Built to Digest

How digestive structures shape what happens to food

HAP.13 "Students will investigate the structures and functions of the digestive system, including the cause and effect of diseases and disorders. Analyze the structure-function relationship in organs of the digestive system..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline four digestive structures in the passage and circle the action or protective effect each one enables. Number each matching structure and effect with the same number.

A Bite of Bread

1. At lunch, a bite of bread begins a trip through structures built for different jobs. Incisors cut the bite, while molars crush it into smaller pieces. This mechanical breakdown exposes more starch to salivary amylase, an enzyme from the salivary glands that starts splitting starch into smaller sugars. Saliva also moistens the food, making it easier to swallow. A wave of muscle contraction pushes the softened mass down the esophagus. At its lower end, a ring of muscle called a sphincter opens for the food and then closes, helping keep stomach acid from flowing upward.

2. In the stomach, stretchy walls expand as food arrives, and muscles squeeze and mix it with acidic fluid. The fluid's low pH allows pepsin to break down proteins, but the acid can harm living tissue. A mucus lining helps protect the stomach wall. If the lower esophageal sphincter closes poorly, acid may wash back into the esophagus and cause the burning sensation of reflux. Unlike the stomach, the esophagus lacks a thick protective barrier against stomach acid. A sphincter at the stomach's exit releases partly digested food into the small intestine in portions.

3. In the small intestine, pancreatic enzymes help break down fats, proteins, and carbohydrates. The liver makes bile, which the gallbladder stores and releases. Bile spreads fat into tiny droplets, giving enzymes more surface to reach. The pancreas also releases bicarbonate, which raises the pH of the acidic mixture entering from the stomach. This helps intestinal and pancreatic enzymes work. Tiny villi on the intestinal wall have even smaller microvilli, greatly expanding the surface available to absorb nutrients. Food that was crushed, mixed, and chemically broken down can now supply molecules that pass through this lining, many of which enter the blood.

2 ANSWER WITH EVIDENCE

Use the passage

1. How do the shapes and actions of incisors and molars help salivary amylase digest bread?

2. Why can the stomach use acidic fluid to digest protein without its wall being as exposed to damage?

3. What change in a digestive structure can cause reflux, and how does that change produce the burning sensation?

4. How do bile and the small intestine's villi help with different stages of processing food?

3 YOUR TURN

Your own words

Design an experiment using commercial amylase, equal masses of bread, and iodine solution to test whether smaller food pieces speed starch digestion. State what you would change, what you would keep the same, how you would check for starch over time, and what you predict with a reason; iodine turns blue-black when starch is present and stays amber when it is absent.

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PART 1 · READ AND MARK

Underline four digestive structures in the passage and circle the action or protective effect each one enables. Number each matching structure and effect with the same number. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How do the shapes and actions of incisors and molars help salivary amylase digest bread?	**Incisors cut bread and molars crush it into smaller pieces, exposing more starch for salivary amylase to break down.**
2	Why can the stomach use acidic fluid to digest protein without its wall being as exposed to damage?	**The low pH allows pepsin to break down protein, while the stomach's mucus lining helps protect its wall from acid.**
3	What change in a digestive structure can cause reflux, and how does that change produce the burning sensation?	**If the lower esophageal sphincter closes poorly, stomach acid can flow into the less-protected esophagus and cause burning.**
4	How do bile and the small intestine's villi help with different stages of processing food?	**Bile spreads fat into droplets so enzymes can reach more of it. Villi and microvilli expand the intestinal surface for nutrient absorption.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would crush one bread sample and leave an equal mass of bread in larger pieces. I would add the same amount of commercial amylase to each and keep the temperature, water, and test times the same. At set times, I would remove a small sample from each mixture and add iodine to check for starch. I predict the crushed bread would stop turning the iodine blue-black sooner because its smaller pieces expose more starch to the enzyme.

Accept different sets of four accurate structure-effect pairs for the marking task. For the experiment, look for piece size as the changed variable, a fair comparison, repeated starch checks, and a prediction linked to exposed surface area.