

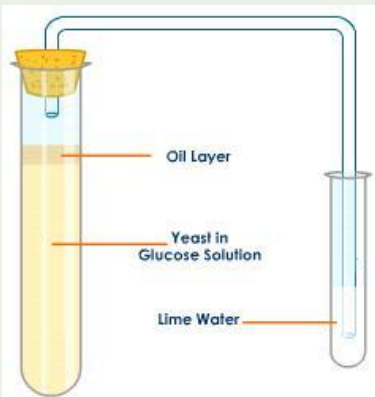
# Respiration

Key words		Key diagram
Respiration	Glucose is broken down to release energy and form new molecules.	<p><b>Aerobic respiration</b></p> <p>When the body is able to supply the cells with the oxygen and glucose that they need, it carries out <b>aerobic</b> respiration.</p> <p><b>glucose + oxygen</b> → <b>carbon dioxide + water + energy</b></p> <p>↑                    ↑                    ↑                    ↑                    ↑</p> <p>from the digestive system    from the breathing system    waste product exhaled    waste product exhaled    <b>useful!</b></p> <p><b>Anaerobic respiration</b></p> <p>When the body <b>cannot</b> supply the cells with the oxygen needed to break down glucose, then it has to carry out <b>anaerobic</b> respiration. Energy is released <b>without oxygen</b>:</p> <p><b>glucose</b> → <b>lactic acid + energy</b></p>
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 ethanol and carbon dioxide (in plants and microorganisms).	
Fermentation	Anaerobic respiration process that produces ethanol and carbon dioxide.	
Lactic Acid	A by-product of anaerobic respiration in humans.	
Exothermic	A chemical reaction in which energy (thermal) is transferred from the reacting mixture to the surroundings.	

Key knowledge
Cellular respiration is an exothermic reaction which is continuously occurring in the mitochondria of living cells.
The energy transferred supplies all the energy needed for living processes, including chemical reactions to build larger molecules, movement & keeping warm
Aerobic respiration is represented by the equation: glucose + oxygen → carbon dioxide + water
Anaerobic respiration in muscles is represented by the equation: glucose → lactic acid
Anaerobic respiration in plant and yeast cells is represented by the equation: glucose → ethanol + carbon dioxide
Anaerobic respiration in yeast cells is called fermentation.
Yeast fermentation is used in brewing and bread making.
Most living things use aerobic respiration but switch to anaerobic respiration, which provides less energy, when oxygen is unavailable e.g. during vigorous exercise
During exercise the human body reacts to the increased demand for energy by the heart rate, breathing rate and breath volume increasing to supply the muscles with more oxygenated blood.
Limewater can be used to test for the presence of carbon dioxide.

## Practical –investigate fermentation with yeast to explore respiration

The time taken for the limewater to go cloudy could be measured under differing conditions: the faster the time, the faster the rate of respiration. You could investigate the effect of changing the temperature, the pH or the concentration of glucose solution used.



Lime water will go cloudy in the presence of carbon dioxide. Glucose solution is needed to provide the reactant sugar for the yeast to respire. The oil layer on the top is to prevent the diffusion of oxygen from the air into the Yeast in Glucose solution, so that anaerobic respiration will occur.

## Key process – comparing aerobic and anaerobic respiration

