

Digestive System Reading and Questions

The Function of your **digestive system** is ,to take food into the body, breakdown food into smaller pieces, absorb nutrients into body and excrete waste.

Digestion is necessary to break a complex mixture of proteins, carbohydrates, lipids, and other substances into small molecules, which can move through cell membranes. It takes place in the alimentary canal, a continuous tube running from the mouth to the anus.

The digestive system consists of four processes:

Ingestion: taking food in

Digestion: breaking food down mechanically and chemically

Absorption: nutrients are actually absorbed

Egestion: waste is excreted

Digestion is both mechanical and chemical. **Chemical digestion** is the breakdown of larger molecules into smaller ones. Proteins, carbohydrates, and lipids can be broken down by combining them with water. This is called hydrolysis. Proteins are hydrolyzed into amino acids. Polysaccharides are hydrolyzed into simple sugars (glucose). Triglycerides (complex fats) are hydrolyzed into fatty acids and glycerol (simple parts of fat molecules). **Mechanical digestion** is the physical breakdown of food into smaller particles. This involves chewing and muscular churning. These processes expose more surface area to the enzymes, therefore, it speeds up chemical digestion.

As you read about the following parts of the digestive system, find these parts in the diagram below:

Parts of The Digestive System

Teeth - cut, tear, and grind food. A variety of types of teeth indicates adaptation to an omnivore (organism that eats both plants and animals).

Mucus - from cells lining the mouth; it makes food easier to swallow.

Saliva - from three pairs of salivary glands; lubricates food and adds the enzyme amylase which breaks down starch.

Tongue- muscular organ; keeps food where it can be chewed and pushes food to the back of the mouth to be swallowed. Also contains sensory organs for taste.

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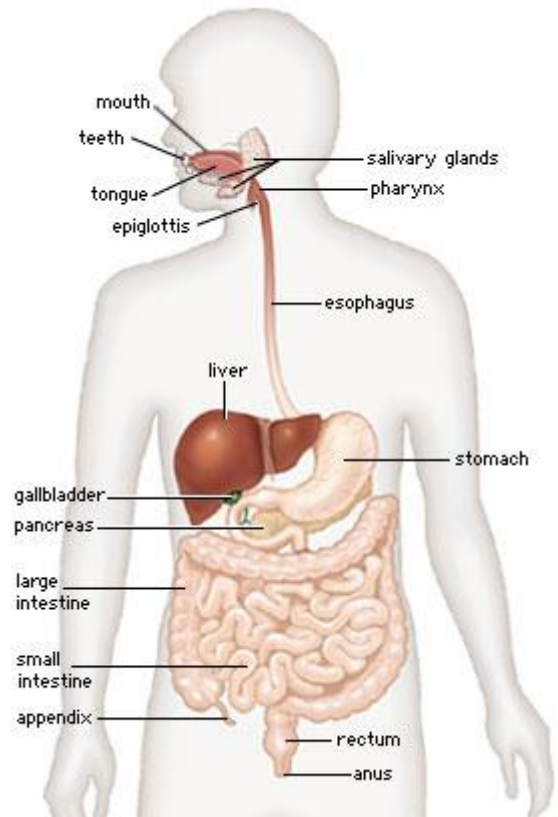
Mouth Breaks down food. By Chewing. Digests Carbohydrates using . **Saliva** is mixture of water (99%), mucus, and digestive enzyme (amylase)

Epiglottis (Small flap of cartilage depressed by tongue, prevents food from entering windpipe)

Esophagus - takes food from the pharynx and carries it to the stomach. The hollow interior of the esophagus is the lumen. The cells that line the lumen, and secrete mucus are the mucosa. Beneath the mucosa are two layers of muscle. In the innermost layer, muscle fibers wrap around the esophagus. Fibers of the outer layer run lengthwise along the esophagus. These layers alternately contract and relax causing waves of constriction. These waves push food along ahead of them. This rhythmic muscular contraction is called **peristalsis**. It moves food in the esophagus, and the rest of the alimentary canal.

Stomach- the opening is controlled by a muscular sphincter, which opens and closes the tube. The stomach is J-shaped; one of its primary functions is food storage (about 2L). It is lined with mucosa. There are three kinds of cells in the stomach mucosa (one secretes mucus; one secretes enzymes; one secretes hydrochloric acid and water). The enzymes, water and hydrochloric acid combine to form gastric juice. The pH of gastric juice is between 1.5 and 3. It helps break up connective tissue and cell membranes; it also kills harmful bacteria.

Chemical digestion is aided by mechanical digestion in the stomach. Peristalsis of the stomach wall churns food for several hours. Mucus in the stomach is resistant to attack by gastric juice; this protects the stomach cells. Sheets of fat molecules resist digestion because they digest so slowly. Digestive enzymes are only activated by an acidic environment. When these factors are out of balance, stomach cells are attacked. The result is an ulcer; this may require a change in diet, or surgery. The other end of the stomach also has a sphincter. When it relaxes, partially digested food moves into the small intestine.



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Pancreas/Liver- These are not part of the alimentary canal, but they are very important to digestion.

The pancreas produces hormones that regulate homeostasis (fairly constant level) of blood glucose. It also produces pancreatic juice which neutralizes the acidic stomach contents before they enter the small intestine. Pancreatic juice also contains a number of digestive enzymes, including many different proteases (chemical enzymes that break down protein that you eat). Pancreatic juice reaches the small intestine via the pancreatic duct.

The liver takes glucose from the blood and converts it to glycogen. It stores the glycogen until it is needed by the body. The liver also produces bile. Bile contains no enzymes, but does aid in the digestion of fats and oils in the intestine, breaking them down into tiny droplets (fats are not water soluble).

Bile travels through ducts to the gall bladder for storage. During digestion, it is released through the common bile duct into the small intestine. Gallstones develop from insoluble materials in the bile. They can block the bile duct and cause bile to accumulate in the gallbladder. In serious cases, the gall bladder may be surgically removed with no serious long- lasting effects.

Small Intestine- Food from the stomach enters the first 30 cm of the small intestine, called the duodenum; this is where bile and pancreatic juice enter. Cells of the intestinal lining also produce digestive enzymes.

The next several metres of small intestine are called the jejunum. Many small molecules are absorbed here. The last half of the small intestine is called the ileum. By now, most chemical digestion is complete. The small intestine is primarily responsible for absorption of nutrients.

Blood from the small intestine moves to the liver where excess glucose and some broken down proteins are removed.

Stretched out, the small intestine measures about 6 meters.

Large Intestine- Also known as the colon, it is about two meters long, but larger in diameter than the small intestine (about 2X). Where the small and large intestines join, there is a small projection known as the appendix. It has no known function in humans, but in some plant eating species it helps digest the tough outer part of plant cells. Appendicitis results when bacteria lodge, grow, and secrete toxins in the appendix. It is more common in children, because the opening is much larger.

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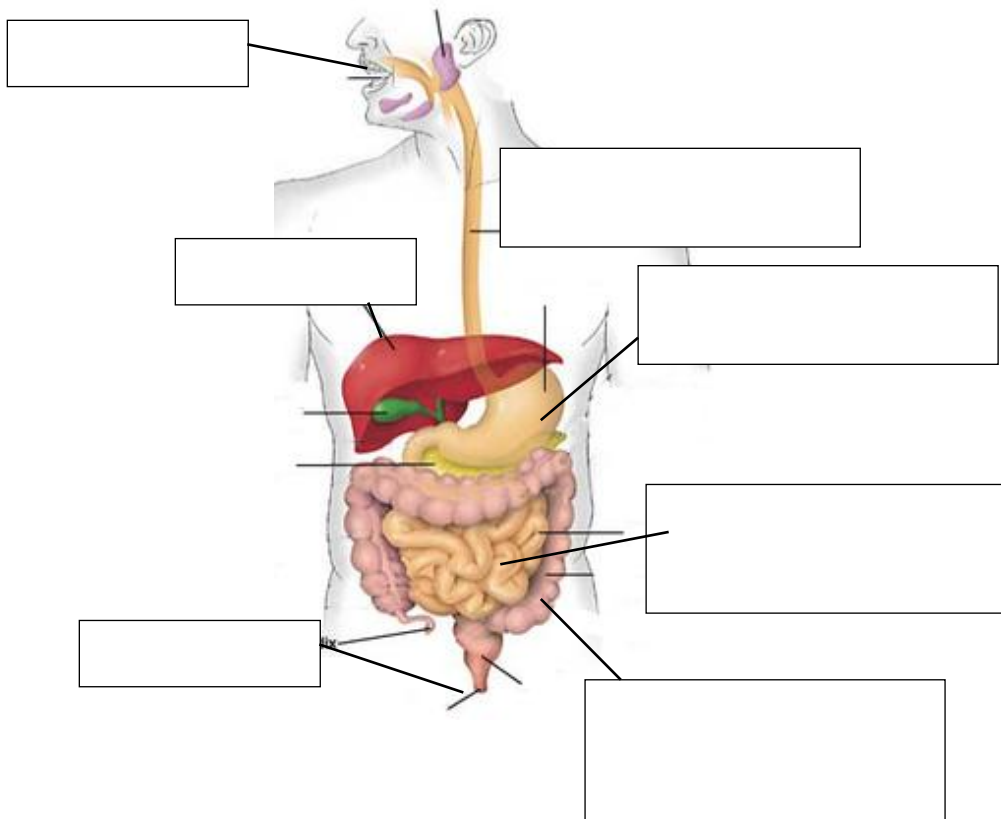
The major role of the large intestine is water absorption. The volume of water in the human body must remain relatively constant. A great deal of water enters the stomach as gastric juice. The only food residue left at the end of the colon is indigestible waste, called feces.

Feces is about 75% water and 25% solid matter. Of the solid matter, about 30% is dead bacteria, 10-20% inorganic matter, 2-3% protein, and 30% undigested fiber. Feces also contains epithelial cells (cells that line and cover body parts) and bile pigments.

The last 20-30 cm of the colon is called the rectum. Feces is stored here until eliminated from the body.

Adapted from Heath Biology, p. 629 and BSCS Biology, p. 393

Label The diagram Below



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Questions:

1. What are the 4 processes that take place in your digestive system?
2. What is the difference between these methods of breaking down food?
3. What function do acidic gastric juices serve?

List the major Functions of the following major components of the digestive system

Mouth

Esophagus

Stomach

Small Intestine

Large Intestine

Anus

4. What is an ulcer?
5. What are gallstones?
6. What is appendicitis?

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