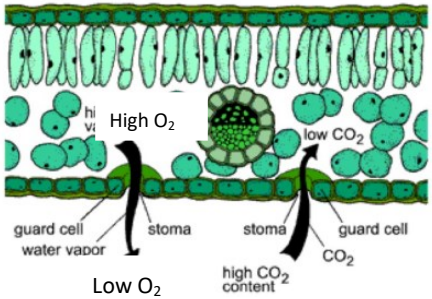
SCIENCE

Year 8: Cells

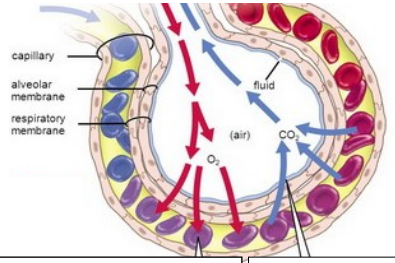
1) Diffusion

- Diffusion is the movement of substances from an area of **high concentration** to **low concentration**.
- Diffusion happens in **liquids** and **gases** because their particles move randomly from place to place.
- Diffusion is an important process for living things; it is how substances move in and out of cells.

In leaves: CO_2 diffuses into a leaf for photosynthesis and O_2 diffuses out



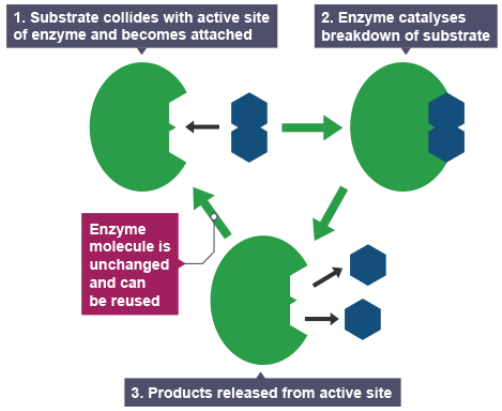
In the lungs:



O_2 diffuses from the alveoli to the red blood cells	CO_2 diffuses into the alveoli

2) Enzymes

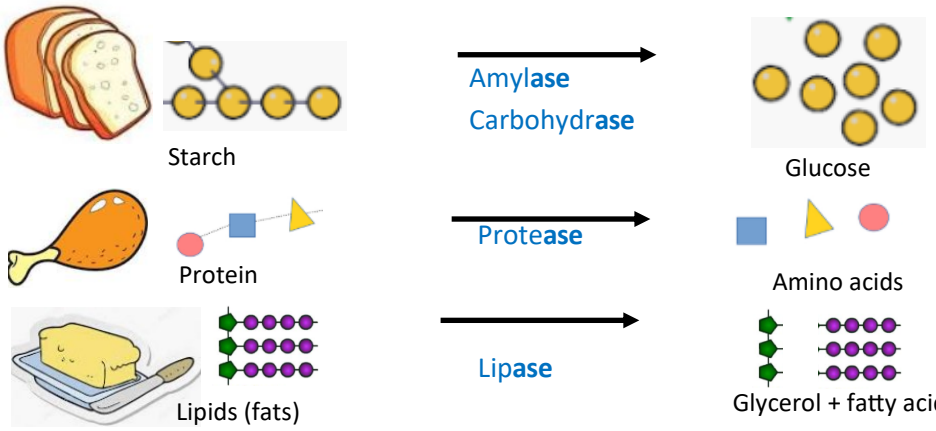
- Enzymes can either **break down** larger molecules into smaller ones, or **build** larger molecules out of smaller ones
- The substances to be reacted or broken down are called '**substrates**'. They fit specifically into an area called the '**active site'.** This is called the **'Lock and Key Theory'**
- For each type of enzyme, only one specific type of molecule will be the right shape to fit into the active site. **Enzymes are substrate specific**
- The products are released and the **enzyme remains unchanged** and can be used again
- Enzymes work best in specific temperatures and pH conditions.
- Outside of these conditions enzymes become **denatured.**



Keyword	Meaning	Keyword	Meaning
Active site	Area of an enzyme where a substrate attaches	**Diffusion**	Movement of particles from an area of high concentration to low concentration
Aerobic respiration	Respiration using oxygen and glucose to release energy	**Enzymes**	Proteins molecules that speed up chemical reactions without being used up.
Anaerobic respiration	Respiration in the absence of oxygen to release energy	**Fermentation**	Anaerobic respiration in some micro-organisms and yeast
Concentration	The amount particles in a volume of substance	**Optimum**	When a condition such as pH or temperature is most suitable for enzyme activity
Catalysts	Chemical substances that speed up reactions	**Substrate**	A substance that an enzyme reacts with
Denature	The process where an enzyme loses its active site.	**Respiration**	A chemical reaction which takes place in living cells to release energy from glucose.

3) Uses of enzymes

- The names of enzymes all end with '**ase**'
- Enzymes are involved in the digestive system to break down food into molecules small enough to diffuse into the bloodstream



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4) Aerobic respiration

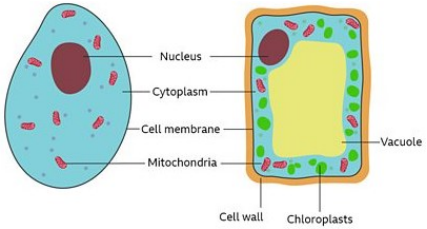
- A **chemical reaction** which uses oxygen and glucose to release energy
- The energy released is needed for all the life processes to take place e.g. movement, maintaining body temperature, growth and repair
- NOT the same as breathing (mechanical process of getting air into lungs.)
- **Equation of Respiration:**

Glucose + Oxygen → Carbon dioxide + water (+ energy)

$$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O + \text{Energy}$$

Reactants — Products

- Oxygen comes from the air we breathe in
- Glucose comes from the food we eat
- Takes place in the **mitochondria** of our cells



5) Anaerobic respiration

- Chemical reaction to release energy **without using oxygen**
- Takes place during hard exercise when not enough oxygen reaches the muscle cells
- The waste product lactic acid causes muscle pain and cramps
- Takes place in the **cytoplasm**

Equation for anaerobic respiration in animals:

Glucose → Lactic acid (+ energy)

$$C_6H_{12}O_6 \longrightarrow 2C_3H_6O_3$$

6) Aerobic vs. anaerobic respiration in animals

	Aerobic respiration	Anaerobic respiration
Oxygen needed	Yes	No
Reactants	Oxygen and glucose	Glucose
Products	Water and carbon dioxide	Lactic acid
Where it takes place	Mitochondria	Cytoplasm
Amount of energy released	More energy released	Less energy released
Uses	Most of the time, gentle exercise, endurance exercise	Hard exercise e.g. sprinting, weightlifting

7) Fermentation

- The name given to **anaerobic respiration** in yeast and some micro-organisms
- Used in the brewing and baking industries to make beer and bread

Glucose → Ethanol + Carbon dioxide (+energy)

$$C_6H_{12}O_6 \Rightarrow 2C_2H_5OH + 2CO_2$$

Ethanol is alcohol so fermentation is used for brewing

Carbon dioxide makes dough rise so fermentation is used for baking