutrients necessary for survival. 	<div style="text-align: center;">  </div> <p>→ E.g. Earthworm</p> <ul style="list-style-type: none"> • Food ingested in the mouth travels through the _____ and into the esophagus. • The _____ then pushes the food into the _____ for temporary storage. • _____ breakdown of the food is carried out by the gizzard. • The food particles pass into the intestine and are _____ broken down into smaller molecules to be absorbed by the cells lining the intestine • Any _____ waste is eliminated through the anus.

Name: _____



The Human Digestive System

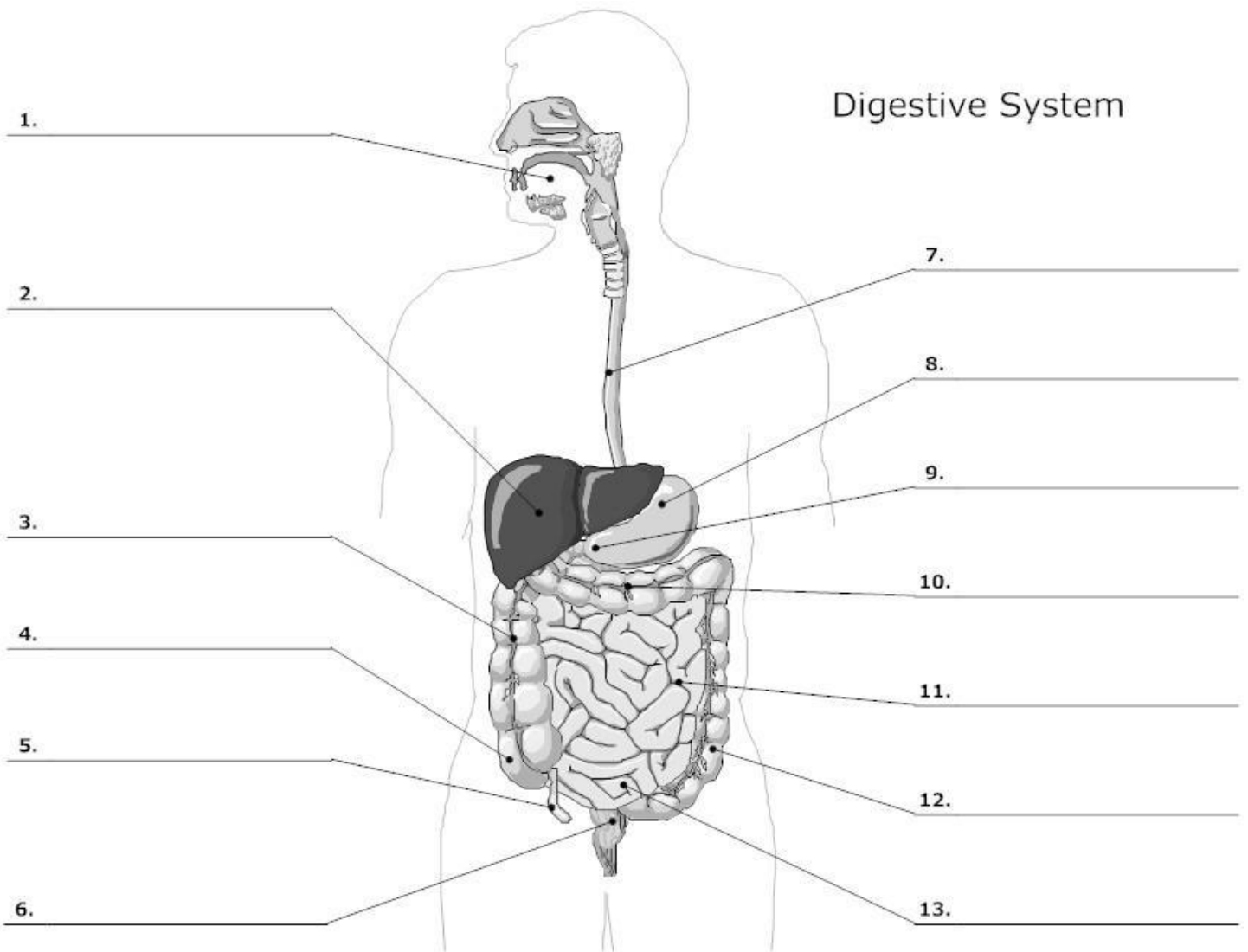
- The human digestive system is a complete system and is known as the **gastrointestinal (GI) tract**.
- How does the length of your digestive system compare to your height?
 - Your digestive system is _____ your height for maximal absorption of nutrients. Length varies - 7-9 meters long in adults!

Relationships with Other Systems

- **Musculoskeletal** - Presence of muscle and bones allows animals to _____ , _____, and _____ food.
- **Cardiovascular** - The circulatory system _____ and other materials to the digestive organs. It also carries nutrients from the digestive system to all the tissues of the body.
- **Nervous and Endocrine** - The nervous system and endocrine system regulate the _____ of the digestive organs.

Name: _____

Digestive System



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Homework

p. 407 # 1, 2 & 3

Terminology:

Enzyme: any chemical (protein) produced by cells that facilitates biochemical reactions in the body, such as those involved in digestion and metabolism; all enzymes are proteins.

Amylase: an enzyme that breaks down complex carbohydrates.

Mucus: a protective secretion produced by the epithelial cells that form the mucous membrane.

Esophagus: an organ consisting of a muscular tube that passes food from the pharynx to the stomach.

Peristalsis: the rhythmic, involuntary wave-like contractions of the smooth muscles of the gastrointestinal tube.

Sphincter: the circular muscle that contracts to close an opening in the body.

Gastrin: a hormone that stimulates the release of hydrochloric acid and pepsinogen in the stomach.

Pepsin: a protein-digesting enzyme produced in the stomach.

Ulcer: a lesion or open sore in the epithelium of an organ.

Salivary glands: glands in the mouth that produce saliva to begin the chemical digestion of food.

Saliva: a watery secretion in the mouth that begins the digestive process.

Gastric juice: a mixture of hydrochloric acid, salts, enzymes, water, and mucous that is produced by the glands in the stomach to help digest food.

Chyme: a thick liquid produced in the stomach and made of digested food combined with gastric juices.

Pepsin: an enzyme in gastric juice that helps breakdown proteins into polypeptides.

9.4 Digestion in the Mouth and Stomach

P. 409 - 411

The Mouth

- In humans, digestion begins in the mouth.
 - Meer sight, smell or taste of food, causes _____ of saliva via salivary glands
- Saliva is watery and contains enzymes and mucus
 - The enzyme _____ starts chemical digestion of carbohydrates in mouth
 - Mucus is a _____ to help in swallowing
 - 0.75 - 1.5 L of saliva are produced in one day
- Food is broken down into smaller pieces by the teeth (physical/mechanical digestion).
 - Flat teeth - grind and crush food
 - Sharp teeth - grab and cut food
 - Mammalian herbivores have many _____ for chewing plant matter
 - Mammalian carnivores have _____ teeth that allow them to grab and kill prey.
- **Bolus:** Term used to describe food that has been chewed in the mouth and mixed with _____.

Sending Food Down the Right Tube (Esophagus) - The mechanism

1. Soft palate rises to _____ nasal passages.
2. Tongue pressure prevents _____ movement of food.
3. Larynx moves up _____ glottis with epiglottis

Down the Esophagus

- The food stretches the walls of the esophagus, activating the smooth muscles to undergo rhythmic, wave-like contractions called _____ .

Sphincters

- Sphincters are circular _____ that relax to open or contract to close a passage in the body.
- Ensure the _____ moves in the right direction (forward)
- The gastroesophageal sphincter (cardiac sphincter) is located where the esophagus joins the stomach.
 - When open (relaxed) - _____ enters the stomach
 - When closed (contracted) - chyme (in stomach) is prevented from _____ into esophagus (acid reflux)
- The pyloric sphincter is located between the exit point of the stomach and the first part of the small intestine (_____)
- **Chyme:** term used to describe food in a semisolid state once _____ with acidic gastric juice in the stomach.

The Stomach

- The stomach is an organ where food is temporarily _____ (stretches to hold up to 2 litres)
- Physical (_____) digestion occurs
 - _____ of stomach
- Limited _____ digestion occurs
 - _____ is partially digested in stomach (by activated enzyme pepsin)

Name: _____

4 Layers of the Stomach

- **Mucosa -**
 - Made up of three layers itself:
 - Epithelial lining that is replaced every _____ (cells divide rapidly); this lining produces _____ to coat the stomach protecting it from stomach acid
 - Extensively _____ lamina propria
 - Muscularis mucosae that helps push out gastric juices (mixture of digestive enzymes, acid and mucus).
- **Submucosa -**
 - Layer of connective tissue
 - Contains network of _____ and _____ vessels
 - Nerves - signal contractions
 - Blood vessels - supply blood (oxygen and nutrients) to layers of stomach
- **Muscularis -**
 - Consists of smooth _____
 - Muscle allows for _____ (mixing) of food with gastric juices
 - Mixture (food + gastric juice) is referred to as _____
- **Serosa -**
 - Smooth, _____ layer
 - Secretes _____ fluid (prevents friction between organs)

The Stomach

- Nerves detect presence of food → signal causes _____ (hormone) to be released into bloodstream
- Gastrin travels to gastric cells in the stomach and causes release of _____
- The millions of gastric glands release 2L of gastric juice per day (cumulatively)
- Gastric juice is acidic (pH 2). The acid:
 - kills _____ microorganisms
 - stops _____ from functioning (no more chemical digestion of carbohydrates)
 - _____ enzyme pepsinogen (allowing for chemical digestion of proteins)
- **Pepsinogen Becomes Pepsin**
 - Pepsinogen (_____ enzyme) is secreted in the stomach
 - In _____ conditions (due to food causing release of gastric juices), pepsinogen is converted to pepsin (active enzyme)
 - Pepsin is a _____ digesting enzyme
 - Pepsin breaks down proteins into separate _____ acids
- **Activating Pepsinogen into Pepsin: Safety Mechanism**
 - Having pepsin only be active in _____ conditions is a _____ mechanism
 - The stomach secretes acid (in response to presence of _____) that activates pepsinogen. This ensures that proteins from meal are digested.
 - If pepsin was activated in all conditions, it would digest the proteins that make up the _____ when there is no food present

Name: _____

Acid Reflux

- Incomplete _____ of gastroesophageal sphincter results in acid contents of stomach entering esophagus
- Causes _____ sensation (heartburn)
- Risk factors:
 - Overfilled stomach
 - _____

Helicobacter pylori: Peptic Ulcers

- An ulcer is an _____ in the lining of the stomach
- Can be caused by the presence of _____ (bacteria)
- *H. pylori* prevents mucus-producing cells from producing enough mucus to protect the stomach lining
- As a result, acid passes through weakened mucus layer forming an ulcer

More on *H.pylori*

- *H. pylori* may be transmitted through food or water, but the bacteria have also been found in the saliva of people with ulcers
- Stomach acid is strong enough to kill most bacteria that enter the stomach.
- *H. pylori*, however, can withstand this highly acidic environment. How?
 - Secretes acid _____ enzymes and _____ through mucosa
- Antibiotics can successfully eliminate *H. Pylori*

Homework

p. 411 # 1, 2, 4 & 5