Lesson Description

In this lesson, we:

- Study the structure of the human digestive system
- Explain the processes used in the human digestive system
- Explain and compare the two different types of digestion
  - Mechanical
  - Chemical

Summary

Structure of the Digestive System

The digestive system is composed of the following parts:

- Mouth with teeth and salivary glands to begin the process of digestion.
- Oesophagus that connects the mouth to the stomach.
- Stomach is where the food undergoes both mechanical and chemical digestion.
- Small intestine is where the digested food undergoes the final step of digestion and where the majority of substances are absorbed from the digested food.
- Large intestine is where water is absorbed from the food and faeces are formed.

Processes used in the digestive used

- Nutrition is defined as the sum of the following processes – ingestion, digestion, absorption, assimilation and egestion.

- Some definitions that you need to know:
  - Ingestion is the process where food is taken in – this occurs in the mouth.
  - Digestion is the process where large molecules are broken down into smaller molecules either mechanically or chemically.
  - Absorption is the process where the molecules move through the intestinal walls (small intestine) into the blood vessels.
  - Assimilation is the process where nutrients are moved into and used by the cell.
  - Egestion is the process whereby unused nutrients are eliminated from the digestive system.

- Organs and glands associated with the digestive system
  - The salivary glands situated in the mouth produce an enzyme called amylase that begins the digestion of starches and carbohydrates.
  - The Liver produces bile and breaks down amino acids, alcohol, hormones and drugs.
  - The Gall Bladder stores bile produced by the liver.
  - The pancreas produces insulin, glucagon and pancreatic juice.
  - The stomach contains cells that produce and secrete hydrochloric acid.
Types of Digestion

- **Mechanical digestion** starts in the mouth with the teeth chewing the food and the tongue working the food into a ball (bolus) for swallowing.

- The Biological name for chewing is mastication.

- The bolus is moved to the back of the mouth and pushed into the oesophagus where more mechanical digestion occurs in the form of peristalsis.

- Peristalsis in the process where muscles in the wall of the oesophagus contract and relax antagonistically. This means when one muscle contracts. The other muscle relaxes and so it continues alternating contracting and relaxing.

- Peristalsis also happens in the stomach and the rest of the digestive tract to push the food along.

- Another form of mechanical digestion occurs in the stomach where the stomach muscles churn the food into a liquid called chyme.

(Solutions for all Life Sciences, Macmillan, p155)

- Chemical digestion uses enzymes to break the food into its basic chemical compounds for absorption by the body.

- The enzymes control the chemical breakdown.

- The enzymes are sensitive to temperature and pH. Different enzymes act in different pH levels in the various parts of the digestive system.

- There are a large number of glands and organs associated with the digestive system. They provide chemical substances that enhance the chemical digestion of food.
<table>
<thead>
<tr>
<th>Digestive secretion</th>
<th>Where produced</th>
<th>Enzymes</th>
<th>Functions of enzyme/s</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saliva</td>
<td>Salivary glands</td>
<td>Carbohydrases</td>
<td>Cooked starches - maltose</td>
<td>Alkaline (6 – 7)</td>
</tr>
<tr>
<td>Gastric juice</td>
<td>Glands in stomach</td>
<td>Proteases</td>
<td>Proteins → polypeptides</td>
<td>Acid(3)</td>
</tr>
<tr>
<td>Pancreatic juice</td>
<td>Pancreas</td>
<td>Carbohydrases Proteases</td>
<td>Starches → maltose Proteins → polypeptides</td>
<td>Alkaline (8)</td>
</tr>
<tr>
<td>Intestinal juice</td>
<td>Glands in small intestine</td>
<td>Carbohydrases Proteases Lipases</td>
<td>Maltose → glucose Polypeptides → amino acids Fats → fatty acids &amp; glycerol</td>
<td>Alkaline (8)</td>
</tr>
</tbody>
</table>

(Taken from Series Life Sciences p 125)

**Test Yourself**

**Question 1**
Which is not true of peristalsis?
A. it enables defaecation  
B. it causes the forward movement of food along the gut  
C. enables you to swallow even when standing on your head  
D. is a voluntary action

**Question 2**
Lipase a fat digesting enzyme is found in:
A. saliva  
B. gastric juice  
C. pancreatic juice  
D. intestinal juice

**Question 3**
What process causes the digestion of the macro-nutrients – starch, proteins and fats?
A. hydrolysis  
B. glycolysis  
C. photolysis  
D. condensation synthesis
Question 4
A protein molecule will be digested by enzymes secreted by:
A. the mouth, stomach and colon
B. the stomach, liver and small intestine
C. the small intestine, mouth and liver
D. the small intestine, pancreas and stomach

Question 5
Digestion in the lumen of the stomach is limited to
A. carbohydrates
B. fats
C. proteins
D. None of the above. All kinds of food is digested here

Question 6
Which of the following does not occur in the mouth?
A. lubrication of the food
B. beginning of protein digestion
C. breaking the food into small fragments
D. all of the above

Question 7
If the pancreas is removed, the compound which remains undigested is
A. proteins
B. carbohydrates
C. fats
D. proteins and carbohydrates

Question 8
Digestion takes place in each of the following organs except:
A. large intestine
B. stomach
C. small intestine
D. mouth

Improve your Skills

Question 1
1.1 Where does bile go after it leaves the liver? (1)
1.2 Which organ is primarily responsible for protein digestion? (1)
1.3 Where does fat digestion begin? (1)
1.4 Where does starch digestion begin? (1)
1.5 What protects the walls of the large intestine? (1)
Question 2

Read the following sentences and fill in the words that best fill each blank.

The human digestive system is a group of organs that break down food into _____1_____ to be used as fuel by the body. Digestive juices, which are mostly _____2_____, speed up this breakdown. Carbohydrates are changed into _____3_____, fats are digested into _____4_____, and proteins are broken down into _____5_____ and amino acids. Digestion begins in the mouth, where food is ground into smaller particles, and an enzyme breaks down some of the _____6_____. In the stomach, _____7_____ such as hydrochloric acid begin the breakdown of protein. Fats and starches move on to the _____8_____, where most of the digestive process takes place. Fluid secreted by the _____9_____ and _____10____, which is made in the liver, help digest fat. Enzymes secreted by glands in the walls of the small intestine continue to break down _____11_____. Capillaries and lymph vessels in the _____12_____ absorb the digested food and carry it to the body.

Question 3

Complete the table below by filling in the missing concepts.

<table>
<thead>
<tr>
<th>Digestive secretion</th>
<th>Where produced</th>
<th>Enzymes</th>
<th>Functions of enzyme/s</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saliva</td>
<td>1. Glands in stomach</td>
<td>Carbohydrases</td>
<td>Cooked starches - maltose</td>
<td>2. (6 – 7)</td>
</tr>
<tr>
<td>Pancreatic juice</td>
<td>Pancreas</td>
<td>Carbohydrases 5.</td>
<td>Proteins → polypeptides</td>
<td>Alkaline (8)</td>
</tr>
<tr>
<td>Intestinal juice</td>
<td>7. Glands in stomach</td>
<td>Carbohydrases Proteases</td>
<td>Maltose → glucose</td>
<td>Alkaline (10)</td>
</tr>
</tbody>
</table>