2.8. CELL RESPIRATION

RELEASE OF ENERGY

cell respiration is the controlled released energy from organic compounds to produce ATP.

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

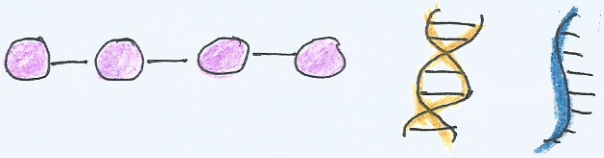
- cell respiration is carried out using enzymes in a careful and controlled way, so that the energy released is retained in the form of **Adenosine triphosphate**.

= ADP + ip

A phosphate group is linked to Adonesine diphosphate to make ATP.

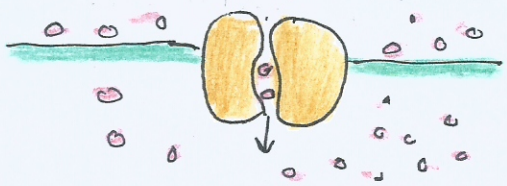
ATP splits into ADP and inorganic phosphate to release instant energy.

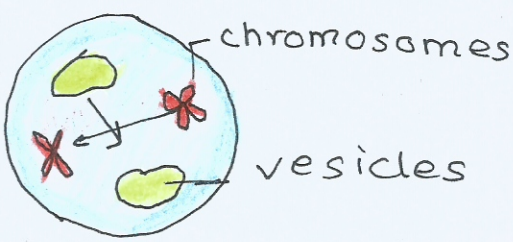
The energy released by ATP is used for:



Synthesizing large molecules like DNA, RNA and proteins.

Pumping molecules or ions across the membrane by using active transport.





Moving things around inside the cell.

when ATP is used, the energy released is converted to heat. It is useful to keep an organism warm but it cannot be used for cellular activities.

RESPIRATION

Anaerobic

- Glucose is broken down without using any oxygen.
- The yield of ATP produced is small but is produced quickly. (2 ATP).

Anaerobic respiration in animals / humans:-

Glucose $\xrightarrow[ADP\ ATP]{}$ lactate

In yeast and plants,

Glucose $\xrightarrow[ADP\ ATP]{}$ ethanol + CO_2

Aerobic

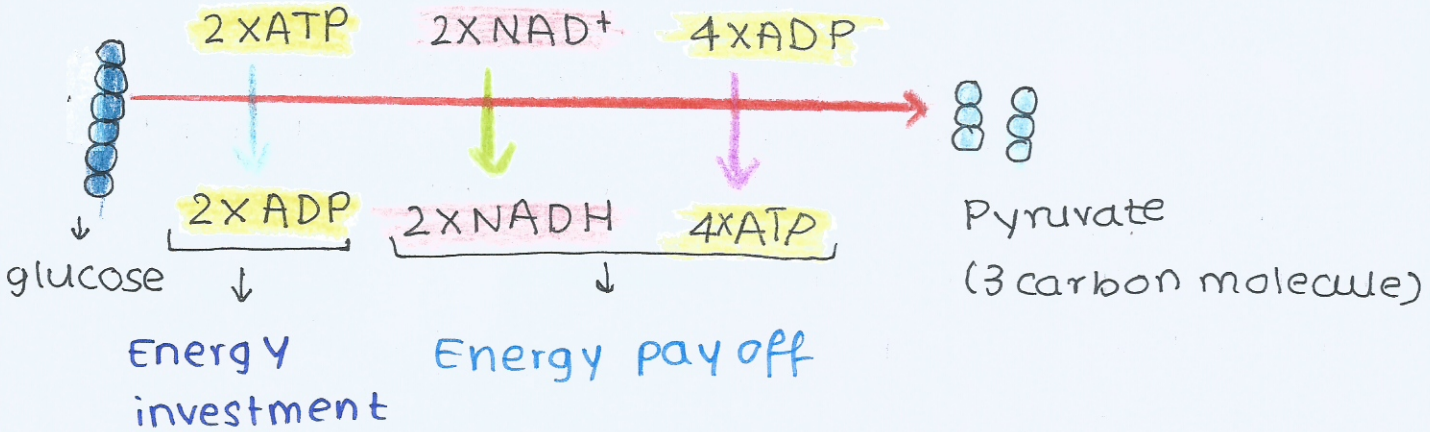
- Glucose is broken down in the presence of oxygen.
- The yield of ATP produced is greater than that produced in anaerobic respiration. (36/38 ATP).

Aerobic respiration in eukaryotes:-

glucose + oxygen $\xrightarrow[ADP\ ATP]{}$ carbon dioxide + water

---

Both, aerobic and anaerobic respiration begin with with the process of GLYCOLYSIS.

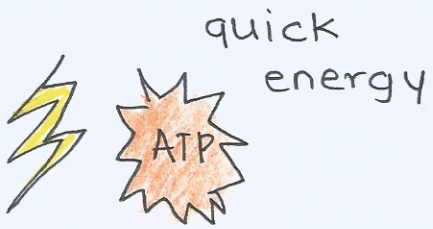


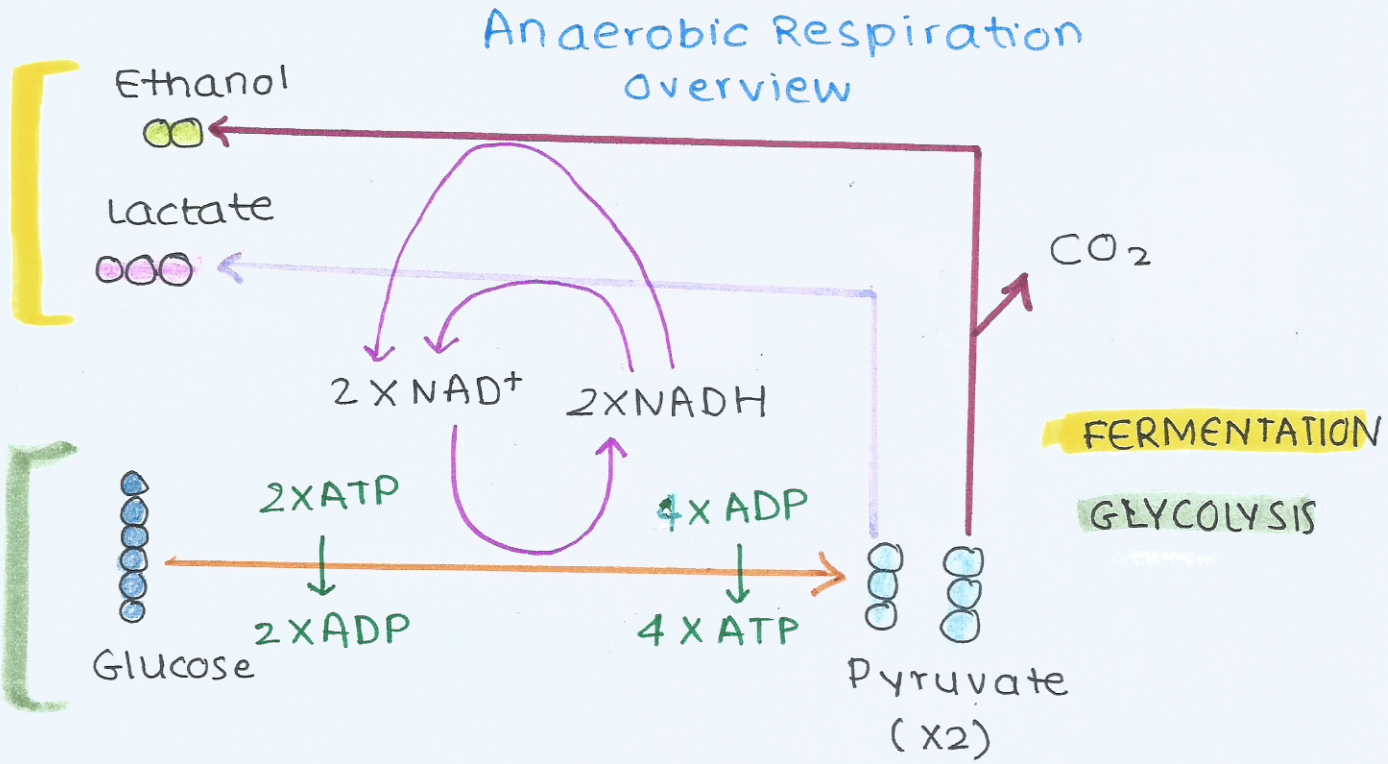
- Glucose is broken down into a 3 carbon molecule called Pyruvate (2 molecules).
- It also produces produces NADH from NAD^+ and a small yield of ATP (2 molecules).

Anaerobic Respiration

It is useful when:-

- A short but a rapid burst of ATP production is needed
- Oxygen supply runs out in respiring cells.
- The environments that are deficient in oxygen.





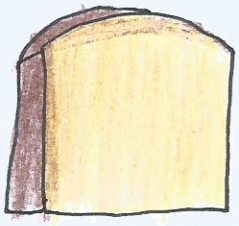
The purpose of anaerobic respiration is to restock NAD+ → this is needed for glyolysis.

The conversion of pyruvate into lactic acid or ethanol is reversible. The pyruvate levels can be restored once O_2 is present & the cells can start respiring aerobically to produce more ATP.

YEAST AND ITS USES -

- Yeast is a fungus that can respire aerobically or anaerobically. Anaerobic respiration is the basis for food production and drinks.
- Yeast is used in bread as it releases CO_2 which helps the bread to rise.
- The ethanol that is produced is evaporated during baking

Yeast is also used to make alcoholic beverages as it produces ethanol by respiring anaerobically.



Bread - CO_2
Wine - Ethanol
Beer - CO_2 + Ethanol

- Bioethanol is used as an energy resource. It is produced by sugar cane and corn, using yeast.

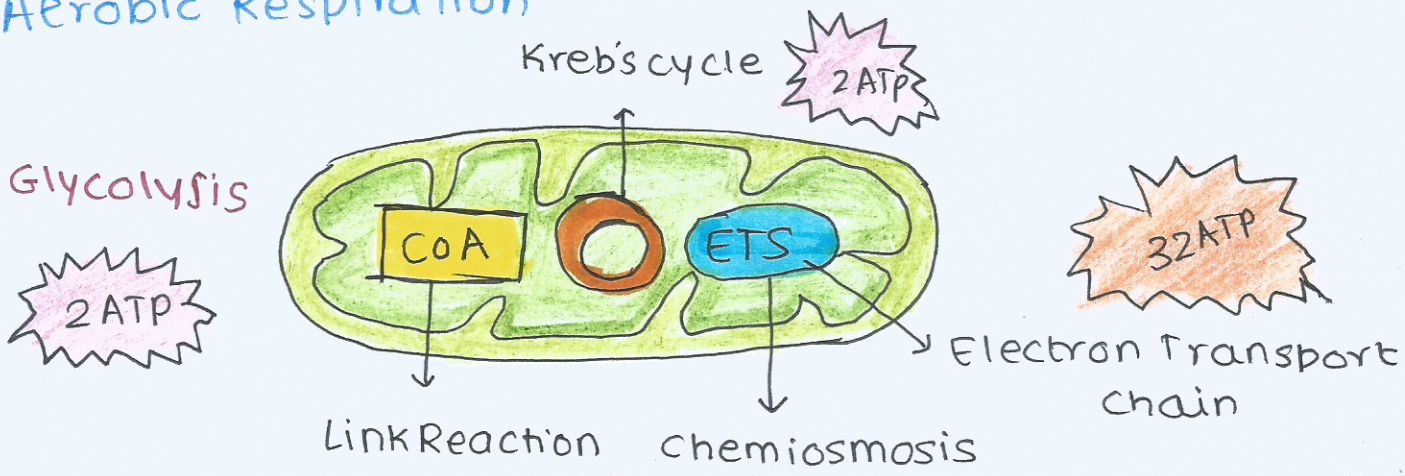
ANAEROBIC RESPIRATION IN HUMANS:-

Lactate production in humans when anaerobic respiration is used to maximize the power of muscle contraction.

Anaerobic respiration can supply ATP rapidly for a short amount of time. It occurs during-

- running, weight lifting, cycling, rowing etc.

Aerobic Respiration



- It takes place in the mitochondria.
- It consists of the Link reaction, Krebs cycle and the Electron Transport system.
- The final energy released is 36 molecules of ATP.