

GCSE Biology Complete Revision Summary

Plant structure and their functions

Cell Biology

Organisation

Infection and Response

Bioenergetics

Photosynthesis

Factors affecting photosynthesis

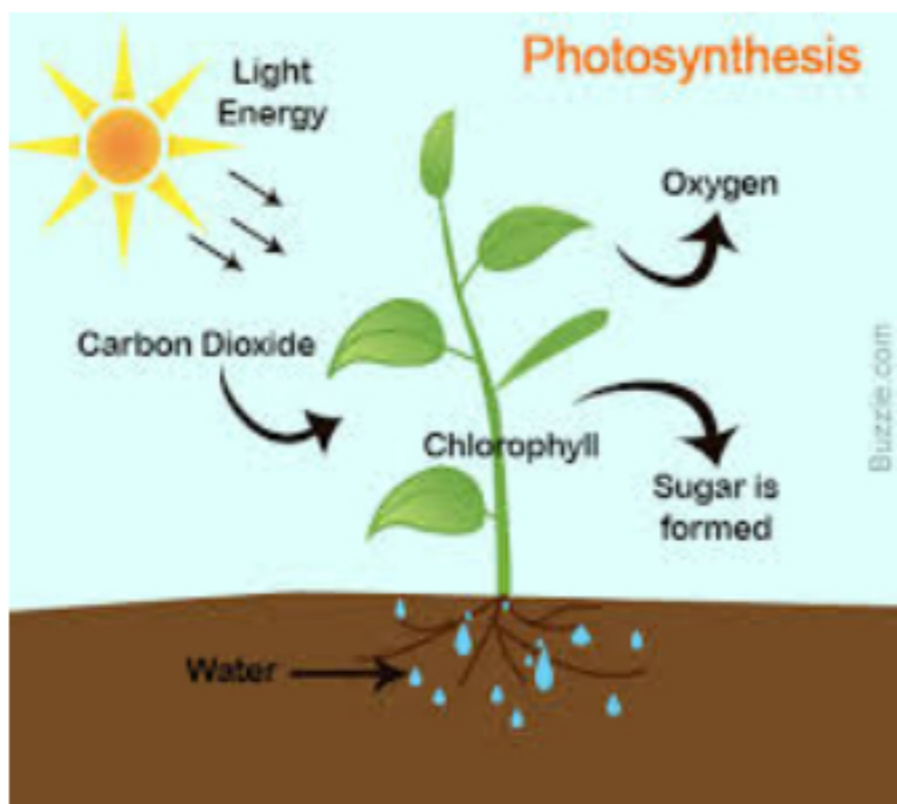
How plants use glucose

Greenhouses

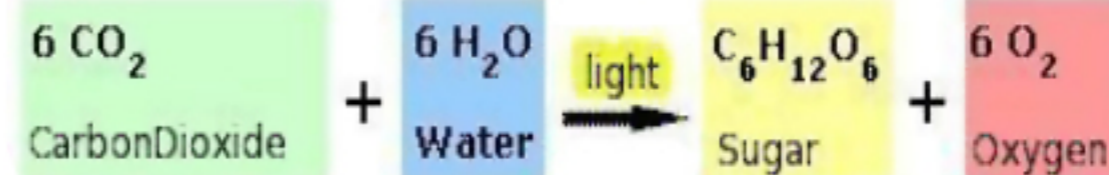
Respiration

PHOTOSYNTHESIS

It is the process by which green plants prepare their own food by using water, carbon dioxide in presence of sunlight to form glucose and oxygen.



Source: Wikimedia Commons



Only leaves can photosynthesize as they chlorplast which contains chlorophyll. Chlorophyll is the green pigment that traps light for the leaves and helps them to photosynthesis.

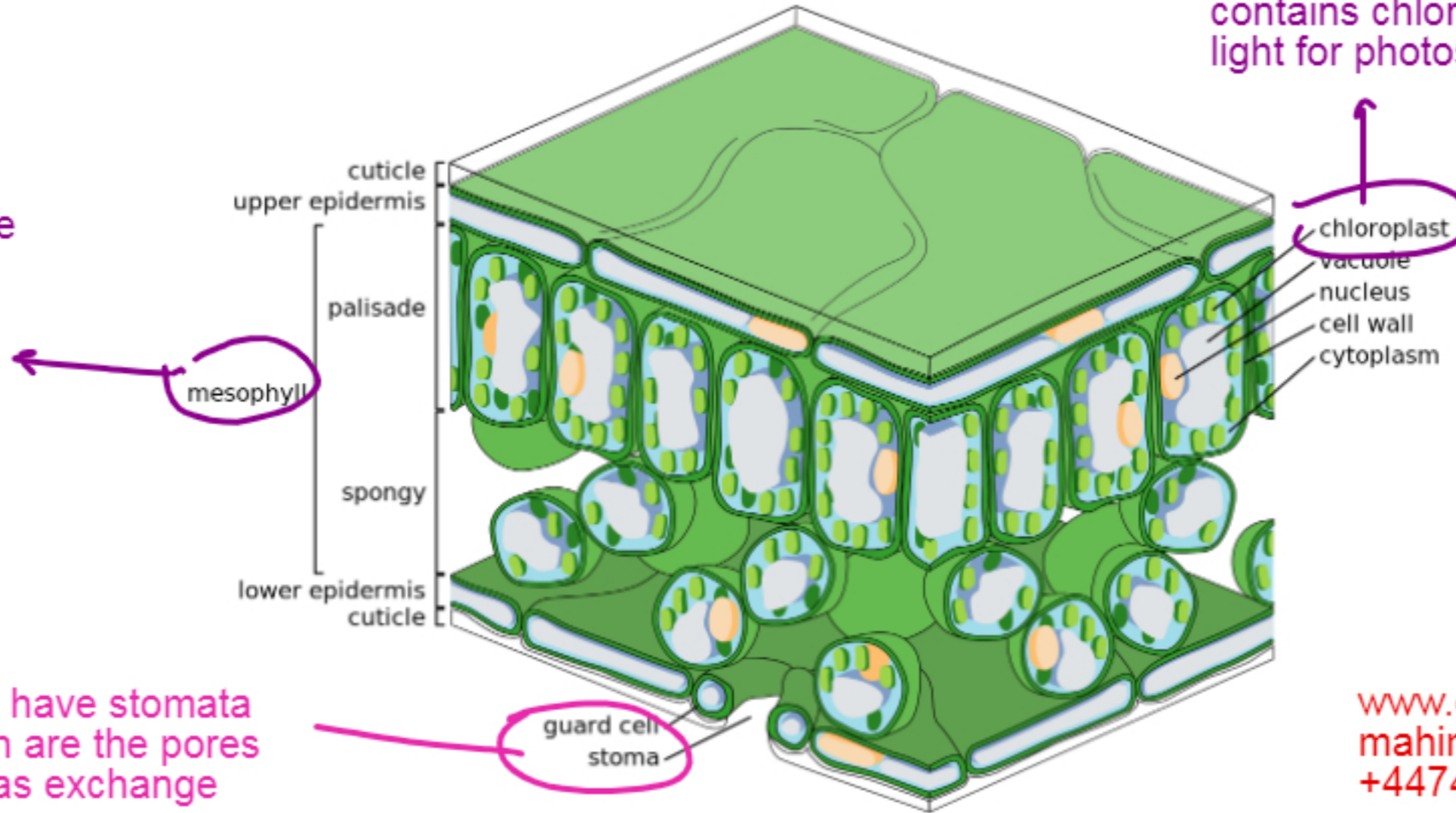
Photosynthesis is **ENDOTHERMIC**

Endothermic as it takes in heat from the sunlight.

The energy released in making glucose and oxygen is less than the energy required to break the bonds of carbon dioxide and water.

LEAF ADAPTATIONS FOR PHOTOSYNTHESIS

Photosynthetic cells are closer to the stomata for quick exchanges of gases



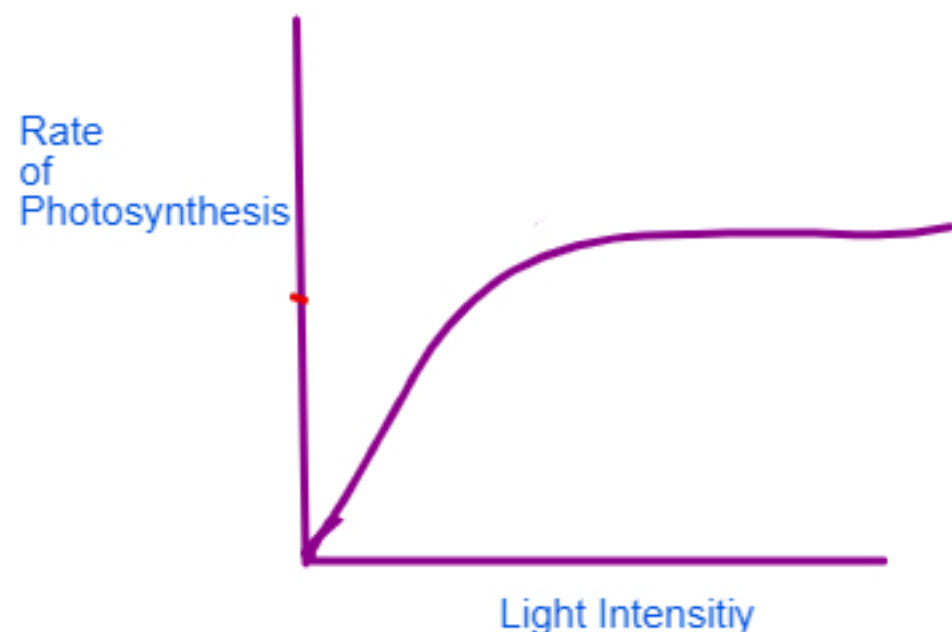
They have chloroplast which contains chlorophyll and traps light for photosynthesis

They have stomata which are the pores for gas exchange

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SOURCE: WIKIPEDIA

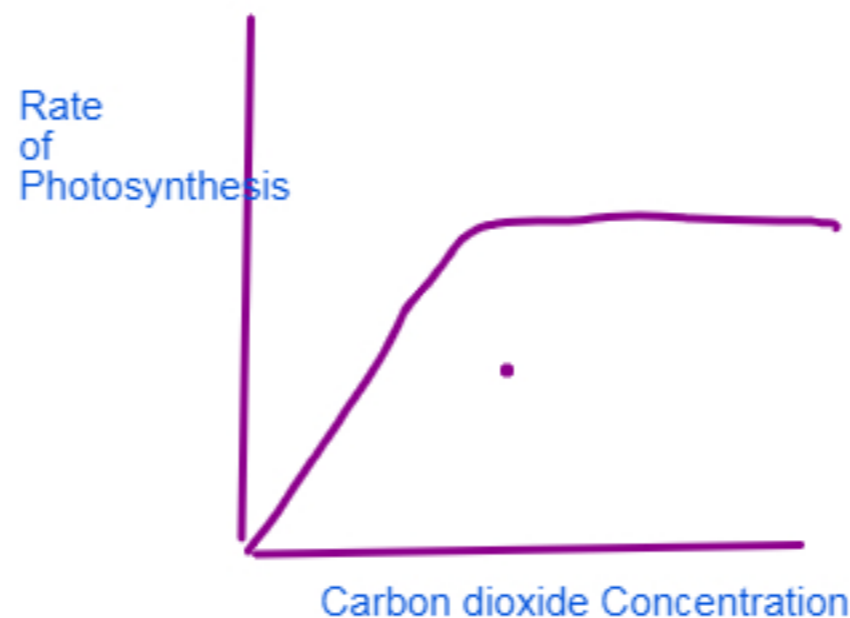
LIGHT



As the light intensity increases the rate of photosynthesis increases and then it levels off.

Initially the rate increases and then it has no effect as at that point other factors become limiting

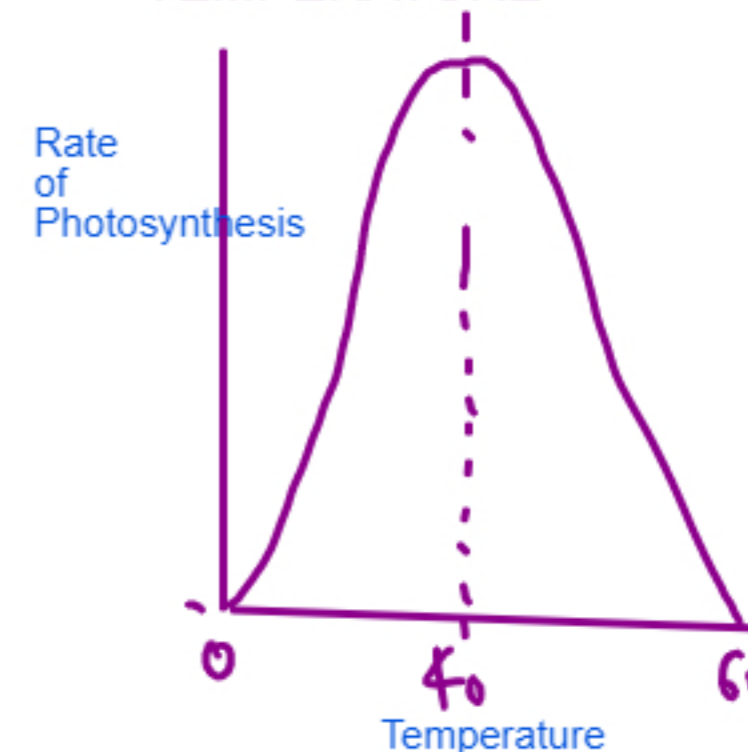
CARBON DIOXIDE



As the light intensity increases the rate of photosynthesis increases and then it levels off.

Initially the rate increases and then it has no effect as at that point other factors become limiting

TEMPERATURE



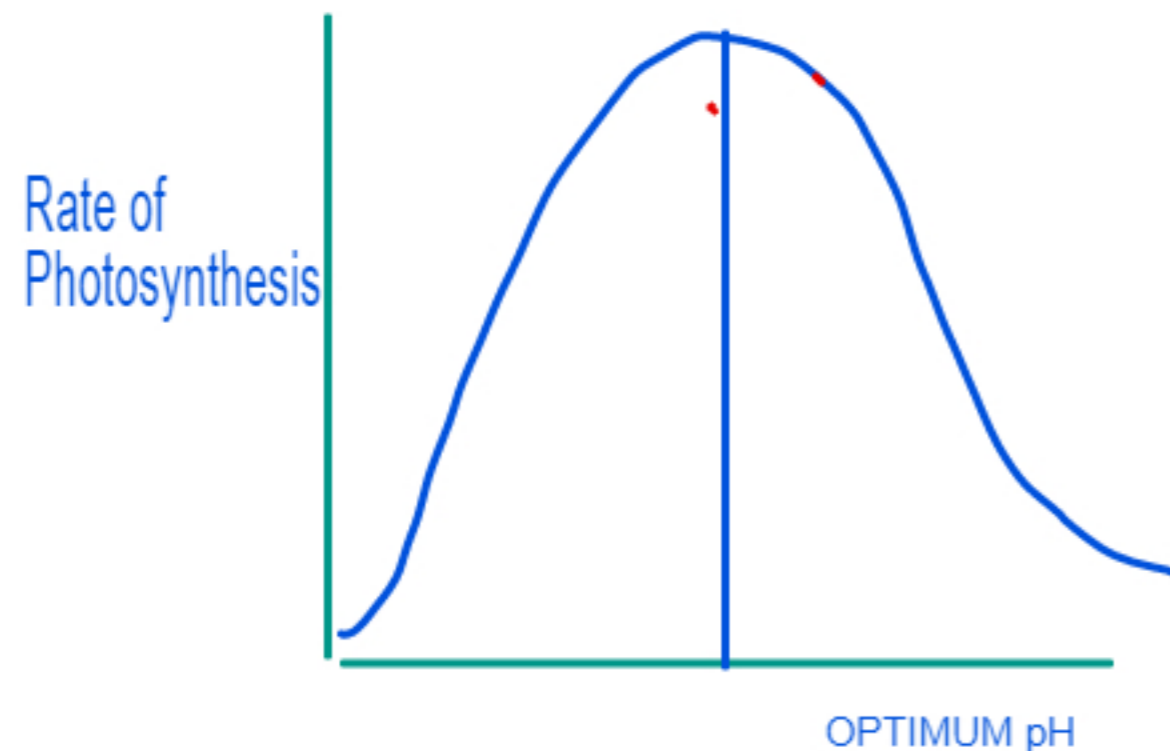
As the temperature increases the rate increases as the particles gain kinetic energy and moves faster causing greater collision and increase reaction rate.

Beyond optimum the rate decreases as at the higher temperature the enzymes get denatured. The enzyme changes shape and is not functions if the shape changes



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As the pH increases the rate increases upto optimum. Beyond optimum the rate decreases as enzymes get denatured.

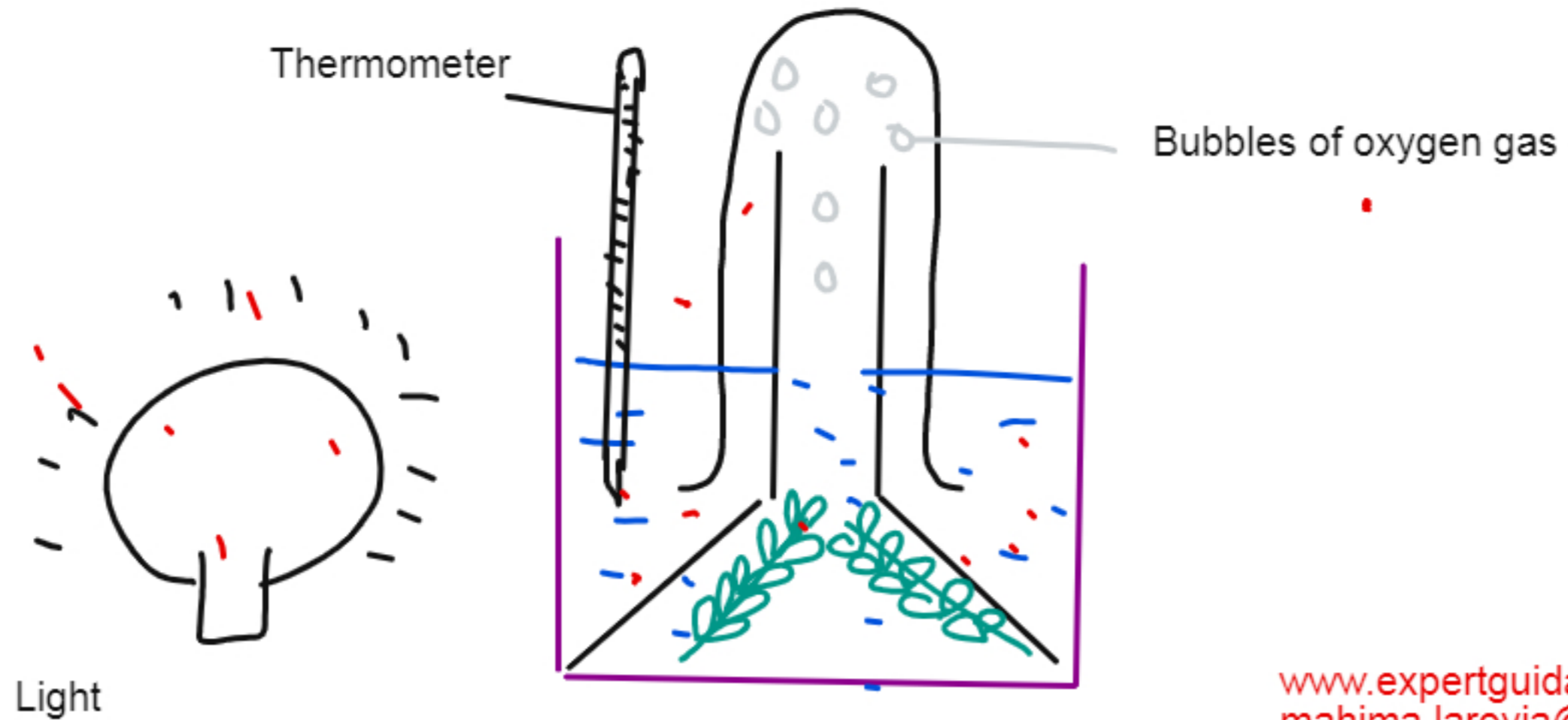
LAW OF LIMITING FACTORS !!!

The factor that limits the rate OF photosynthesis

Limiting factor is that factor that is present in a least amount than required and affect the rate of photosynthesis.

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MEASURING PHOTOSYNTHESIS



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FATE OF GLUCOSE

Glucose is soluble in water and if present longer will disturb osmotic balance of the cell. Starch is complex molecule which is insoluble and can store large amount of glucose. Also starch being insoluble does not disturb the osmotic balance of the cell.

STARCH

Excess glucose is stored in the plant as starch and is used by the plant when needed.

PROTEINS

Glucose is combined with nitrates and other mineral ions from the soil to form protein. Proteins are responsible for growth and also to make enzymes for metabolic reactions.

GLUCOSE

Principle source of energy. It broken down during respiration and produces energy for the plant to grow and reproduce.

CELLULOSE

Excess glucose can be converted into structural carbohydrate called Cellulose.

Cellulose is the component of the cell wall which provide shape and support to the plant.

LIPIDS

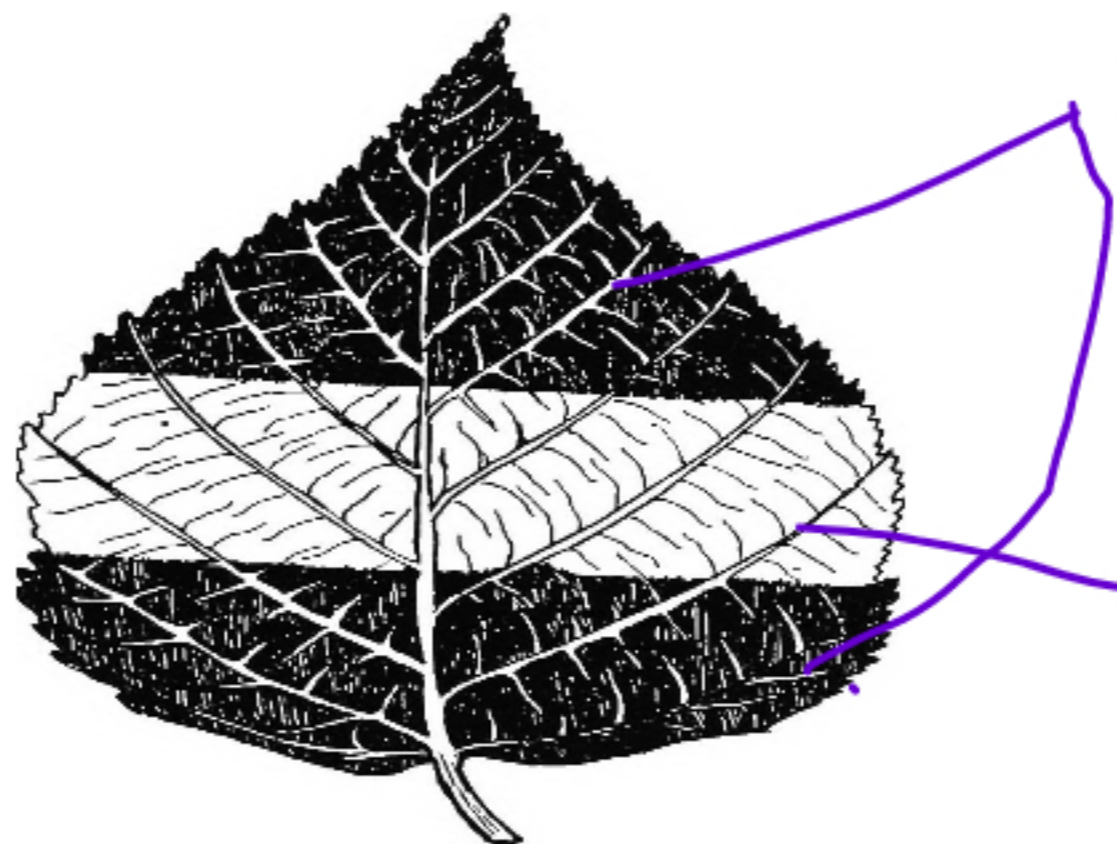
Glucose can be converted to fats and oil to serve as energy source. Fats and oil can form the component of the cell membrane. They are also stored in seeds as an energy store for germination.

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TEST FOR STARCH

Add Iodine Solution

If the solution turns blue black it indicates the presence of starch.



Exposed part of the leaves photosynthesized and produce starch. On adding iodine solution the part of the leaves turn blue black.

Source: Flickr.com

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GREENHOUSE



It controls all the limiting factors to provide maximum yield of photosynthesis

Temperature, light, carbon dioxide and other factors affecting photosynthesis are controlled and monitored.

It works on the principle of greenhouse effect in which light is allowed to enter but is not allowed to escape thereby increasing light and temperature inside the greenhouse.

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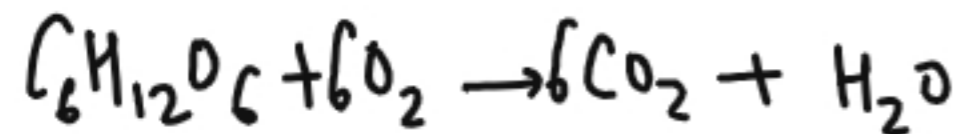
RESPIRATION

It is the process of breaking down food to release energy.

AEROBIC RESPIRATION

- Takes place in the presence of Oxygen
- Releases more energy and the food is completely broken down.
- Takes place in the mitochondria
- It is opposite of photosynthesis

Glucose + Oxygen → Carbon Dioxide + Water

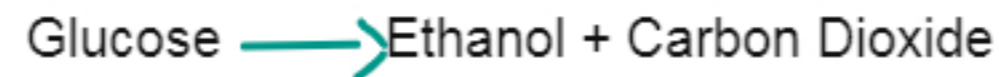


ANAEROBIC RESPIRATION

- Takes place in absence of oxygen.
- Releases less energy and food is not completely broken down.
- Takes place in the Cytoplasm

PLANTS

known as fermentation
forms ethanol and carbon-dioxide



ANIMALS

takes place in muscles

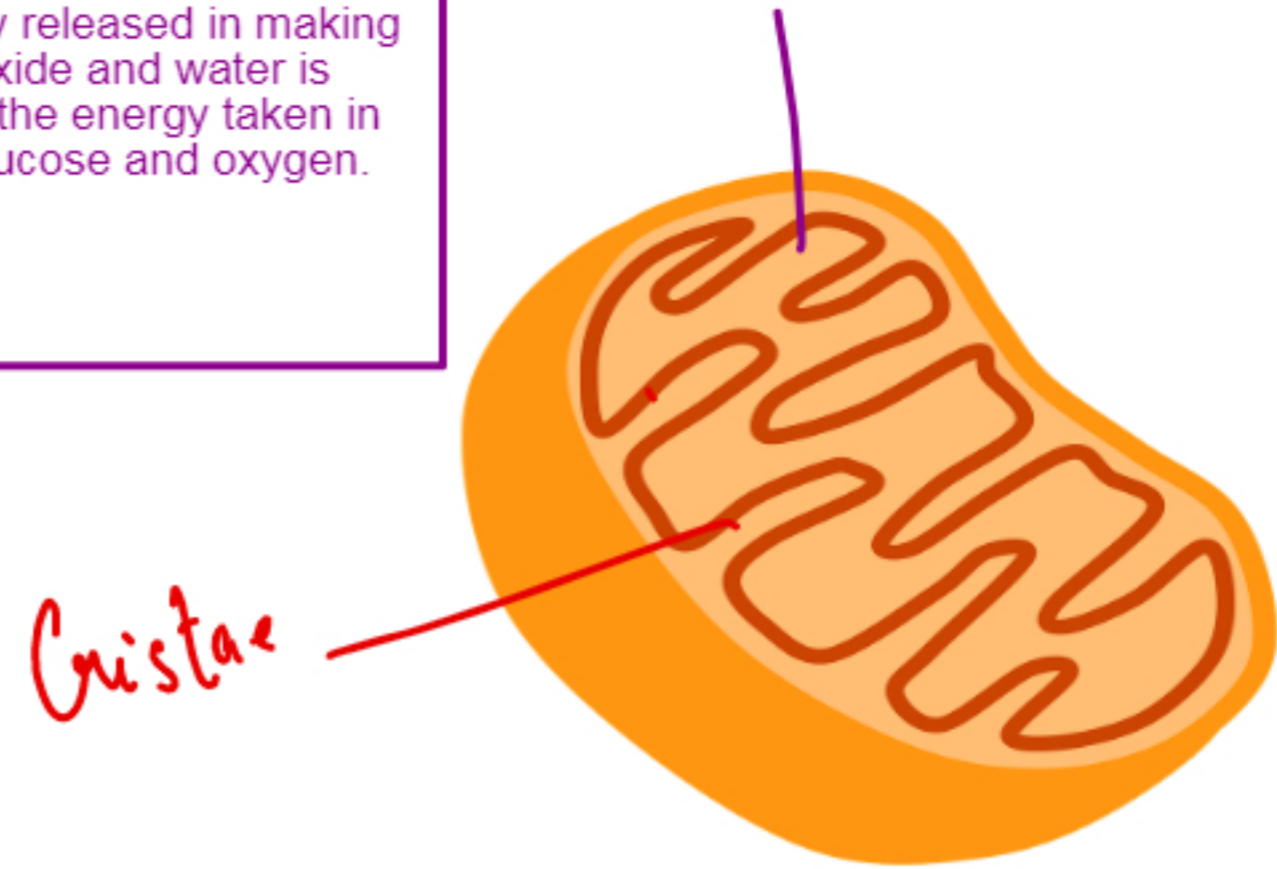


BREATHING AND RESPIRATION

| BREATHING | RESPIRATION |
|--|--|
| It is a physical process. | It is chemical process. |
| Does not involve enzymes | Involve Enzymes |
| It is breathing in oxygen and breathing out carbon dioxide | It is breaking of food in presence of oxygen for energy. |
| No energy is released | Energy is released |
| Takes place outside the cells | Takes place inside the cells |

EXOTHERMIC
As it releases heat.

The energy released in making carbon dioxide and water is more than the energy taken in to break glucose and oxygen.





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WHY WE NEED ENERGY

• **MOVEMENT**

Energy is required by the muscles to contract.

Respiration provides energy for muscle contraction.

Muscle cells have loads of mitochondria and glycogen for efficient respiration.

TRANSPORT

Transport of substance in an out of the cell against the concentration gradient via active transport required energy.

THERMOREGULATION

Respiration produces heat which helps to maintain the body temperature.

CATABOLISM

Breaking of large substances to smaller ones like digestion requires energy.

ANABOLISM

Building of bigger molecules from smaller ones like making proteins fats and lipids from minerals ions require energy.

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BREATHING RATE

The breathing rate increases so that more oxygen is inhaled to meet the demands of oxygen by the muscles.

Increased breathing rates also increases the rate of removal of carbon dioxide.

HEART RATE

Increase heart rate pumps more blood to the muscles.

Increase blood supply increases the supply of both glucose and oxygen via blood to the muscles cells.

RESPONSE TO EXERCISE



Demand for oxygen and glucose increases as more energy is needed



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GLYCOGENOLYSIS



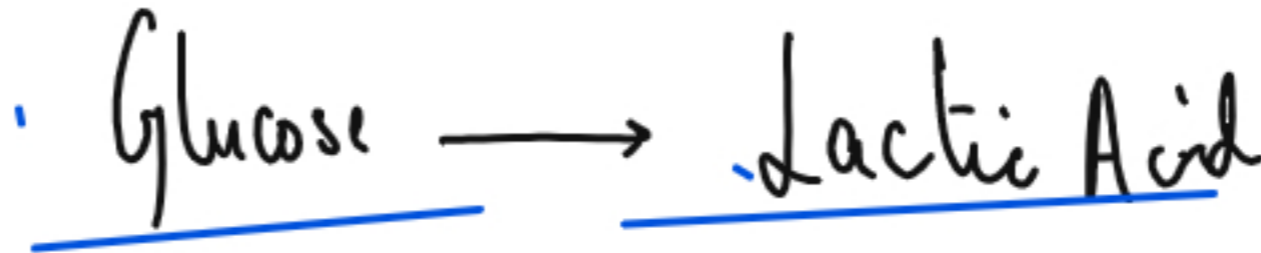
Stored carbohydrates, glycogen is converted to glucose in the muscles during exercise to meet the demand for increased glucose.

WHY BREATHING RATE IS HIGH AFTER STOPPING THE EXERCISE

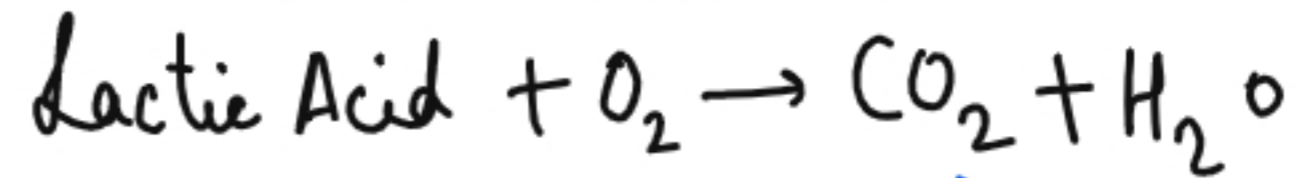
OXYGEN DEBT

Extra Oxygen needed by the body after exercise to recover.

During Exercise the body switches to anaerobic respiration. So glucose is broken down into lactic Acid.



The lactic acid needs to be broken down into carbon dioxide. The breathing rate is still high to get maximum oxygen to break lactic acid.



METABOLISM

It is the sum of all the reactions of the body

CATABOLISM

breakdown reaction in which bigger molecule is broken down into smaller ones.

- a) Breakdown of glycogen
- b) Breakdown of proteins
- c) Breakdown of lipids
- d) Respiration

ANABOLISM

It is the synthesis reaction in which bigger molecule is formed from the smaller ones.

- a) Synthesis of cellulose from glucose
- b) Synthesis of starch and glycogen from glucose
- c) Synthesis of fats and lipids
- d) Synthesis of proteins

LIVER

DETOXIFICATION

The alcohol or any poisonous substance taken in the body is detoxified in the liver as liver contains enzymes for detoxification

BREAKDOWN OF BLOOD CELLS

Old and worn out blood cells are broken down in liver.

BREAK DOWN OF LACTIC ACID

Lactic acid produced during anaerobic respiration in the muscles is transported into the liver via blood and liver converts it into carbon dioxide and water by taking in more oxygen which is inhaled as oxygen debt.

BREAKDOWN OF HARMFUL SUBSTANCES FOR EXCRETION

Excess proteins is broken down into urea in the liver which is excreted by kidney as Urine

PHOTOSYNTHESIS VERSUS RESPIRATION

| PHOTOSYNTHESIS | RESPIRATION |
|------------------------------------|---|
| Only in plant cells | Occurs in all living cells |
| It is endothermic reaction | It is exothermic reaction. |
| Oxygen is produced | Oxygen is used up |
| Takes place in chloroplast | Takes place in Mitochondria |
| Anabolic reaction, glucose is made | Catabolic reaction, glucose is broken down. |
| Light dependent | Light independent |



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Photosynthesis — It is the process by which green plants prepare their own food. carbon dioxide and water are combined to form glucose and oxygen in presence of sunlight

Respiration — breakdown of food to release energy.

Limiting Factors — Factor that limits the rate of photosynthesis

Endothermic Reaction — Reaction that takes in heat

Exothermic Reaction — Reaction that releases heat

Glucose — product of photosynthesis and fuel for respiration

Starch — Storage carbohydrate in plants

Glycogen — Storage carbohydrate in animals

Aerobic Respiration — Breaking down of food in presence of oxygen.

KEY TERMS

Anaerobic Respiration — breaking down of food in absence of oxygen

Fermentation — Anaerobic respiration in plants that produces ethanol and carbon dioxide

Greenhouse — A glass or a plastic house to control the limiting factors and increase the rate of photosynthesis.

Metabolism — Sum of all the catabolic and anabolic reactions of the body.

Liver — An organ involved in metabolism.

Lactic Acid — The product of anaerobic respiration in animals

Oxygen Debt — The extra oxygen needed after exercise to break down lactic acid and recover to pre exercise state.

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NEXT STEP !!!!



CHECK SPECIFICATION



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