Section 2: Stomach Digestion and Chyme Formation

Learning Objective: Describe how mechanical churning and chemical breakdown by gastric acid transform food inside the stomach into chyme.

Key Vocabulary:

- **Gastric Acid:** An acidic fluid containing hydrochloric acid and enzymes secreted by the stomach glands.
- **Mechanical Digestion:** The physical mashing, churning, and grinding of food into smaller pieces.
- **Chemical Digestion:** The molecular breakdown of food into simpler nutrients using acid and enzymes.
- **Chyme:** The thick, acidic, semi-fluid mixture of partially digested food produced in the stomach.
- **pH:** A scale measuring acidity from 0 to 14, with the stomach maintaining an extremely acidic level near pH 2.

Concept Review: Inside the Stomach

The stomach is a flexible, J-shaped muscular pouch that continues digestion using two simultaneous methods. For mechanical digestion, three layers of muscle contract vigorously in multiple directions, churning and pulverizing solid food boluses into tiny fragments. For chemical digestion, the stomach lining secretes gastric juice containing hydrochloric acid (creating an acidic environment of around pH 2) and digestive enzymes. This acid dissolves food chunks, activates enzymes that break down proteins, and kills harmful microbes. After several hours of churning and chemical action, food becomes an acidic liquid slush called chyme.

Part A: Classifying Digestive Actions

1. For each stomach activity listed in the table, determine whether it is an example of **Mechanical Digestion** or **Chemical Digestion**, and provide a brief explanation.

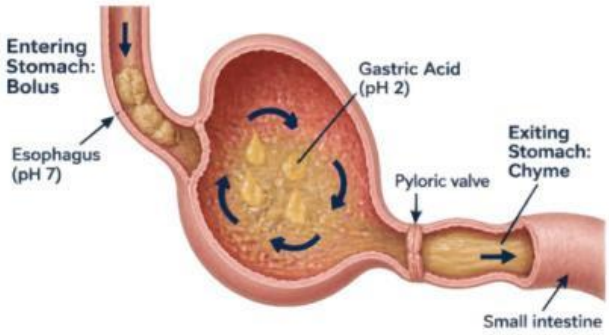
Stomach Activity	Type of Digestion	Reason for Classification
Three layers of stomach wall muscle contract to churn and grind solid chunks.	---------- ----------	---------- ----------
Hydrochloric acid dissolves connective tissues and lowers pH to 2.	---------- ----------	---------- ----------

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Digestive enzymes break long protein chains into smaller peptide molecules.	---------- ----------	---------- ----------
Peristaltic waves push and slosh food back and forth against the closed stomach exit.	---------- ----------	---------- ----------

Part B: Diagram Analysis: Bolus to Chyme

Study the diagram below comparing the condition of food entering the stomach to the mixture leaving it.



2. Analyze the diagram and apply your knowledge of stomach digestion. Choose the best answer for each question.

a. How does the food's physical state change as it passes through the stomach?

☐ **A.** A chewed bolus becomes a semi-fluid mixture called chyme.

☐ **B.** A liquid bolus becomes dry, solid chunks.

☐ **C.** Chyme enters the stomach and becomes an unchewed bolus.

☐ **D.** Food remains unchanged as it passes through the stomach.

b. Which combination of stomach actions helps turn the bolus into chyme?

☐ **A.** The epiglottis grinds food while the trachea adds acid.

☐ **B.** Gravity dissolves food while saliva churns it.

☐ **C.** Muscles churn food while gastric acid and enzymes help break it down.

☐ **D.** The stomach removes all liquid and presses food into a dry ball.

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c. The stomach has a low pH of about 2. What is one role of this acidic environment, and how is the stomach lining protected?

☐ **A.** Acid makes food solid, and the epiglottis coats the stomach lining.

☐ **B.** Acid helps activate digestive enzymes, and a mucus layer protects the stomach lining.

☐ **C.** Acid stops all digestion, and the trachea protects the stomach lining.

☐ **D.** Acid pushes food through the esophagus, and saliva lines the stomach.

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