## 2.1 Introduction

The human body is very complex.
It consists of a variety of parts (systems, organs, tissues and cells) that all work together to ensure the survival of a person.
In this unit each system will be discussed to understand what its function is, how it works and how to keep it healthy.

### Practical task 2 Date:

Draw the outline of the human body on a piece of A3 paper.
Once you have discussed a system in class, draw it onto a piece of different coloured paper and cut it out. Stick it in the right position on your model.

## 2.2 Digestive system

All living organisms have to ingest food to satisfy their need for energy.
Green plants can manufacture their own food through photosynthesis.
Humans and animals, however, need to ingest food to ensure survival.
That is why they eat plants or meat of other animals.
The aim of the digestive system is to digest food.
This means that food is broken down into usable decomposed form, viz. nutrients.
The nutrients are absorbed in the bloodstream and transported to different body parts through cells.

### Quick facts

A nutrient is an ingredient of food for the nourishment of the body.

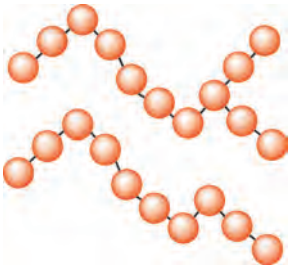
### 2.2.1 Steps in digestion

The following steps form part of digestion:

1. Intake of food (ingestion).
2. Chewing of food (mastication).
3. Digestion: food is broken into very small particles which enable them to be absorbed.
4. Absorption: nutrients are absorbed in the blood stream.
5. Transportation of food to different parts of the body for digestion.
6. Assimilation: absorbed food molecules are used in the processes of growth, tissue repair and reproduction.
7. Egestion of wastes that have not been absorbed.

## 2.2.2 Types of digestion

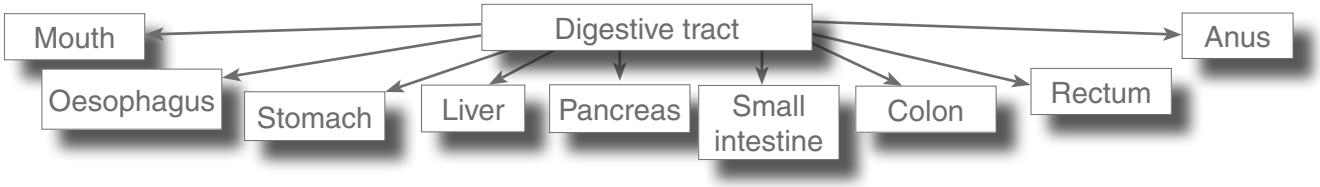
There are two types of digestion.

| Mechanical digestion | Chemical digestion |
|---|---|
|  |  |
| A physical process in which food is broken into smaller parts by tearing, pushing, mixing and grinding/crushing. | A chemical process in which crushed food is mixed with gastric juices (enzymes) and hydrochloric acid. Food is converted into liquid form for easy absorption. |
| Food is broken into smaller pieces. | Food is broken into its simplest form. |

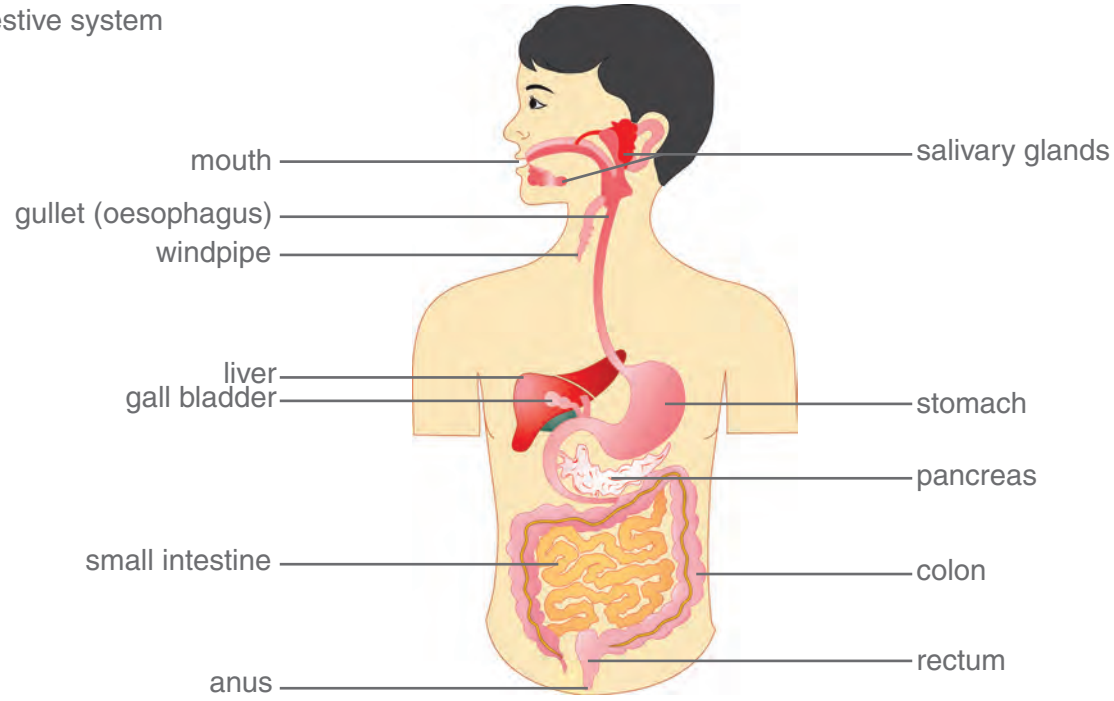
Mechanical and chemical digestion take place simultaneously.

## 2.2.3 Organs

The digestive tract consists of the following:




The digestive system



## 2.2.4 Functions of the organs

The structure of each part of the digestive tract is adapted for a specific function.
The function and position of all the organs are explained in the following table.

| | Position | Function |
|---|---|---|
| Lips and cheeks  | Cover the mouth in the front and on the sides. | Prevent food from falling out of the mouth. |
| Jaws and teeth  | On the upper and lower jaw. Lower jaw can move to enable chewing. | • Bite<br>• Chew<br>• Mince food to a bolus. |

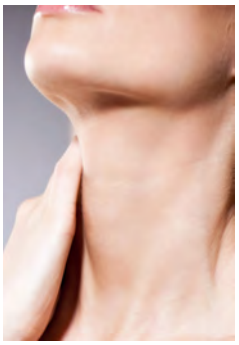
**Quick facts**

A bolus is food that has been rolled into a little ball.

| | Position | Function |
|---|---|---|
| Tongue  | A muscled organ connected to the back and bottom of the mouth. It contains taste buds. | • Grinds food against the teeth and palate.<br>• Mixes food with saliva.<br>• Rolls food into a bolus.<br>• Pushes food to the back of the mouth to swallow more easily.<br>• Organ used to taste. |
| Soft palate and uvula | At the back and top of the mouth | Closes the opening to the nasal cavity when you swallow. |
| Salivary glands  | There are three pairs: under the ears, under the tongue, under the lower jaw. | • Produce saliva which helps to mix food.<br>• In certain cases saliva dissolves food.<br>• Facilitate the swallowing process. |

## Interesting facts

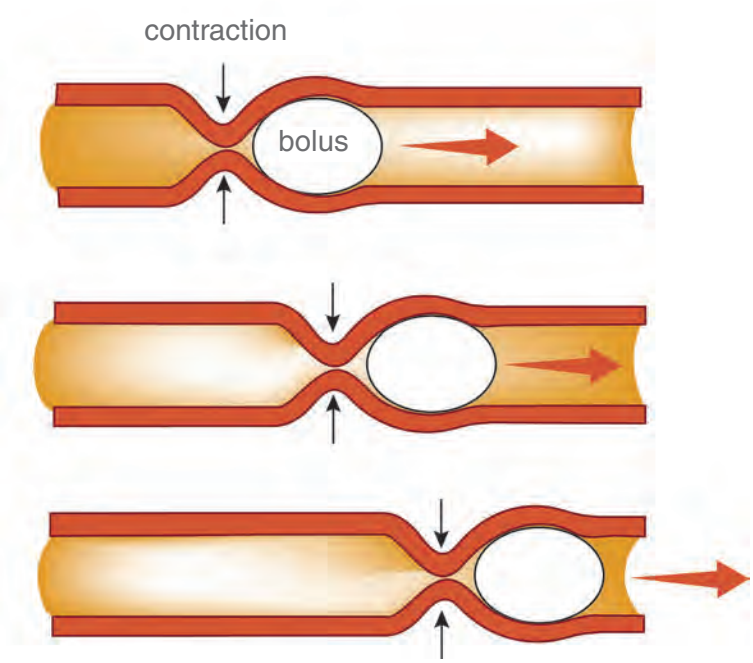
There are three kinds of salivary glands: parotid glands (under the ears); sub-mandibular glands (under the jaw); sublingual glands (under the tongue).
During the childhood disease of mumps, it is the parotid glands that swell.

| | Position | Function |
|---|---|---|
| Gullet (oesophagus)  | • Links the pharynx to the stomach.<br>• Has muscular walls that contract and relax involuntarily (cannot be controlled). | • Through peristalsis, the bolus is pushed downwards to the stomach. |

## Quick facts

Peristalsis is the process of involuntary muscle contractions that moves the bolus down the oesophagus.

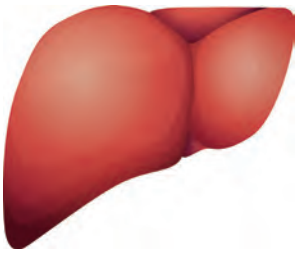
This diagram is a representation of how peristalsis works.



| | Position | Function |
|---|---|---|
| Stomach  | • Pear-shaped and lies just under the diaphragm.<br>• Lies between the oesophagus and the small intestines. | • Mechanical digestion: muscle walls grind food and mix it with the gastric juices to form chyme.<br>• Chemical digestion: gastric juices that contain enzymes break down proteins and carbohydrates. |

### Quick facts

Chyme is a mixture of food and gastric juices.

| | Position | Function |
|---|---|---|
| Liver  | • Situated just under the diaphragm and partly covers the stomach.<br>• Consists of a large lobe on the right and small lobe on the left. | • Produces bile.<br>• Produces glycogen.<br>• Stores vitamins.<br>• Stores blood and iron. |

### Interesting facts

Bile is formed from old red blood cells and the part of haemoglobin that does not contain iron.

### Interesting facts

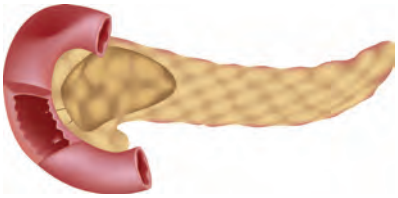
Glycogen is a polysaccharide that is converted by enzymes into glucose, which is used during respiration to release energy.

### Quick facts

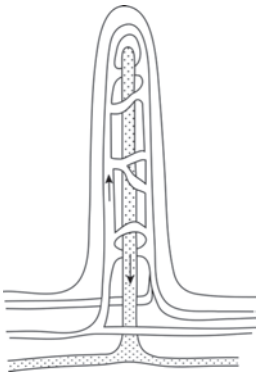
The liver is the largest gland in our bodies, and can weigh between 1,5 and 2 kilogram.

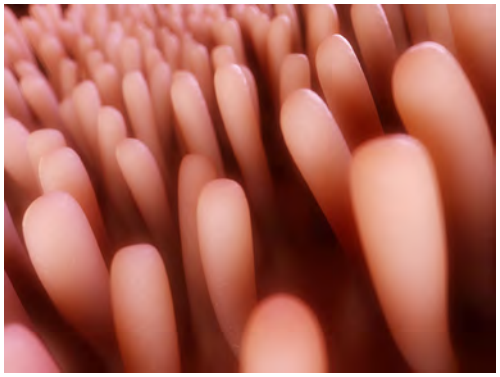
| | Position | Function |
|---|---|---|
| Gall bladder  | • The gall bladder is attached to the bottom of the liver. | • Stores the bile. |

What is the purpose of bile?
- Breaks down fats so that it can be digested more easily.
- Promotes peristalsis in the intestines.
- It neutralises chyme that comes out of the stomach.
- It is an antiseptic and prevents decay in the small intestine.

| | Position | Function |
|---|---|---|
| Pancreas  | • Tongue shaped gland found under the stomach.<br>• It consists of multiple small lobes. | • Secretes pancreatic juice which helps with the breakdown of starch, fats and proteins.<br>• Neutralises chyme.<br>• Secretes hormones that control the blood sugar levels. |
| Small intestine  | • A tube that is approximately seven meters long and consists of muscles.<br>• Situated between the stomach and the colon. | • Chemical digestion: main section where enzymes are added to the food.<br>• Most digestion takes place here.<br>• Contains villi to maximise absorption.<br>• Most nutrients are absorbed here. |

What are villi?
- Villi are also known as intestinal villi.
- It is hair-like outgrowths of approximately one millimetre found in the small intestine.
- The capillaries in the villi absorb digested food.





| | Position | Function |
|---|---|---|
| Colon  | • Tube of approximately one and a half meters in length.<br>• Situated between the small intestine and the anus. | • Absorbs water, bile salts, mineral salts and vitamins.<br>• Temporary storage of waste products |
| Rectum  | Situated between the colon and the anus. | Storage of waste products before excretion. |
| Anus | A terminal opening at the end of the digestive tract | Egestion: waste products are excreted through the anus. |

## 2.2.5 Nutrition and nutrients

Humans have to ingest food for survival.
But why is food so important?
The necessity of food can be summarised as follows:

i. Energy
   Food provides the necessary energy to our bodies to survive.
   We require energy for all life processes like movement, growth and propagation.
   Food is the fuel for our bodies.
ii. Growth
   Our bodies use food to generate new cells.
iii. Health
   The different nutrients enable our cells to stay healthy and ward off diseases.
   The nutrients are provided to our cells by the food we ingest.
iv. Recover
   Cells in our bodies use nutrients to replace dead cells and heal wounds.

Nutrition is the process whereby living organisms obtain energy by ingesting food to allow life processes to take place.