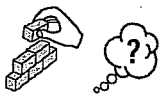


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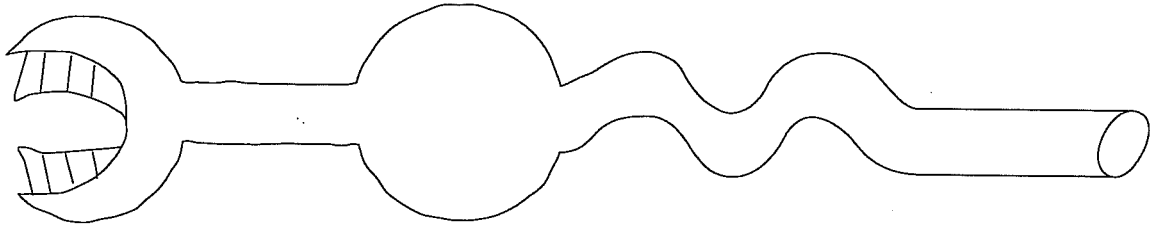
Activity 41.1 How are form and function related in the digestive system?

1. What is the overall function of digestion (as a whole)?

2.

a. How do bacteria eat?		b. How do amoeba eat?	
How are their eating styles similar to what we see in humans? How are they different?			
c. Similarities with bacteria	d. Differences from bacteria	c. Similarities with amoeba	d. Differences with amoeba

3. Label the parts of the mammalian digestive tract in the diagram, and state the major function(s) of each part.



How does the structure of each part reflect its function?

a. Mouth and teeth	b. Esophagus	c. Stomach	d. Small intestine	e. Large intestine



4. Make a larger copy of the diagram in question 3. Use this larger diagram to model or trace what happens to a food particle from the time it enters the mouth until its indigestible remains are egested, or eliminated. Include all of the following terms in your discussion. Also, note on the diagram the function of each and where it is found in the digestive system.

carbohydrate

fat

nucleic acid

protein

cardiac orifice

epiglottis

pyloric sphincter

pharynx

pepsinogen

lipase

pepsin

salivary amylase

bile

dipeptidase

saliva

amylase

pancreas

nuclease

gastric acid (HCl)

bolus

microvilli

lacteals

capillaries

feces

intestinal bacteria

hepatic portal vein

fiber or roughage

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Using the understanding of the structure and function of the digestive system you gained from the model in question 4, answer the questions.

5. The mammalian digestive tract has been called an extension of the outside world that you enclose in your body.
- What does this statement mean? Consider what would happen if you swallowed a marble. Is the marble ever “inside your body”?
 - At what point in the digestive process is food officially inside the body?
 - How is mammalian digestion more efficient than the type of digestion seen in bacteria?
6. Have you ever heard the old adage: “Be sure to chew your food 20 times before swallowing”?
- What, if any, effect would this chewing have on how well the digestive system functions? Keep in mind that enzymes work only on the surfaces of food particles. Explain.
 - How does the function of the teeth complement the function of one of the digestive chemicals in the stomach?

7. Digestion (in humans and many other animals) is both physical and chemical. Among the chief chemical agents of digestion are the digestive enzymes. What do enzymes do to food?

8. Of the carbohydrates, fats, and proteins in a hamburger, what has been partially digested prior to entry into the small intestine?

9. Although enormous quantities of various enzymes are added to the contents of the duodenum of the small intestine, no traces of enzymatic activity are left in the intestinal contents when they pass into the large intestine (colon). Why? What happens to the enzymes?

10. How does a herbivore such as a cow extract the glucose from the cellulose in its diet? What characteristics of the structure and function of the digestive tract of a ruminant suit it for this function?

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11. A good rough generalization is that the more meat in the diet of a species of animal, the shorter its intestine. In comparison, herbivores have long intestines (length always being relative to total body length). How can this be explained?

12. Most of the blood that leaves the digestive tract of a human is collected into a series of veins that merge to form the hepatic portal vein. The hepatic portal vein carries blood to the liver, where the hepatic portal vein breaks down again into a system of liver capillaries. The liver capillaries drain into the hepatic vein, which carries blood to the vena cava. The vena cava carries blood from the body to the right atrium of the heart. Some of the products of digestion enter a different system of transport, the lacteal system. The lacteal system bypasses the liver and carries its contents directly to the right atrium of the heart.

- a. Which products of digestion are carried in the blood to the liver?
- b. Which products of digestion are carried via the lacteal system?
- c. During the first hour after a heavy meal, how does the concentration of glucose in the blood going from the small intestine to the liver compare to the concentration entering the right side of the heart?
- d. Similarly, how does the concentration of amino acids compare?
- e. How does the concentration of fat leaving the small intestine compare to the concentration in the right atrium?