

### 1) Breathing

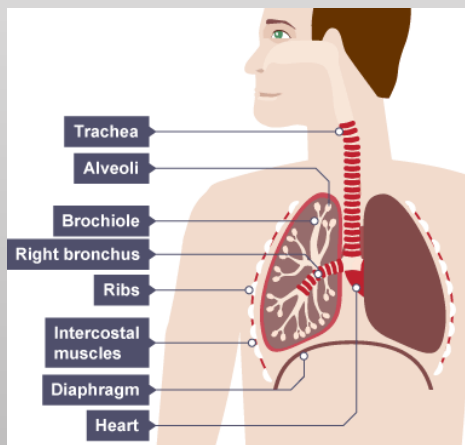
- Ventilation is the scientific name for breathing in and out
- When we breathe in, we **inhale**
- when we breathe out, we **exhale**

|                           | Inhaling                                       | Exhaling                                     |
|---------------------------|------------------------------------------------|----------------------------------------------|
| Diaphragm                 | Contracts and moves downwards                  | Relaxes and moves upwards                    |
| Intercostal muscles       | Contract, moving the ribs upwards and outwards | Relax, moving the ribs downwards and inwards |
| Volume of ribcage         | Increases                                      | Decreases                                    |
| Pressure inside the chest | Decreases                                      | Increases                                    |
| Movement of air           | Moves into the lungs                           | Moves out of the lungs                       |

We need to breathe in oxygen and breathe out carbon dioxide.

### 2) The Lungs

The lungs are part of the **respiratory system**. They allow gases to be exchanged. Air passes through the mouth, to the **trachea** which then splits into two branches called **bronchi**. One branch goes into each lung. The bronchi further split into more branches called **bronchioles**. At the end of the bronchioles are **air sacs** called **alveoli**.



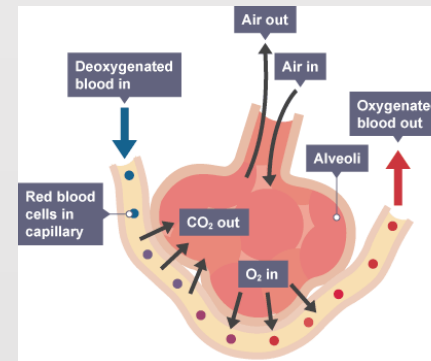
### 3) Alveoli

**Gas exchange** in the lungs happens in the alveoli.

- Gases **diffuse** from **high concentration to low concentration**
- Oxygen diffuses from alveoli into the blood when we inhale
- Carbon dioxide diffuses from blood into the alveoli as we exhale

The alveoli have special features to allow efficient gas exchange:

- thin walls** (one cell thick)
- large surface area**
- good blood supply
- moist surface



### 4) Factors Affecting the Lungs

Lung function can be increased and decreased.

- Exercise** increases lung function as it strengthens the intercostal muscles which **increases lung volume** so more gas exchange can happen.
- Asthma** decreases lung function. It is where there is **restriction in the airways** due to inflammation, excess mucus and muscle constriction. Asthma can be genetic or it can be due to the environment. It is treated using drugs called bronchodilators (inside an inhaler).

### 5) Effects of smoking / vaping on the Lungs

Cigarettes contain substances that are harmful to your health:

- Smoke** – damages cilia on epithelial cells lining the airways so microbes can't be removed properly leading to **bronchitis**.
- Tar** – coats inside of lungs and alveoli which causes coughing. This can cause **cancer** of the lungs, mouth and throat.
- Nicotine** – addictive substance that increases the heart rate and blood pressure. This can lead to **heart disease**.
- Carbon monoxide** – reduces the amount of oxygen your red blood cells can carry so your circulatory system has to work harder and so can lead to **heart disease**.

### 6) Exercise

Exercise immediately causes an increase in:

- breathing rate**
- tidal volume** (the volume of air breathed in or out in one breath)

Regular exercise has some additional effects, including an increase in the:

- strength of the diaphragm and intercostal muscles
- vital capacity** (volume of air that can be forcibly exhaled after inhaling fully)

Exercise also causes an **increase in heart rate**, which;

- Increases the amount of blood flow to muscles
- More glucose and oxygen** reach muscle cells
- More aerobic respiration** can take place
- More energy can be released** for muscle contraction

### 1) Balanced Diet

A balanced diet is one that contains the correct amounts of all the nutrients needed for healthy growth and activity.

| Nutrient     | What is it used for               | Food it is found in                  |
|--------------|-----------------------------------|--------------------------------------|
| Carbohydrate | Provides energy                   | Pasta, rice, potatoes                |
| Protein      | Growth and repair                 | Meat, pulses, eggs                   |
| Fat          | Store of energy and insulation    | Butter, oils, nuts                   |
| Vitamins     | Maintains health                  | Fruit, veg, dairy                    |
| Minerals     | Maintains health                  | Milk (for calcium), liver (for iron) |
| Fibre        | Keeps food moving through gut     | Vegetables, bran cereals             |
| Water        | Used in all cells and body fluids | Water, fruit juice, milk             |

### 2) Food Testing

- Iodine** solution tests for the presence of **starch**
  - Present: orange → black
  - Not present: stays orange
- Biuret** solution tests for the presence of **protein**
  - Present: blue → lilac
  - Not present: stays blue
- Ethanol** tests for the presence of **fats**
  - Present: colourless → cloudy white
  - Not present: stays colourless

### 3) Energy from Food

Individuals need different amounts of energy depending on:

- gender (male or female)
- age
- amount of daily activity

Foods energy content is usually measured in **kilojoules, kJ**.

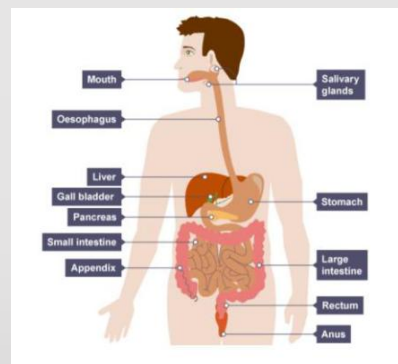
The energy content of food can be found by burning the food and calculating the temperature change of the water you heat.

### 4) Malnourishment - when people do not eat the right amounts of **nutrients**

- Too little food, or a lack of particular nutrients can cause **deficiency diseases** e.g. lack of vitamin C causes **scurvy**, lack of iron causes **anemia** and lack of vitamin D causes **rickets**.
- Too much food results in **obesity**. This may cause **heart disease** or **type-2 diabetes**.

### 5) The Digestive System

An organ system that breaks food down into small molecules that can then be absorbed into the blood.

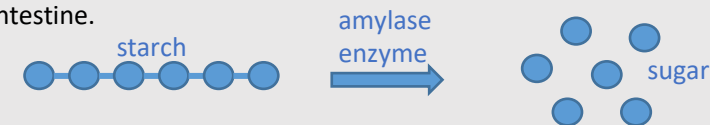


Organs in the digestive system:

- Oesophagus:** Connects the mouth to the stomach. Food is pushed down using the contraction of muscles.
- Stomach:** Churns the food. Hydrochloric acid kills harmful bacteria and enzymes break down proteins.
- Small intestine:** Enzymes break down food and the products are absorbed into the bloodstream.
- Large intestine:** Absorbs excess water.
- Rectum:** Storage of faeces (digested material) before excretion.
- Anus:** Where faeces are excreted (removed from the body).
- Liver:** Produces bile to help break down fats.
- Pancreas:** Produces and releases enzymes into the small intestine which speed up the break down of food.

### 6) Enzymes

Enzymes are special proteins that help break large food molecules into smaller molecules so they can be absorbed into the blood. They are found in the mouth, stomach and small intestine.

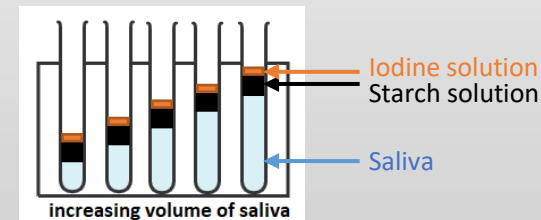


Different enzymes are needed to break down different foods.

- Proteases:** break down protein into amino acids.
- Lipases:** break down fats into glycerol and fatty acids.
- Carbohydrases** e.g. **amylase:** break down starch into sugar.

### 7) Investigating Effects of Saliva on Starch

- Independent variable** – what you change e.g. volume of saliva
- Dependent variable** – what you measure e.g. time taken for the starch to break down into sugar
- Control variables** – what you keep the same e.g. volume of starch solution, concentration of starch solution, volume of iodine solution, temperature, concentration of saliva used



- Anomaly** – a result that does not fit the pattern

### 8) The Small Intestine

The small intestine is lined with **villi** that are adapted for efficient absorption of digested food into the blood stream by:

- Having a very **large surface area**.
- Being surrounded by **lots of blood capillaries**.
- Having **thin walls** (1 cell thick) for faster absorption.

