

Knowledge Organiser Y8 Respiration

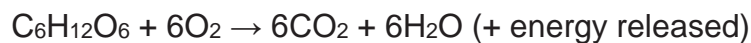
Respiration

Respiration is a **chemical reaction** that happens in the **mitochondria** in all cells to **produce energy** for all living processes.

The word equation for **aerobic respiration** is:



You need to be able to recognise the chemical symbols:

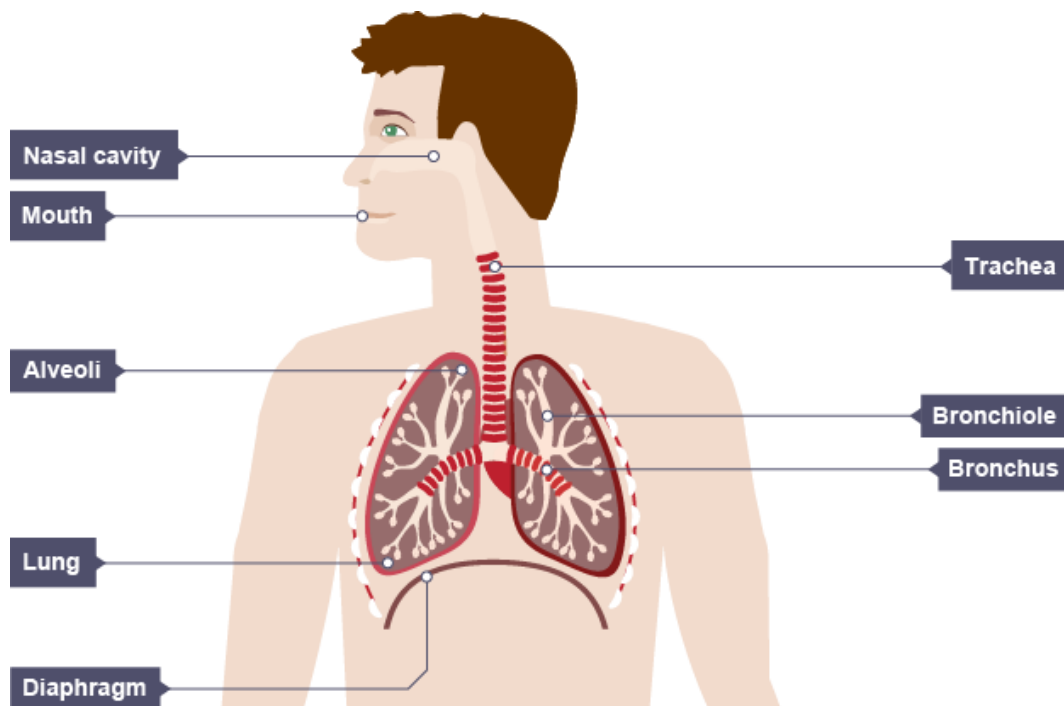


Most organisms cannot respire without oxygen but some organisms and tissues can continue to respire if the oxygen runs out. These organisms and tissues use the process of anaerobic respiration.

The word equation for **anaerobic respiration** is:



The Respiratory System



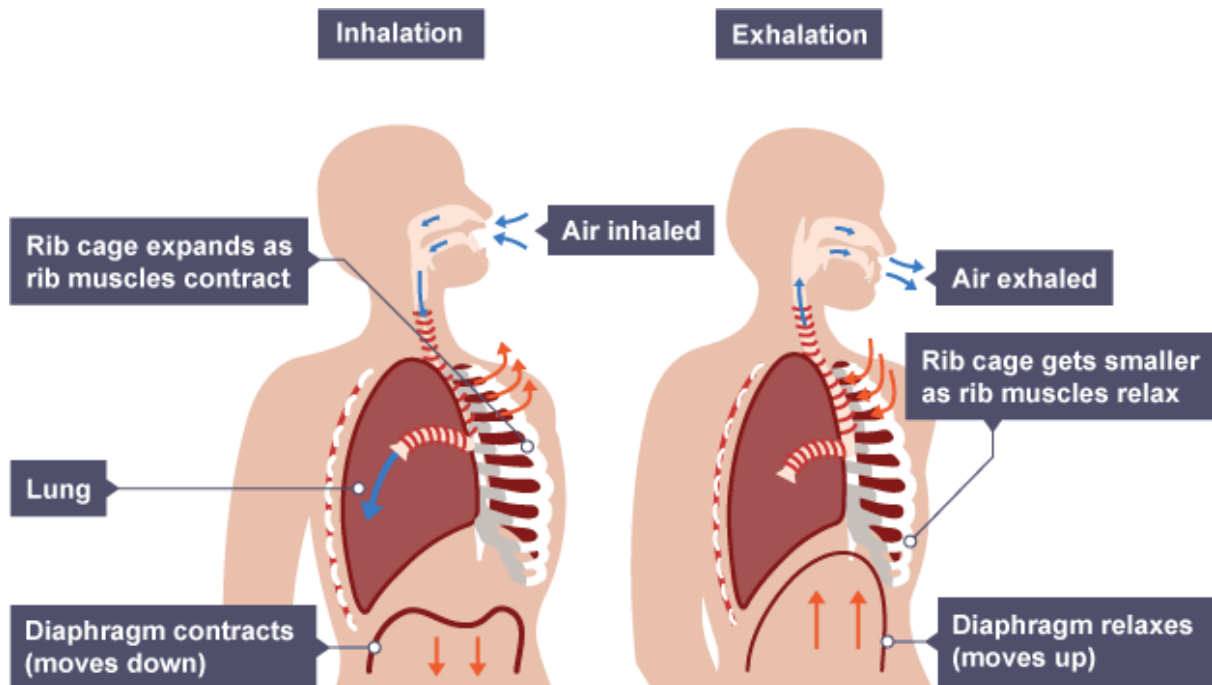
Air passes from the **mouth** into the **trachea**, often called the windpipe. The trachea divides into two **bronchi**, with one **bronchus** for each lung.

Each bronchus divides further in the lungs into smaller tubes called **bronchioles**. At the end of each bronchiole, there is a group of tiny **air sacs**. These air sacs have bulges called **alveoli** to increase their surface area.

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Breathing

Breathing is the term given to the process of taking air into and out of the lungs.



Two important structures for breathing are the **diaphragm** and **intercostal muscles**.

The diaphragm is a sheet of muscle that separates the chest (or thoracic) cavity from the rest of the body.

The intercostal muscles are found between the ribs and they control rib movement.

The impact of exercise

Muscles need energy to contract. While exercising, the muscles need additional energy as:

- the **breathing rate and volume of each breath increases** to bring more oxygen into the body and remove the carbon dioxide produced
- the **heart rate increases**, to supply the muscles with extra oxygen and remove the carbon dioxide produced

If insufficient oxygen is available to the muscles, for instance the exercise is vigorous and/or prolonged, the heart and lungs are unable to supply sufficient oxygen. Muscles begin to respire **anaerobically**. Lactic acid is produced from glucose, instead of carbon dioxide and water. Muscles continue to contract, but **less efficiently**.

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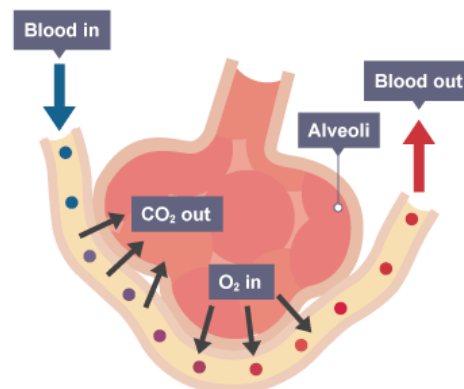
Gas Exchange

Gas exchange occurs at the **alveoli** in the lungs and takes place by **diffusion**. The alveoli are surrounded by **capillaries** so oxygen and carbon dioxide diffuse between the air in the alveoli and the blood in the capillaries.

Diffusion is the movement of gas from an area of high concentration to an area of low concentration.

Both the capillaries and alveoli walls are **very thin** - just one cell thick. They are made of **semi-permeable membranes** which allow oxygen and carbon dioxide to pass through them.

There is a **high concentration** of oxygen in the alveoli and a **low concentration** of oxygen in the blood, so oxygen diffuses from the alveoli into the blood. There is a **high concentration** of carbon dioxide in the blood and a **low concentration** in the alveoli, so carbon dioxide diffuses from the blood into the alveoli.



Smoking

Tobacco smoke contains many harmful substances. These include:

Tar	Causes cancer of the lungs, mouth and throat. It coats the inside of the lungs, including the alveoli, causing coughing. It damages the alveoli, making it more difficult for gas exchange to happen.
Smoke	However, hot smoke and tar from smoking damages the cilia (cells in the trachea and bronchi with hairs that move mucus containing microbes out of the lungs). As a result of this, smokers cough to move the mucus and are more likely to get bronchitis.
Nicotine	Nicotine is addictive. It causes a smoker to want more cigarettes. It also increases the heart rate and blood pressure, and makes blood vessels narrower than normal. This can lead to heart disease.
Carbon Monoxide	Carbon monoxide is a gas that takes the place of oxygen in red blood cells. This reduces the amount of oxygen that the blood can carry. It means that the circulatory system has to work harder, causing heart disease.