Enzymes in Digestion

Name: _____ **Class:** _____ **Date:** _____

Quick Review

Digestive enzymes are biological catalysts that speed up the breakdown of large food molecules into smaller molecules that can be absorbed by the body.

Three important groups of digestive enzymes are:

- **Amylase:** Breaks starch into smaller sugars, including maltose.
- **Protease:** Breaks proteins into smaller peptides and, through further digestion, amino acids.
- **Lipase:** Breaks fats (lipids) into fatty acids and monoglycerides.

Digestive enzymes are produced in different organs, including the salivary glands, stomach, pancreas, and small intestine.

Most nutrient absorption takes place in the **small intestine**, where villi and microvilli increase the surface area available for absorption.

Part A — Multiple Choice

1. What is the main function of digestive enzymes?

A. To store energy in the body
B. To speed up the breakdown of food molecules
C. To transport oxygen through the blood
D. To prevent food from entering the stomach

2. Which enzyme breaks down starch?

A. Protease
B. Lipase
C. Amylase
D. Pepsin

3. Which enzyme group is responsible for breaking down proteins?

A. Protease
B. Amylase
C. Lipase
D. Lactase

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4. What does lipase help digest?

A. Proteins
B. Starch
C. Vitamins
D. Fats

5. Where does most nutrient absorption occur?

A. Stomach
B. Small intestine
C. Oesophagus
D. Large intestine

Part B — Matching

Match each term with the correct description.

Term	Answer	Descriptions
1. Amylase	_____	A. Produces several digestive enzymes and releases them into the small intestine
2. Protease	_____	B. Breaks down fats into smaller molecules
3. Lipase	_____	C. Main site of nutrient absorption
4. Small intestine	_____	D. Breaks down starch into smaller sugars
5. Pancreas	_____	E. Breaks down proteins into smaller peptides and amino acids through digestion

Part C — Complete the Table

Fill in the missing information.

Enzyme	Food molecule digested	Products of digestion
Amylase	_____	_____
Protease	_____	_____
Lipase	_____	_____

1. Why must large food molecules be broken into smaller molecules?

2. Explain why each digestive enzyme acts on particular food molecules.

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Part D — Where Do Digestive Enzymes Work?

Complete the following table.

Organ	Enzyme or enzyme group	Main function
Mouth	_____	Begins starch digestion
Stomach	_____	Begins significant protein digestion
Pancreas	Amylase, proteases, and lipase	_____
Small intestine	_____	Completes digestion and absorbs nutrients

1. Why is the pancreas important for digestion?

2. Why is the small intestine well suited for absorbing nutrients?

Part E — Application Questions

1. A student eats a meal containing bread, chicken, and butter.

Identify the main enzyme group involved in digesting each food.

a) Bread (starch): _____

b) Chicken (protein): _____

c) Butter (fat): _____

2. A person produces very little lipase.

Which type of nutrient would be most difficult to digest?

3. Explain why chewing food helps digestive enzymes work more effectively.

4. What might happen if the body could not produce enough digestive enzymes?

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Part F — Follow the Food

A person eats a sandwich containing bread, cheese, and meat.

1. Which enzyme begins digesting the starch in the bread in the mouth?

2. Which type of enzyme begins significant protein digestion in the stomach?

3. Which organ releases amylase, proteases, and lipase into the small intestine?

4. Why must the food molecules be broken down before most of their nutrients can be absorbed?

5. What structures in the small intestine increase the surface area for absorption?

Exit Ticket

1. What is the function of amylase?

2. What does protease break down?

3. What does lipase break down?

4. Where does most nutrient absorption occur?

5. Why are digestive enzymes important for the human body?

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Enzymes in Digestion — Answer Key

Part A — Multiple Choice

1. B — To speed up the breakdown of food molecules.
2. C — Amylase.
3. A — Protease.
4. D — Fats.
5. B — Small intestine.

Part B — Matching

Term	Answer	Description
1. Amylase	D	Breaks down starch into smaller sugars
2. Protease	E	Breaks down proteins into smaller peptides and amino acids through digestion
3. Lipase	B	Breaks down fats into smaller molecules
4. Small intestine	C	Main site of nutrient absorption
5. Pancreas	A	Produces several digestive enzymes and releases them into the small intestine

Part C — Complete the Table

Enzyme	Food molecule digested	Products of digestion
Amylase	Starch	Smaller sugars, mainly maltose
Protease	Proteins	Smaller peptides and eventually amino acids
Lipase	Fats (lipids)	Fatty acids and monoglycerides

1. Why must large food molecules be broken into smaller molecules?

Large food molecules are generally too large to be absorbed efficiently through the lining of the small intestine. Digestive enzymes break them into smaller molecules that can pass through intestinal cells and enter the blood or lymph.

2. Explain why each digestive enzyme acts on particular food molecules.

Each enzyme has an active site with a particular shape and chemical properties. Only suitable substrate molecules can bind effectively to the active site and undergo the reaction.

This is called enzyme specificity.

Part D — Where Do Digestive Enzymes Work?

Organ	Enzyme or enzyme group	Main function
Mouth	Salivary amylase	Begins starch digestion

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Stomach	Pepsin (a protease)	Begins significant protein digestion
Pancreas	Amylase, proteases, and lipase	Produces enzymes that digest carbohydrates, proteins, and fats in the small intestine
Small intestine	Maltase, sucrase, lactase, and peptidases	Completes digestion and absorbs nutrients

Teaching clarification: The small intestine also contains pancreatic enzymes released into it. Pancreatic lipase and proteases carry out much of the digestion there.

1. Why is the pancreas important for digestion?

The pancreas produces digestive enzymes that help break down carbohydrates, proteins, and fats.

These enzymes are released into the small intestine, where they help convert large food molecules into smaller molecules suitable for absorption.

2. Why is the small intestine well suited for absorbing nutrients?

The small intestine contains numerous villi and microvilli that greatly increase its surface area.

Its lining is thin, and it has a rich blood supply and lymphatic vessels to transport absorbed nutrients.

Part E — Application Questions

1. A student eats a meal containing bread, chicken, and butter. Identify the main enzyme group involved in digesting each food.

a) Bread (starch): Amylase

b) Chicken (protein): Protease

c) Butter (fat): Lipase

2. A person produces very little lipase. Which type of nutrient would be most difficult to digest?

Fats (lipids).

Lipase breaks down fats into fatty acids and monoglycerides. Without sufficient lipase, fat digestion and absorption may be reduced.

3. Explain why chewing food helps digestive enzymes work more effectively.

Chewing breaks food into smaller pieces, increasing the surface area available for enzymes to act on.

It also mixes food with saliva, which contains amylase and begins starch digestion.

4. What might happen if the body could not produce enough digestive enzymes?

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Food would not be broken down efficiently into absorbable molecules.

This could lead to poor nutrient absorption, digestive discomfort, diarrhoea, and nutritional deficiencies.

Part F — Follow the Food

1. Which enzyme begins digesting the starch in the bread in the mouth?

Salivary amylase.

It begins breaking starch into smaller sugars.

2. Which type of enzyme begins significant protein digestion in the stomach?

Protease, specifically pepsin.

Pepsin works in the acidic environment of the stomach and breaks proteins into smaller peptides.

3. Which organ releases amylase, proteases, and lipase into the small intestine?

The pancreas.

4. Why must the food molecules be broken down before most of their nutrients can be absorbed?

Large food molecules such as starch, proteins, and fats generally cannot be absorbed directly in their original form.

Digestive enzymes convert them into smaller molecules that can cross the intestinal lining and enter the body's transport systems.

5. What structures in the small intestine increase the surface area for absorption?

Villi and microvilli.

These structures increase the surface area available for absorbing digested nutrients.

Exit Ticket

1. What is the function of amylase?

To break down starch into smaller sugars.

2. What does protease break down?

Proteins into smaller peptides and, through further digestion, amino acids.

3. What does lipase break down?

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Fats into fatty acids and monoglycerides.

4. Where does most nutrient absorption occur?

The small intestine.

5. Why are digestive enzymes important for the human body?

Digestive enzymes speed up the breakdown of large food molecules into smaller molecules that can be absorbed and used by the body for energy, growth, and repair.

Teaching Notes

- Amylase begins starch digestion in the mouth, but further carbohydrate digestion occurs in the small intestine.
- Proteases act in both the stomach and small intestine.
- Lipase acts mainly in the small intestine, where bile helps by emulsifying fats. Bile is not an enzyme.
- Digestion and absorption are different processes. Digestion breaks molecules down; absorption transfers nutrients into the body.
- Enzymes are specific. Amylase does not digest proteins, and protease does not digest starch.

Assessment suggestion: Accept scientifically correct alternatives, particularly for questions asking students to explain digestion, enzyme specificity, and nutrient absorption.

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