3.3.4

Human Digestive System
Need to know

The functions of the main parts of the alimentary canal and the associated glands

Function of teeth. The human dental formula

Role of mechanical digestion and peristalsis

Details of chemical digestion by one amylase, one protease and one lipase. Role of bile salts

Symbiotic bacteria functions in the large intestine

Benefits of fibre
The Digestive System

- Mouth
- Epiglottis
- Trachea
- Lungs
- Diaphragm
- Liver
- Gall bladder
- Ileum
- Caecum
- Appendix
- Nasal cavity
- Oesophagus
- Stomach
- Pancreas
- Colon
- Rectum
- Anus
Mechanical breakdown of food

1. Teeth
2. Contractions in stomach wall
3. Peristalsis

*Rhythmic muscular contraction and relaxation in the wall of the alimentary canal causing the food to move along the canal*
Human Teeth

- Incisors: Cutting
- Canines: Tearing
- Pre molars: Crushing and grinding
- Molars: Crushing and grinding
Human dental Formula

The number of each type of tooth in the upper jaw one side of the mouth

- **Incisors**: i \(\frac{2}{2}\), c \(\frac{1}{1}\)
- **Canines**: pm \(\frac{2}{2}\)
- **Pre molars**: m \(\frac{3}{3}\)
- **Molars**:
Learning check 1

Name four types of teeth

Write down the human dental formula

State the function of each of the four types of teeth

Name the parts of the digestive system

Name the parts of the digestive system
Oesophagus

A muscular tube
25 cm long

Connects Pharynx
to stomach

Food moves down
the Oesophagus by
Peristalsis
Stomach

J shaped muscular bag

Stores food for about 4 hours

Churns and mixes food with gastric juice forming Chyme

Digest food
Digestion in the Stomach

1. Mechanical Digestion
   Peristalsis physically breaks up food particles

2. Chemical Digestion
   using Gastric Juice containing
   a. Mucus
   b. HCl
   c. Pepsinogen
Functions of gastric juice

1. Mucus
   
   Lines and protects the stomach wall

2. HCl
   
   a. Kills bacteria
   b. Activates pepsinogen

3. Pepsinogen
   
   Converted to the active enzyme Pepsin by HCL.
   Pepsin digests protein to peptides
Learning check 2

Define peristalsis

What is the function of HCl in the stomach

Why is pepsin secreted as inactive pepsinogen

Why is the function of mucus in the stomach
Sphincter Muscle Location

Cardiac Sphincter Muscle

Circular muscle which contracts to close entry from oesophagus to stomach.

Pyloric Sphincter Muscle

Circular muscle which contracts to close the entry to duodenum from the stomach. (Open when relaxed)
Small Intestine

Muscular tube 5-6m long

Functions
  Digestion
  Absorption

Has three parts
  1. duodenum
  2. jejunum
  3. ileum
Duodenum

25cm muscular tube

Function

Most Digestion takes place in the duodenum
Jejuneum / ileum

Function

Absorb nutrients

Adaptations for absorption

1. Long tube.
   This gives time for absorption

2. Villi.
   Infoldings which increase the surface area available for the absorption of food
Villi

Infolding in the lining of the small intestine

Function

Increase surface area for absorption of digested food
A single Villus

Fatty acids and Glycerol are absorbed into the Lacteal

All other digested food are absorbed into the blood vessels
Large Intestine Functions (Colon)

1. Reabsorb water
2. Produce B group vitamins
3. Digest cellulose

Functions 2 & 3 are carried out by symbiotic bacteria
Large Intestine Functions

Caecum

Appendix
Function unknown in humans

Rectum
Stores Faeces
Role of the Liver in digestion

The liver produces bile

Bile is a yellow-green liquid

Bile is stored in the gall bladder

Bile enters the duodenum through the bile duct
Bile consists of

1. Water
2. Bile salts
3. Bile pigments

Function of bile

1. Emulsifies fat
   This increases the surface area of the fat droplets
2. Neutralises the acidic chyme from stomach
Learning check 3

State two ways in which the small intestine is adapted to absorb digested food

What are the main functions of the large intestine

How are the products of fat digestion transported away from the small intestine

Give the function of the liver in digestion
Benefits of dietary fibre

Fibre stimulates peristalsis in the colon

Helps prevent constipation

Constipation results when undigested material passes through the colon too slowly. This leads to too much water being reabsorbed.
Three enzymes involved in digestion

Enzymes are biological catalysts

1. Amylase
2. Pepsin
3. Lipase
Salivary amylase

Role: Digest starch

Production site: Salivary glands

Where it acts: Mouth

pH in mouth: Alkaline, pH =8

Digestion product: Maltose
<table>
<thead>
<tr>
<th></th>
<th>Pepsin</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Role</strong></td>
<td>Digest protein</td>
</tr>
<tr>
<td><strong>Production site</strong></td>
<td>Gastric glands in Stomach wall</td>
</tr>
<tr>
<td><strong>Where it acts</strong></td>
<td>Stomach</td>
</tr>
<tr>
<td><strong>pH in mouth</strong></td>
<td>Acid, pH = 2</td>
</tr>
<tr>
<td><strong>Digestion product</strong></td>
<td>Peptides</td>
</tr>
<tr>
<td><strong>Lipase</strong></td>
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<td></td>
</tr>
<tr>
<td><strong>Role</strong></td>
<td>Digest fat</td>
</tr>
<tr>
<td><strong>Production site</strong></td>
<td>Pancreas</td>
</tr>
<tr>
<td><strong>Where it acts</strong></td>
<td>Dudenum</td>
</tr>
<tr>
<td><strong>pH in mouth</strong></td>
<td>Alkaline, pH = 8</td>
</tr>
<tr>
<td><strong>Digestion product</strong></td>
<td>Fatty acids + Glycerol</td>
</tr>
</tbody>
</table>
Learning check 4

Explain the benefits of fibre in the diet

Name a protease enzyme

Give the site of action of the protease and state the pH at this location

What is the product of the action of the protease
End