

# Knowledge Organiser: Year 8: - Bioenergetics

## Section 1: Key Words

<b>Glucose</b>	a simple sugar produced by plants during photosynthesis. It is an important energy source in living organism for respiration
<b>Carbon dioxide</b>	A colourless odourless gas made up of carbon and oxygen produced by respiration and burning and used by plants in photosynthesis
<b>Water</b>	A colourless odourless liquid made of hydrogen and oxygen. Produced in respiration and used in photosynthesis
<b>Oxygen</b>	Colourless odourless gas used in respiration and produced by plants during photosynthesis
<b>Chloroplast</b>	Part of a plant cell that contains chlorophyll and in which photosynthesis takes place
<b>Mitochondria</b>	Part of the cell in which respiration take place to release energy
<b>Photosynthesis</b>	the process by which green plants and some other organisms use sunlight to produce glucose from carbon dioxide and water
<b>Respiration</b>	The breakdown of glucose to release energy
<b>Aerobic</b>	Using oxygen
<b>Anaerobic</b>	Not using oxygen
<b>Lactic acid</b>	A toxic chemical produced during anaerobic respiration. It cause muscle fatigue which can result in cramp

## Section 5: Obtaining nutrients in plants

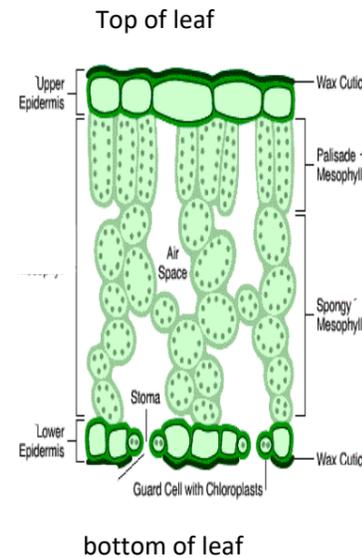
Water	From the soil, taken up through the roots
Carbon dioxide	From the air, diffuses in through the stomata
Oxygen	From the air, diffuses in through stomata/made in photosynthesis
Minerals	From the soil, taken up through the roots

## Section 2: Equations for bioenergetics

	Word equation	Symbol equation
Photosynthesis	Water + carbon dioxide → glucose + oxygen	$6H_2O + 6CO_2 \rightarrow C_6H_{12}O_6 + 6O_2$
Aerobic respiration	glucose + oxygen → Water + carbon dioxide	$C_6H_{12}O_6 + 6O_2 \rightarrow 6H_2O + 6CO_2$
Anaerobic respiration	Glucose → lactic acid	

## Section 3: Adaptations of a leaf

Part	Function
Stomata	Holes to allow gas exchange (CO <sub>2</sub> in and O <sub>2</sub> out). Most are found on the underside of the leaf
Thin	To allow short diffusion distance for gases
Wide and broad	Large surface area to allow for maximum light absorption
Chloroplast	Contains chlorophyll (green pigment needed to absorb light). Is where photosynthesis occurs
Spongy mesophyll layer	Layer of leaf found near the bottom of the leaf that is full of air spaces to allow gas exchange between leaf at surroundings
Palisade mesophyll layer	Layer of leaf found near to top of the leaf. Cells here are packed closely together and are full of chloroplast to allow maximum light absorption
Waxy cuticle	Waxy layer reduces water loss. It is transparent to allow light through to palisade layer
Guard cells	Open and close stomata to control gas exchange



## Section 4a: types of respiration

There are two types of respiration; aerobic and anaerobic.

Aerobic	Anaerobic
Uses oxygen	Doesn't use oxygen
Uses glucose	Uses glucose
Produces carbon dioxide and water	Produces lactic acid
Used in low intensity activity	Used in high intensity activity
Produces a lot of energy	Produces little energy
Occurs in the mitochondria of cell	Occurs in the mitochondria of cell
Complete breakdown of glucose	Incomplete breakdown of glucose

## Section 4b: Anaerobic respiration in micro-organisms (fungi)

This is not specifically taught in lessons by allows optional extra information for those who want it

Type of Respiration	Anaerobic
Reactants	Glucose
Products	Ethanol and carbon dioxide
Equation	Glucose → ethanol + carbon dioxide
Uses	Make bread (CO <sub>2</sub> ) Fermentation e.g. beer, vodka, wine (ethanol)

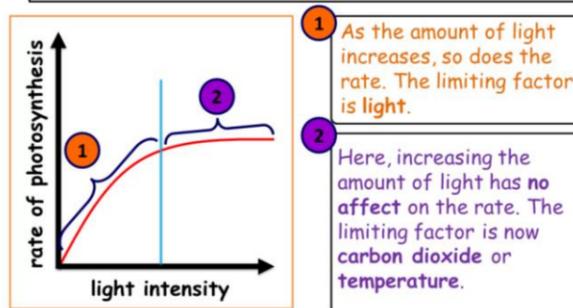
## Section 6: Limiting Factors of Photosynthesis

<b>Light</b>	Light intensity affects the rate of photosynthesis as it provides the energy the reaction needs. Low light intensity = little photosynthesis; high light intensity = lots of photosynthesis
<b>Carbon dioxide</b>	The concentration of CO <sub>2</sub> in the air affects how much photosynthesis can occur as it is a reacted needed for the reaction – lots of CO <sub>2</sub> = lots of photosynthesis
<b>Temperature</b>	The temperature affects how well enzymes work. Enzymes control the photosynthesis reaction. Too cold and the enzymes don't have enough energy to work very fast so the reaction is too slow. Too hot and the enzymes denature and don't work at all and photosynthesis can't occur.

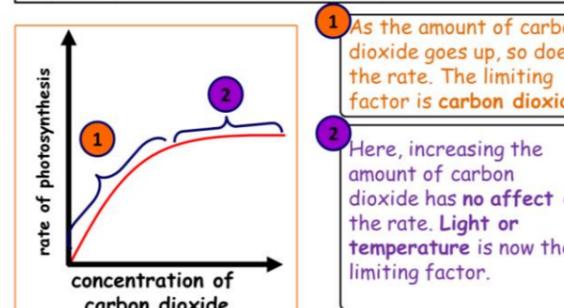
**N.B. water is not a limiting factor as there is generally enough available**

## Section 7: Limiting Factors Graphs

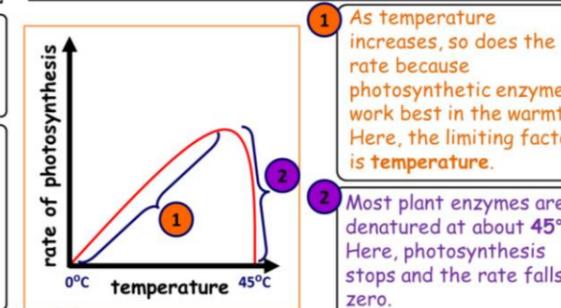
How does the amount of light affect the rate of photosynthesis on this labelled graph?



How does the amount of carbon dioxide affect the rate of photosynthesis on this labelled graph?



How does temperature affect the rate of photosynthesis on this labelled graph?



## Section 8: Why do all Organisms depend on Photosynthesis?

- Organisms need energy to survive.
- They get this from what they eat. Carnivores eat other animals, herbivores eat plants.
- Energy entering the food chain comes from the sun.
- If plants didn't photosynthesis then the sun's energy would not enter the food chain

## Section 9: Types of Respiration and Activity

Aerobic	Anaerobic
Low intensity (walking)	High intensity (sprinting)
Can be sustained for an extended period of time	Only sustained for a short period of time
	Causes muscle fatigue and creates an oxygen debt

## Section 10: Minerals

N	Makes amino acids. Lack = stunted growth; yellow leaves
P	Growth and repair Lack = poor root growth & discoloured leaves
Mg	Chlorophyll Lack = yellow leaves
K	Making enzymes Lack = poor flowers + fruit growth & yellow leaves