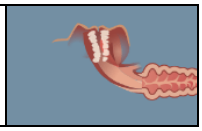
Name: _____ Date: _____

Student Exploration: Digestive System

Activity A: **Build a digestive system**	Get the Gizmo ready: • If necessary, click **Clear screen**.	

Goal: Design your own digestive system.

1. Build: Now it is time to design and build your own digestive system! Start with the LARGE ORGANS tab to build a basic system, starting with the **Mouth/pharynx**. Next, attach organs from the SMALL ORGANS tab to the large organs to complete your system. Draw a picture of your system below. (If you like, open the **Tools** menu and click **Screen shot**. Right-click the image, choose **Copy Image**, and paste the image into a blank document.)

2. Predict: How well do you think your system will digest food? Explain your reasoning.

   _____

   _____

   _____

3. Prepare: Select the FOOD tab. The energy we get from food is measured in **food calories** (Calories). Each Calorie is equal to 4,184 joules of energy. Calories are found in the three main nutrients in food: **carbohydrates** (**sugars** and **starches**), **proteins**, and **fats**.

   Drag the **Cheeseburger** above the mouth in your digestive system. How many Calories in the cheeseburger come from carbohydrates, proteins, and fats?

   Carbohydrate Calories: _____ Protein Calories: _____ Fat Calories: _____

4. Run the Gizmo: Click **Play** ( ), and observe the food moving through the digestive system. The muscular contractions that push food through the system are called **peristalsis**. When food has finished passing through the system, you will see a message.

   A. What percentage of Calories were absorbed by your system? _____

   B. What percentage of water was absorbed? _____

   C. Based on these results, how well do you think this digestive system worked? Explain.

   _____

   _____

   _____

5. Revise: Click **Reset** ( ). Rearrange the organs of your system to try to improve your results. Describe how you changed your system below.

   _____

   _____

   _____

6. Test: Click **Play** or **Fastplay** ( ). List the results below. Did the system improve? _____

   Percentage of Calories absorbed: _____ Percentage of water absorbed: _____

7. Explain: If your system improved, why do you think this was so? _____

   _____

   _____

Activity B:	Get the Gizmo ready: • Click **Reset** and **Clear screen**.	Nutrient: Complexc Initial: 178 Current: 175.4 Absorbed:

Introduction: Digesting nutrients into simple carbohydrates, amino acids, and fatty acids is important, but it doesn't matter unless the nutrients get into the bloodstream to feed body cells. This process is called absorption.

Question: How are nutrients absorbed?

1. Observe: Look through the descriptions of the large and small organs.

   A. Which of the large organs allow nutrients and water to pass through their walls?

   _____

   B. Which of the small organs transport absorbed nutrients to the bloodstream?

   _____

2. Set up the Gizmo: Create the digestive system shown. The small intestine has three parts: the *duodenum* (attached to the stomach), the *jejunum* (the middle portion), and the *ilium* (attached to the large intestine). Drag the **Pecan pie** to the mouth.

Test each of the scenarios below by removing one or more components from the above setup. For each setup, record the nutrients that are *absorbed* by the system. (Be sure to look at the "Absorbed" row of the **Analysis** table.)

Scenario	Sugars	Amino acids	Fatty acids	Water
Remove two sets of capillaries from the small intestine				
Remove all lymphatic vessels				
Remove one set of capillaries from the large intestine				

3. Analyze: Examine the results of your four experiments.

   A. Which nutrients were absorbed by capillaries in the small intestine? _____

   _____

   B. Which nutrients were absorbed by capillaries in the large intestine? _____

   _____

   Bacteria in the large intestine break down some types of **fiber**—a difficult to digest complex carbohydrate—into sugars that are absorbed in the large intestine.

   C. Which nutrient was absorbed by small intestine lymphatic vessels? _____

   D. Did lymphatic vessels absorb anything from the large intestine? _____

4. Draw conclusions: Based on your experiments, where should the capillaries and lymphatic vessels be placed to maximize the absorption of nutrients from food?

   Capillaries: _____

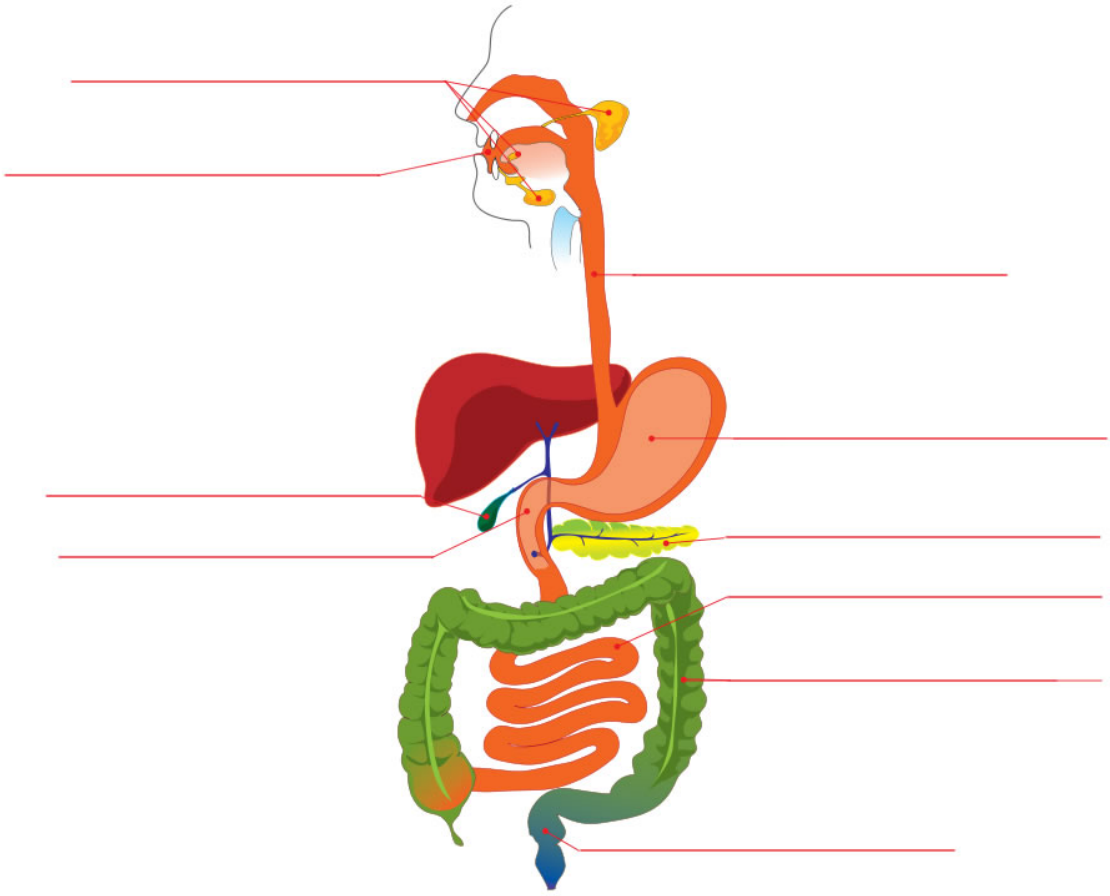
   Lymphatic vessels: _____

Activity C: **Optional Review**	Get the Gizmo ready: • Click **Reset** and **Clear screen**.	

Introduction: Now that you have explored a model of human digestion, it is time to apply what you have learned to the real human digestive system.

Goal: Describe the human digestive system.

1. Label: Based on what you have learned, identify the organs of the human digestive system.



2. Think and discuss: Why is it important that the mouth and stomach are near the start of the digestive system? _____

_____

3. Match: Match each structure, chemical, or process to its function.

_____	Amylase	A. Upper section of the small intestine
_____	Peristalsis	B. Muscular tube connecting the throat and stomach
_____	Duodenum	C. Organ that produces a variety of digestive enzymes
_____	Lymphatic vessel	D. Chemical that breaks up large fat droplets
_____	Anus	E. Muscular contractions that push food through the digestive system
_____	Large intestine	F. Enzyme that starts to digest proteins in the stomach
_____	Esophagus	G. Opening through which wastes are eliminated
_____	Pepsin	H. Produces hydrochloric acid in the stomach
_____	Pancreas	I. Transports absorbed fatty acids to the bloodstream
_____	Parietal cell	J. Organ that absorbs water and vitamin K
_____	Bile	K. Enzyme that breaks down starches into simple carbohydrates