

AEROBIC RESPIRATION

* RESPIRATION

Release of
Energy from
Sugar (glucose)

* AEROBIC

Oxygen is needed

Glucose + Oxygen \longrightarrow Energy + CO₂ + H₂O

Respiration takes place in all living cells all the
time



WHY CELLS NEED ENERGY...

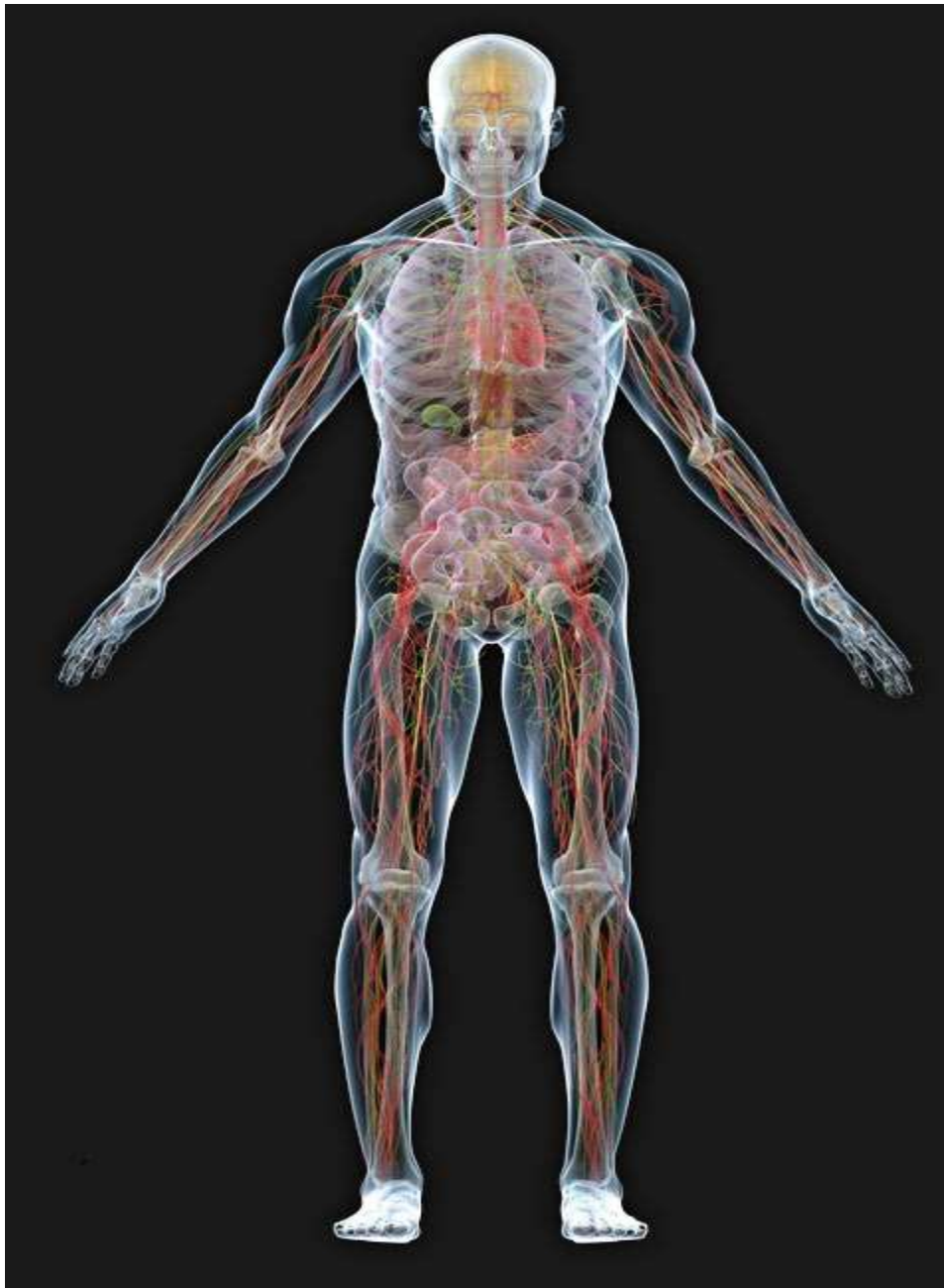
All plants and animals are made of cells. These cells need energy to survive for many reasons.

1. growth and repair
2. Protein synthesis
3. Mitosis
4. Muscular contractions
5. DNA replication
6. Maintenance of body temperature



Photosynthesis

FOOD



Release of
Heat energy
in human cells
maintains the
body
temperature
at 37°C



NOTE:

- Most energy is used up by cellular activities
- Some is released as heat energy



AEROBIC RESPIRATION

* RESPIRATION

Release of
Energy from
Sugar (glucose)

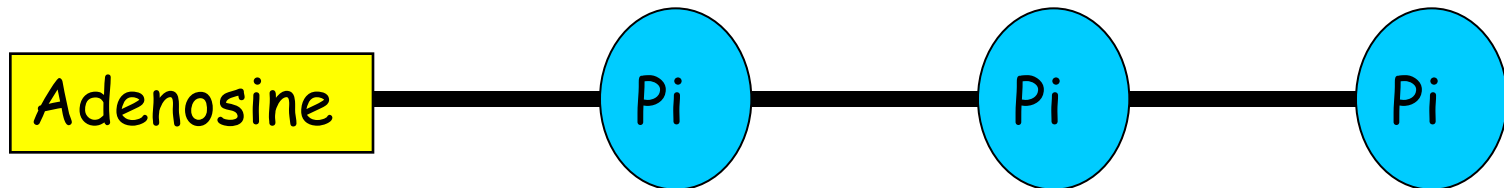
* AEROBIC

Oxygen is needed



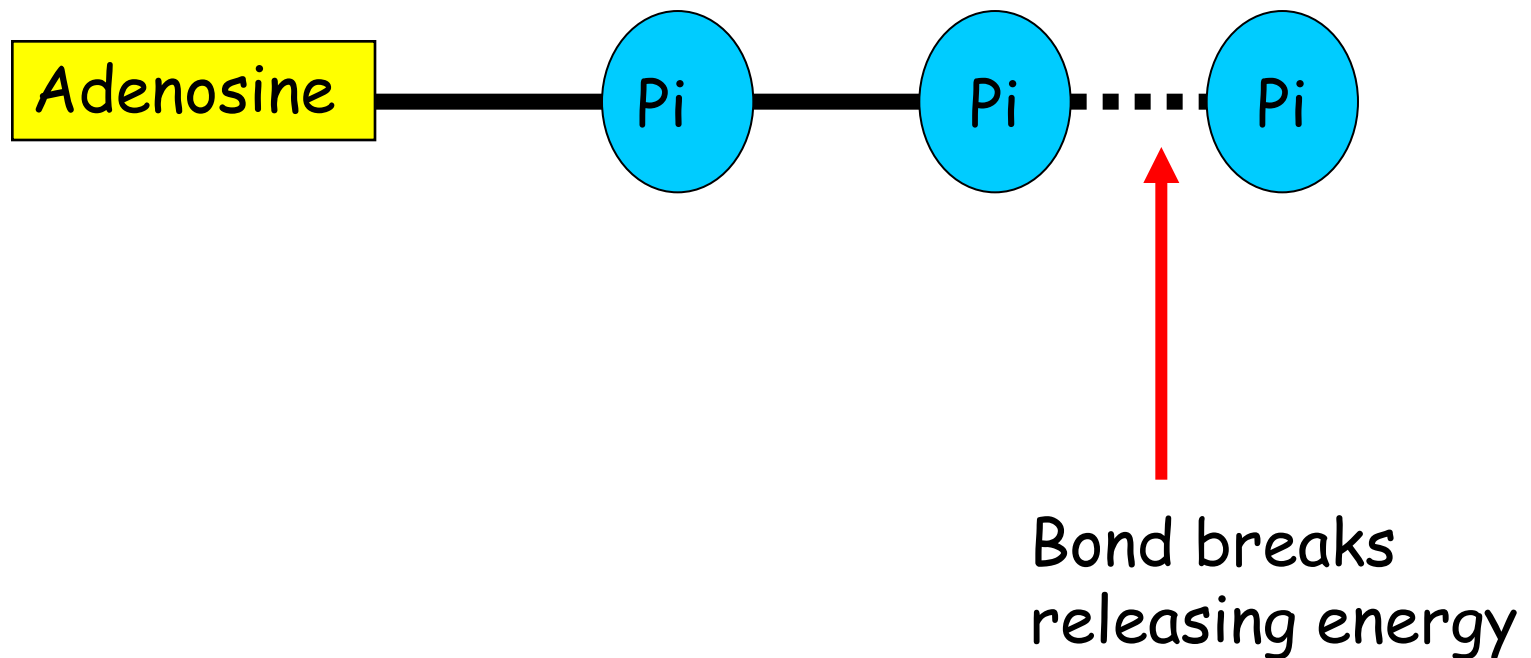
ADENOSINE TRIPHOSPHATE

- The released chemical energy is stored in a molecule called ATP.



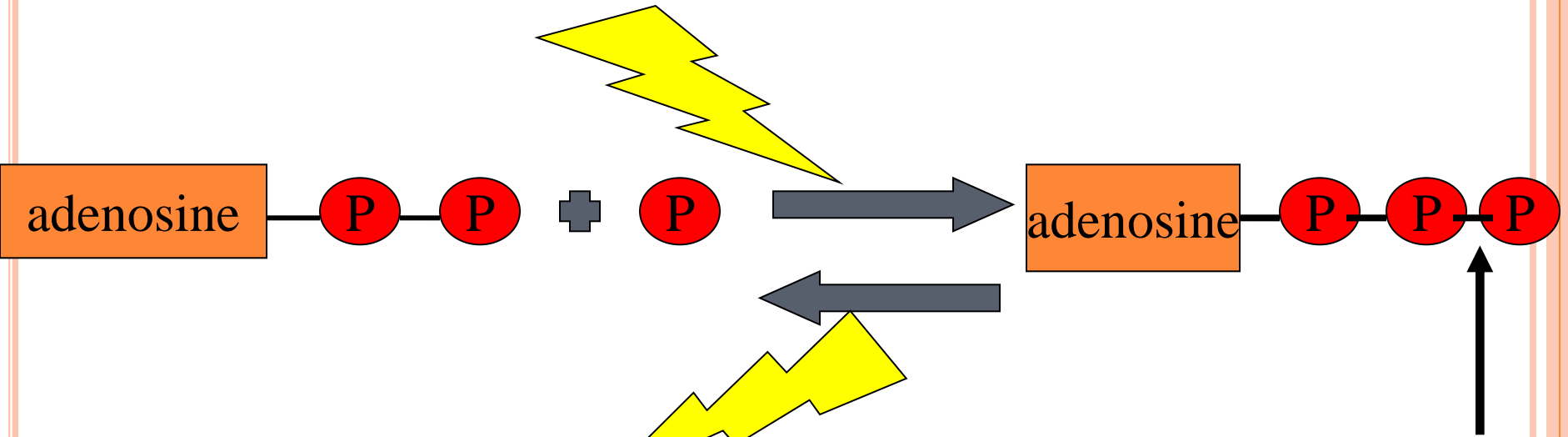
STRUCTURE OF ATP

- When the end phosphate (Pi) is removed, energy is released.



SYNTHESIS OF ATP

Energy made available from glucose breakdown



As the bond between the 2nd and 3rd phosphate breaks immediate energy is provided



ATP



as the bond forms **energy is stored**

breakdown

energy is released as the bond breaks

synthesis



ADP + energy + Pi



CHEMISTRY OF RESPIRATION

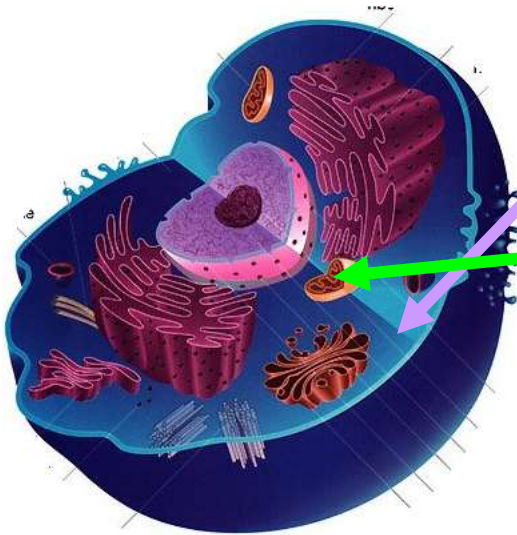
- Respiration is the process which releases energy from glucose.
- This energy gets stored in ATP, ready to be used for reactions requiring energy.
- Respiration occurs in ALL living cells.
- When there is an ample supply of oxygen it is called aerobic respiration.
- When there is no oxygen, anaerobic respiration takes place in cells



STAGES IN AEROBIC RESPIRATION

- Aerobic Respiration is a two stage process.

Stage 1 - Cytoplasm



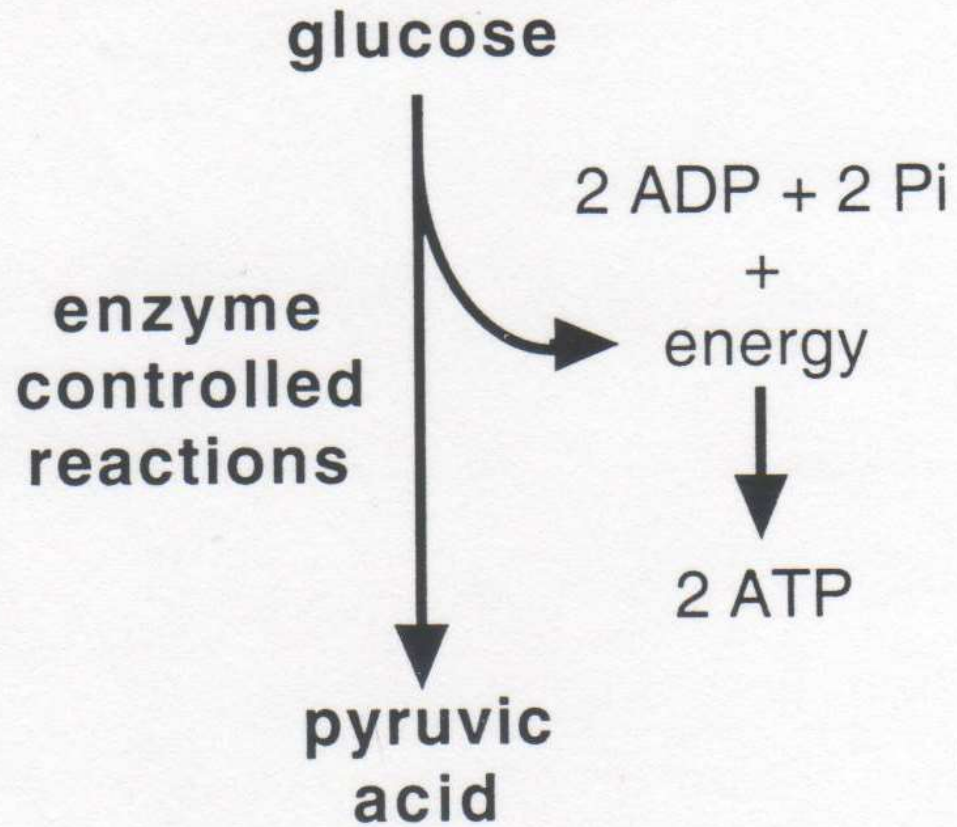
Stage 2 - Mitochondria



STAGE 1

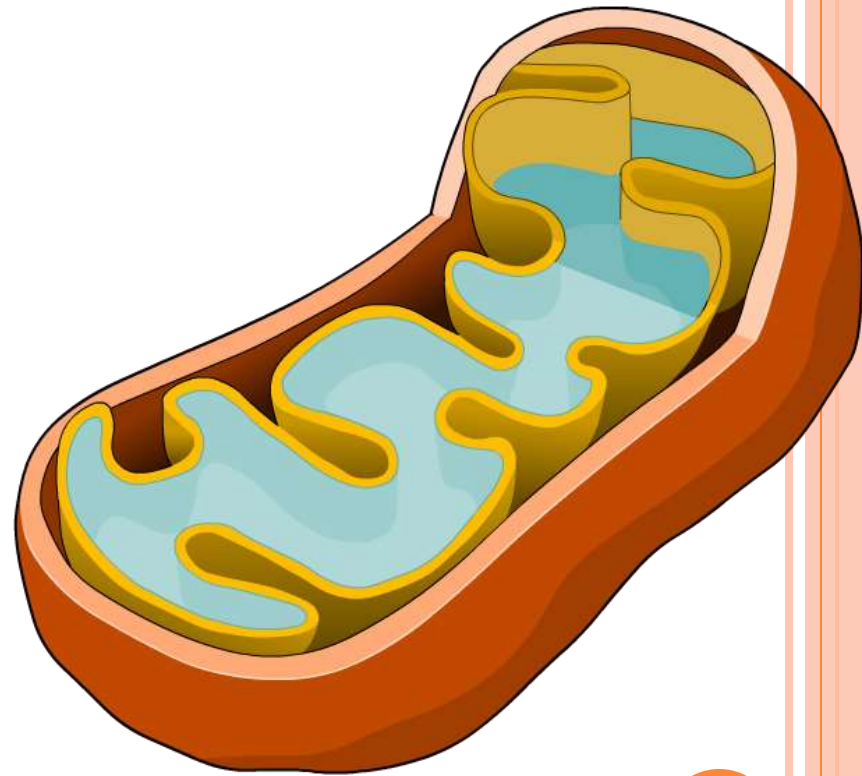
- Known as Glycolysis
- Occurs in the cytoplasm
- Glucose is broken down into pyruvic acid
- 2 molecules of ATP are synthesised (made)





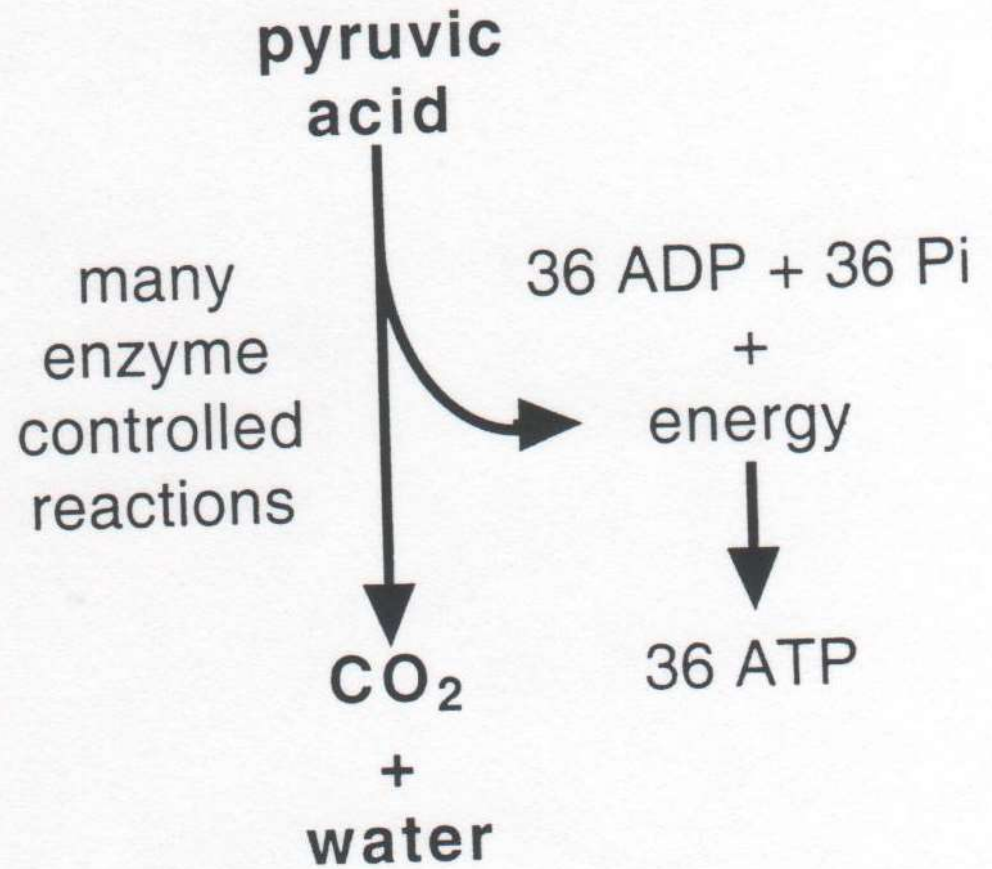
STAGE 2

- Occurs in the mitochondria
- Pyruvic acid is broken down into carbon dioxide and water
- Enough energy is released to synthesise a further 36 ATP from the original glucose molecule



**aerobic
respiration**

Stage 2



ATP SYNTHESIS IN AEROBIC RESPIRATION

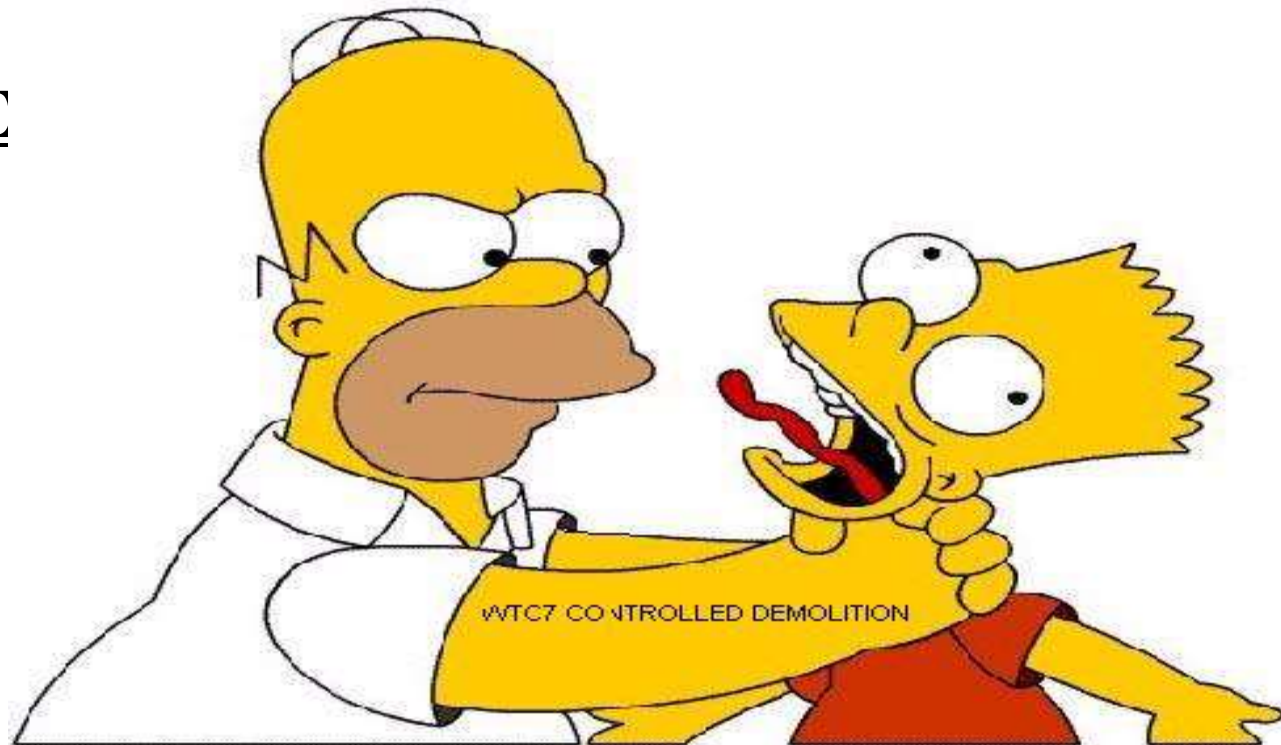
- Stage 1 (Glycolysis) = 2 ATP
- Stage 2 (with oxygen) = 36 ATP
- Total = 38 ATP

Note: From 1 molecule of glucose



ANAEROBIC RESPIRATION

- NO OXYGEN!!!!!!!
- Build up of Lactic Acid in animals
- Production of E plants



Anaerobic Respiration - copy

Plants

Glucose



Pyruvic Acid



Ethanol +
Carbon Dioxide

Irreversible

2 ATP

No ATP

Animals

Glucose



Pyruvic Acid

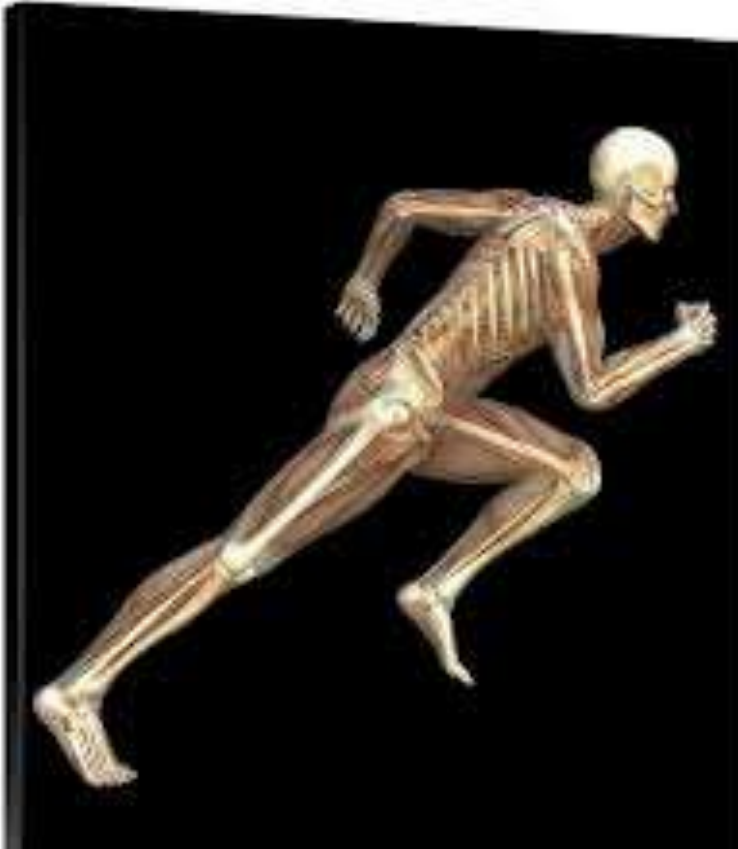


Lactic Acid

Reversible



ANIMAL CELL

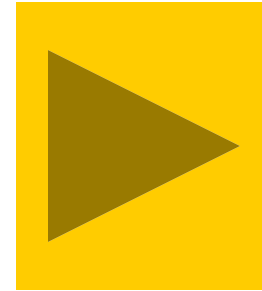


- Anaerobic respiration occurs when the body cannot supply the cells with enough oxygen to breakdown glucose i.e. during exercise.

glucose → lactic acid + energy

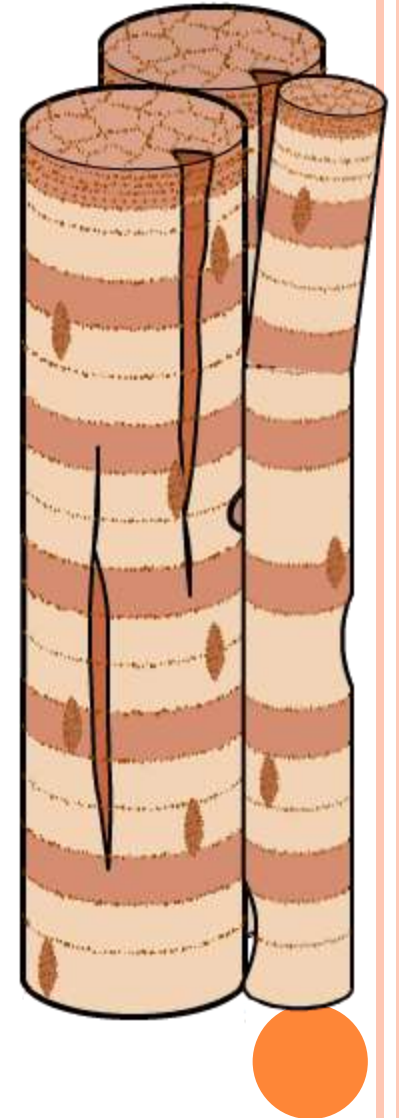
ANIMAL CELL

- When anaerobic respiration takes place, the lactic acid produced soaks the muscle cells and prevents the muscles doing their job.
- **Copy** - A build up of lactic acid causes muscle fatigue.



Oxygen Debt & Recovery Time

- When oxygen becomes available it converts lactic acid back into Pyruvic acid. The volume of oxygen required to do this is known as the oxygen debt.
- The time taken for the oxygen debt to be repaid is called the recovery time



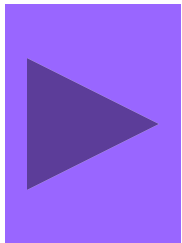
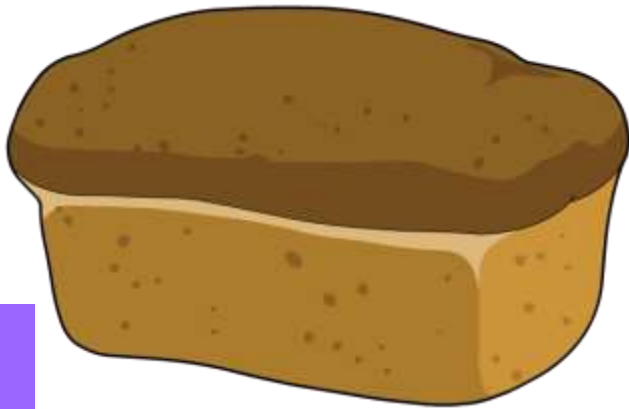
PLANT / YEAST CELLS

- When there is a lack of oxygen alcohol and carbon dioxide are produced.

glucose → carbon dioxide + ethanol (+ energy)



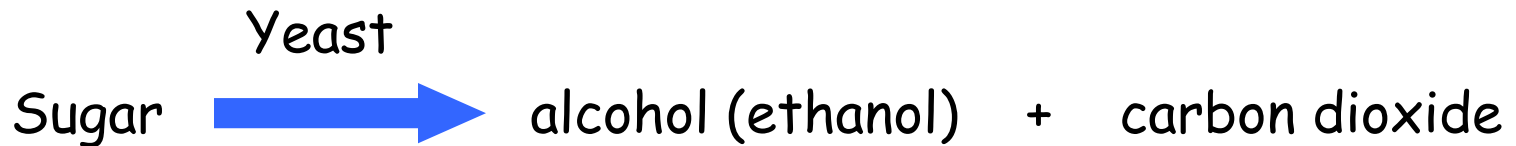
- Anaerobic respiration can be useful in both brewing and bread making industries.



FERMENTATION



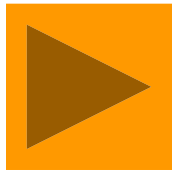
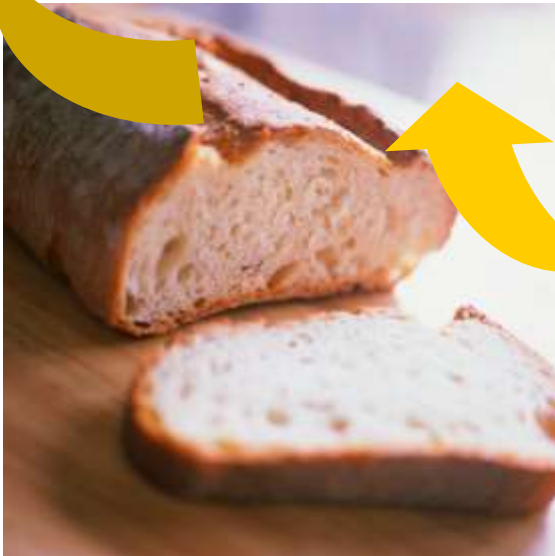
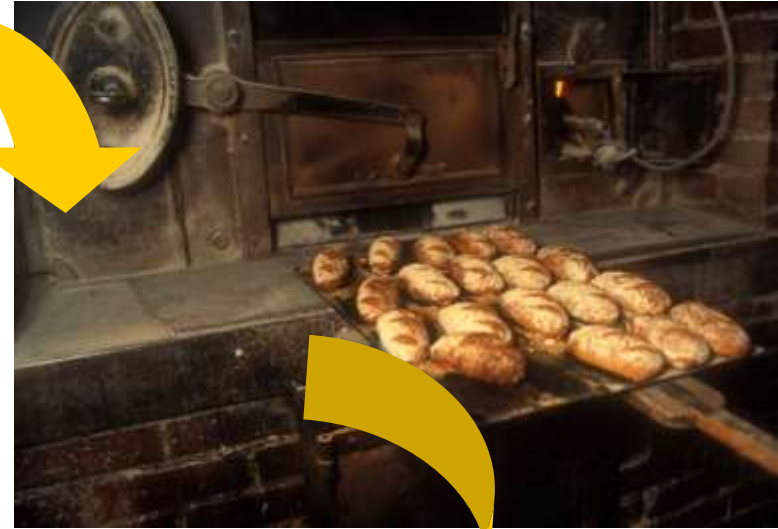
- Yeast is a single-celled fungus
- It respire anaerobically to produce CO_2 and ethanol also.
- Another phrase for anaerobic respiration in plants and yeast cells is fermentation.

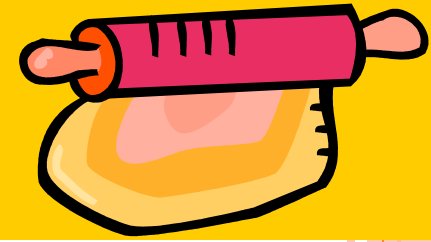


- Yeast is used in bread making to make dough rise.
- The yeast feeds on sugar in the dough and produces carbon dioxide gas which gets trapped in the dough causing it to rise.



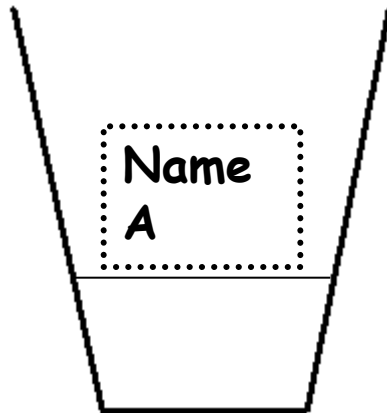
2. DESCRIBE THE USE OF YEAST IN BREAD MAKING



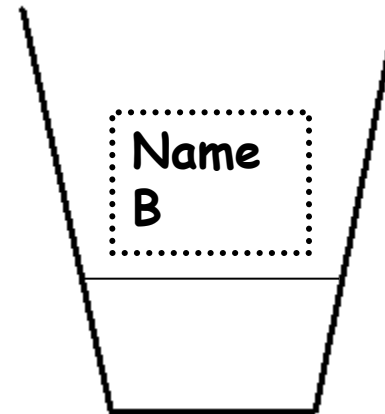


Aim: to show the effect of yeast on dough

Method:



- 10g flour
- 6g Sugar
- 20ml water



- 10g flour
- 6g Sugar
- 2g Yeast
- 20ml water





- Results:

Cup	Height at start (cm)	Height at end (cm)
A		
B		

- Conclusion:

Cup _____ worked best because it contained _____. The yeast fed on the sugar which produced _____ gas causing the dough to increase in height.



- Yeast can be used to produce alcohol. In beer making yeast feed on sugar produced in barley grains to produce alcohol. Beer is fizzy because of the carbon dioxide gas produced by the yeast.



- Different alcoholic drinks are produced by using different sources of sugar. Some examples are shown below:

Alcoholic Drink	Source of Sugar
Wine	Grapes
Beer	Barley
Vodka	Potatoes
Cider	Apple



PRACTICAL



- **Aim:** To produce a batch of your own alcohol
- **Method:**
 1. Crush the fruit into the beaker using a spatula.
 2. Add a spatula of sugar and a small amount of distilled water.
 3. Stir until you get a sugary, fruity mixture.
 4. Add this mixture to your bottle.
 5. Add to the bottle a small amount of yeast suspension.
 6. Place the lid loosely on the bottle. This will prevent too much oxygen getting in but will allow the release of CO₂ gas.
- **Results:**

Write a short report on the experiment you did, including a labelled diagram and what happened.



- The misuse of alcohol can have a very negative effect on people, their family and friends.

What do you know about alcohol? Watch the video clips on the effects of alcohol on young people.

[effects of alcohol on the young 7min 29s](#)

[What is too much?3 min 44s](#)

