

Knowledge organiser – 9.3 Respiration

Energy is needed for life processes such as:

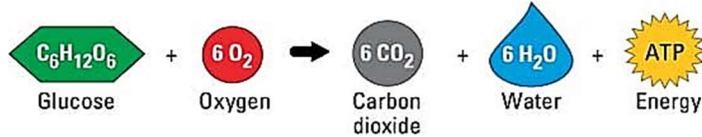
- growth and repair
- movement
- control of body temperature in mammals

Muscle cells carry out lots of respiration, so they contain large amounts of mitochondria.

	Aerobic	Anaerobic
Needs oxygen?	Yes	No
Needs glucose?	Yes	Yes
Product(s) formed	Carbon dioxide and water	Lactic acid

KEYWORD	DEFINITION
Aerobic respiration	Breaking down glucose with oxygen to release energy and producing carbon dioxide and water.
Anaerobic respiration	Releasing energy from the breakdown of glucose without oxygen, producing lactic acid (in animals) and carbon dioxide (plants and microorganisms).
Biotechnology	The use of biological processes or organisms to create useful products.
Fermentation	A type of anaerobic respiration in which glucose is converted to ethanol, carbon dioxide and energy.
Haemoglobin	The substance in blood that carried oxygen around the body.
Oxygen debt	Extra oxygen required after anaerobic respiration to breakdown lactic acid.
Plasma	Liquid that transports blood cells and other materials around the body.

AEROBIC RESPIRATION



- Occurs inside the mitochondria.
- A chemical reaction that transfers energy from organic molecules in food to your cells. The waste products are carbon dioxide and water.
- NOTE: Respiration is NOT breathing.

How does glucose get into the cells?

Glucose is found in food. Once the food is digested, glucose molecules are absorbed into the bloodstream and then transported around the body in the blood. Glucose dissolves in plasma and can diffuse into cells for respiration.

How does oxygen get into the cells?

Oxygen from the air diffuses into the bloodstream. Oxygen binds to haemoglobin in the red blood cells and gets carried around the body in the blood vessels. It then diffuses into the cells.

How does carbon dioxide leave the body?

Carbon dioxide produced diffuses out of the cells and into the blood plasma. The blood transports it to the lungs, where it diffuses into the air sacs and then exhaled.

Which organism respire anaerobically?

- Animals normally respire aerobically. During vigorous exercise, they switch to anaerobic respiration.
- Plants also respire aerobically. If the oxygen supply runs out (e.g. when the soil gets waterlogged), plants will switch to aerobic respiration in their roots.
- Some microorganism respire anaerobically. This allows them to survive in environments with no or very little oxygen (e.g. gut bacteria).

FERMENTATION

The **anaerobic respiration** of yeast is used to make beer and wine.

In this case, the yeast respire without oxygen and produces alcohol (ethanol). This process is known as **fermentation**.

Yeast converts the sugar into alcohol by anaerobic respiration:



ANAEROBIC RESPIRATION

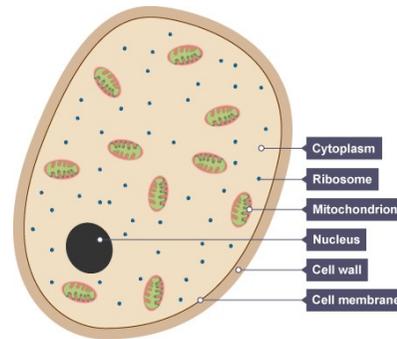


- Anaerobic respiration takes place when there is not enough oxygen for aerobic respiration.
- It happens during strenuous exercise like sprinting.
- The lactic acid produced causes painful cramps in the muscles.
- Breathing heavily after exercise, allows extra oxygen to break down the lactic acid (oxygen debt).
- Energy from anaerobic respiration is LESS than the energy from aerobic respiration.



YEAST

- A microorganism used in the production of bread and many alcoholic drinks. They are made by fermentation.
- Enzymes present in yeast speed up fermentation. The enzymes work best in warm conditions



How do you make bread?

Flour, water, and yeast are mixed to make dough. The dough is then left in a warm place to rise. This is caused by the yeast respiring, changing the sugars in the flour into ethanol and carbon dioxide. The carbon dioxide gas is trapped as bubbles inside the dough, making it rise.

The dough is then baked. In the oven, the ethanol evaporates. The bubbles of gas expand, making the bread rise further.

How do you make beer and wine?

- Wine is made when yeast is used to ferment grape sugar.
- Beer is made when yeast is used to ferment sugar in malted barley.

