

**Project 3.2.2 and Project 3.2.3: Student Resource Sheet**

Use the information found below to guide your research and to design your model. Take notes, answer questions, and complete sketches in your laboratory journal.

**1. Oral cavity, pharynx, (must also include accessory organs such as salivary glands, tongue, and teeth)**

* What is the oral cavity and what does it contain?
  + The oral cavity is a mouth and it is made up of the teeth, lips, teeth, and tongue.
* What is the function of the salivary glands?
  + Salivary glands generate saliva to aid in the digestion of food as it goes through the oral cavity.
* What is the function of the tongue?
  + The tongue is a muscular organ that aids with chewing and swallowing. On the surface of the tongue are the taste buds, which are sensory organs that help with tasting food.
* What is a bolus?
  + A soft mass of chewed food.
* Where are the soft and hard palate located and what are their functions?
  + The hard palate makes up the roof of the mouth and is responsible for holding the roots of the upper teeth and aids in articulation. The soft palate is located behind the soft palate and is made up of a serious of muscles that help you swallow and help create space for yawning.
* What mechanical and chemical digestion occurs in the oral cavity?
  + The chewing of the teeth and movement of the tongue makes up the mechanical digestion, while the enzymes in the saliva carry out the chemical digestion.
* What mechanisms are in place to make sure food does not “go down the wrong tube” and into the windpipe?
  + The epiglottis is in place to keep food from going down the trachea and into the lungs.

**2. Esophagus and Stomach**

* What is peristaltic movement and how does it function in the esophagus?
  + It is the movement of the esophagus and its function is to help digest the food and get it to the stomach.
* Does any digestion of food occur in the esophagus?
  + Yes, a few acids are released to begin digestion.
* What are the primary functions of the stomach?
  + The stomach is a muscular organ that receives food from the esophagus. It creates and secretes acids and enzymes that help digest food. Stomach muscles also contract and relax to help churn food to enhance digestion.
* What is chyme and how does the stomach mix this material?
  + Chyme is the pulpy acidic fluid that consists of gastric juices and partly digested food. The alternating relaxation and contraction of stomach muscles mixes the chyme with the gastric juices.
* What role does the stomach play in decontaminating the incoming food matter?
  + The stomach, in addition to having enzymes, also has different types of acid that break down, but also are capable of killing bacteria.
* What cells in the stomach function to form enzymes and acids?
  + Chief cells produce two digestive enzymes: pepsinogen and gastric lipase.
* Why doesn’t gastric juice digest the inside of the stomach?
  + Stomach walls have a lining that contains epithelial cells that secrete a protective layer of mucus and bicarbonate
* What are sphincters and how are they related to the stomach?
  + Sphincters are rings of muscle that are capable of opening and closing in order to let a substance in or keep a substance out. Sphincters in the stomach are responsible for letting food into the stomach to be digested or newly digested food out of the stomach.
* What mechanical and chemical digestion occurs in the stomach?
  + The mechanical digestion in the stomach occurs when the smooth muscles contract and produce “mixing waves” that mix and churn food with gastric juice. While the food is being mechanically churned, enzymes in the gastric juices work to break down the food into smaller subunits, or monomers.

**3. Small Intestine and Large Intestine**

* What are the three sections of the small intestine and what role does each section play in digestion or absorption?
  + The three sections that make up the small intestine are the duodenum, the jejunum, and the ileum. The duodenum is the first section of the small intestine, so it receives the bile, acid, and enzymes that are working hard to break down the food. The jejunum and ileum are the second and third sections of the small intestine, respectively, and they make sure that the food is broken down more fully before it reaches the large intestine.
* What is the pH within the small intestine and how is this pH maintained?
  + The pH of the small intestine is 6, which is slightly acidic. The pH is maintained by bicarbonate ions that are secreted by the pancreas.
* Where do bile and pancreatic enzymes enter the small intestine?
  + The bile and enzymes digesting the food from the stomach enter the small intestine by the pyloric sphincter and they are moved into the duodenum.
* How does food move through the intestines?
  + It passes through the pyloric sphincter into the duodenum. From there it passes through the jejunum and ileum into the large intestine. It is excreted once it reaches the end of the large intestine by the rectum and anus.
* What enzymes act inside the small intestine and what are the functions of these enzymes?
  + Protease → breaks down proteins into building blocks, or amino acids.
  + Lipase → breaks down fats/lipids into fatty acids and glycerol
  + Amylase → breaks down carbohydrates to release the energy held within the bonds
* What is the function of the large intestine in relation to digestion?
  + The large intestine is responsible for taking water out of the food that passes through it and making sure that the water goes where it needs to go. It also stores and compacts waste from the food that has been consumed until it is ready to be excreted.
* What are the three sections of the large intestine and what roles does each play in digestion or absorption?
  + The cecum takes in digested liquid from the ileum and makes sure that it is passed on to the colon. The colon is the main part of the large intestine where water is reabsorbed and salts also, assuming that they are needed. The colon is such a major portion of the large intestine that many people use “colon” and “large intestine” synonymously. The rectum is where feces are stored until they need to be excreted through the anus.
* How does the large intestine help maintain a water balance in the body?
  + When the body is in need of water, the large intestine removes as much water as possible from feces before it exits the body.

**4. Pancreas, Liver and Gallbladder**

* What are the size and the location of the pancreas?
  + The pancreas is located behind the stomach and is about 6 inches long.
* What are the different functions of the pancreas, and how is the pancreas directly related to digestion?
  + The pancreas is important for regulating blood sugar levels with glucagon and insulin. It secretes enzymes into the small intestine, such as lipase, that help break down food.
* How does the pancreas connect to the rest of the digestive system?
  + The pancreas directly secretes enzymes into the small intestine, specifically the duodenum.
* What enzymes are produced by the pancreas and what are their functions?
  + The pancreas secretes lipase, protease, and amylase, which help break down fats, proteins, and carbohydrates, respectively.
* How is insulin related to the digestive system?
  + Insulin is usually only released when the food broken down by other parts of the digestive system releases too much sugar into the bloodstream. Insulin makes sure that the cells are able to absorb and use that insulin.
* What is the size of the liver and where is it located?
  + The liver is quite large, weighing nearly 3 pounds. It is located near the stomach and pancreas in the abdomen.
* How does the liver function in relation to digestion?
  + The liver's main function is to filter blood and detoxify chemicals before they are spread throughout the body. As a result, the liver secretes bile that is sent right back into the small intestine to break down food molecules.
* What are other functions of the liver in the body?
  + The liver can convert glycogen stored within itself into usable glucose once glucagon is sent to it. The liver also metabolizes drugs, which is why many people must get regular liver checks to make sure that a medication they are taking is not affecting their liver in a harmful way.
* What is the relationship between the liver and the gallbladder?
  + The gallbladder is just underneath the liver, and its main function is to store extra bile that the liver produces.
* What is the function of bile and where does it enter the digestive tract?
  + Bile is sent to the small intestine, specifically the duodenum, where it helps to break down food into its component molecules.

Each group will be assigned one of the following bites of food. First, think about the class of molecule this food item represents and then identify the specific enzymes that would break this polymer into monomers. Remember to describe features that help mechanically digest this bite. Depending on your food item, you may need to do some additional research.

* **Bread**
* **Butter**
* **Steak**
* **Celery**
* **Skittles**