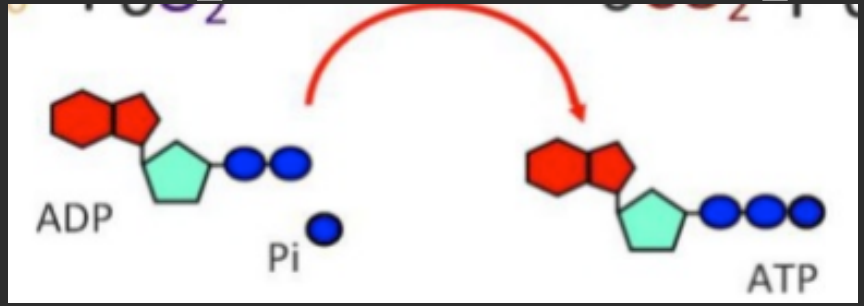
8.2 CELLULAR RESPIRATION

Respiration: the controlled release of energy from organic compounds to make a usable form (ATP)

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

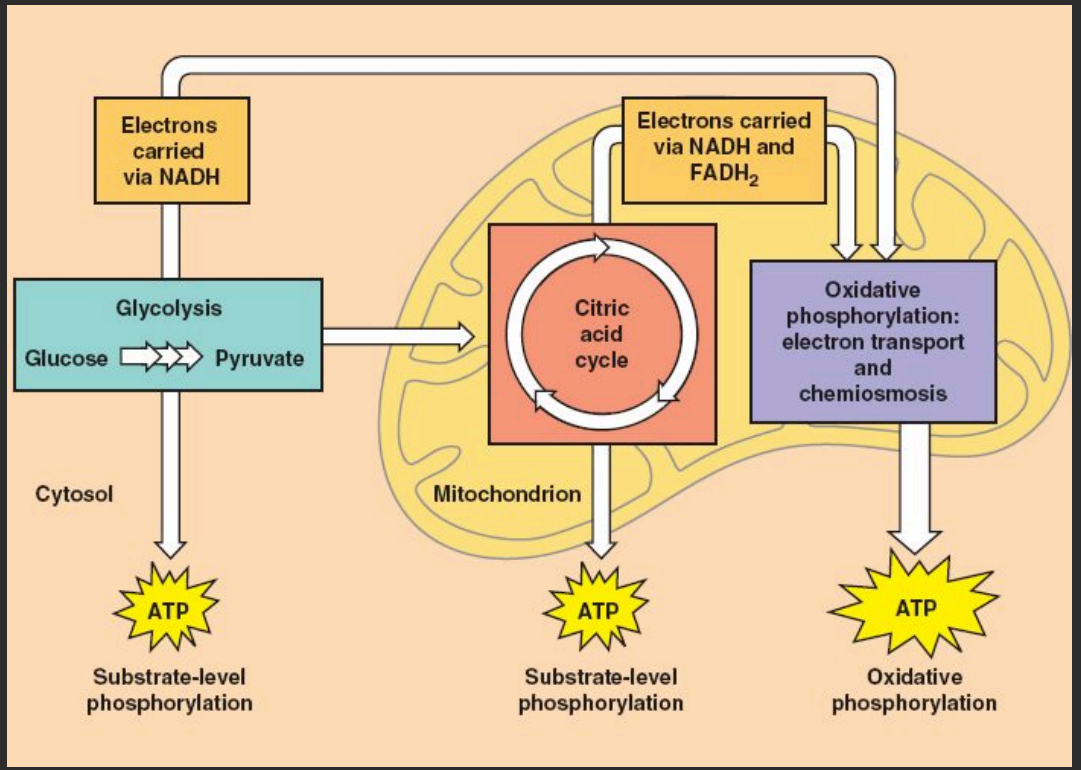


Understandings:

- Cell respiration involves the oxidation and reduction of electron carriers
- Phosphorylation of molecules makes them less stable
- In glycolysis, glucose is converted to pyruvate in the cytoplasm
- Glycolysis gives a small net gain of ATP without the use of oxygen
- In aerobic cell respiration pyruvate is decarboxylated and oxidised, and converted into acetyl compound and attached to coenzyme A to form acetyl coenzyme A in the link reaction
- In the Krebs cycle, the oxidation of acetyl groups is coupled to the reduction of hydrogen carriers, liberating carbon dioxide
- Energy released by oxidation reactions is carried to the cristae of the mitochondria by reduced NAD and FAD
- Transfer of electrons between carriers in the electron transport chain in the membrane of the cristae is coupled to proton pumping
- In chemiosmosis protons diffuse through ATP synthase to generate ATP
- Oxygen is needed to bind with the free protons to maintain the hydrogen gradient, resulting in the formation of water
- The structure of the mitochondrion is adapted to the function it performs

Cellular Respiration takes place in mitochondria

1. Glycolysis/ Anaerobic
2. Link Reaction
3. The Krebs Cycle (Citric Acid Cycle)
4. Oxidation phosphorylation
5. Electron Transport Chain (ETS)



8.2.U1: Cell respiration involves the oxidation and reduction of compounds

OXIDATION

- Lose e-
- Lose H
- Gain O_2

REDUCTION

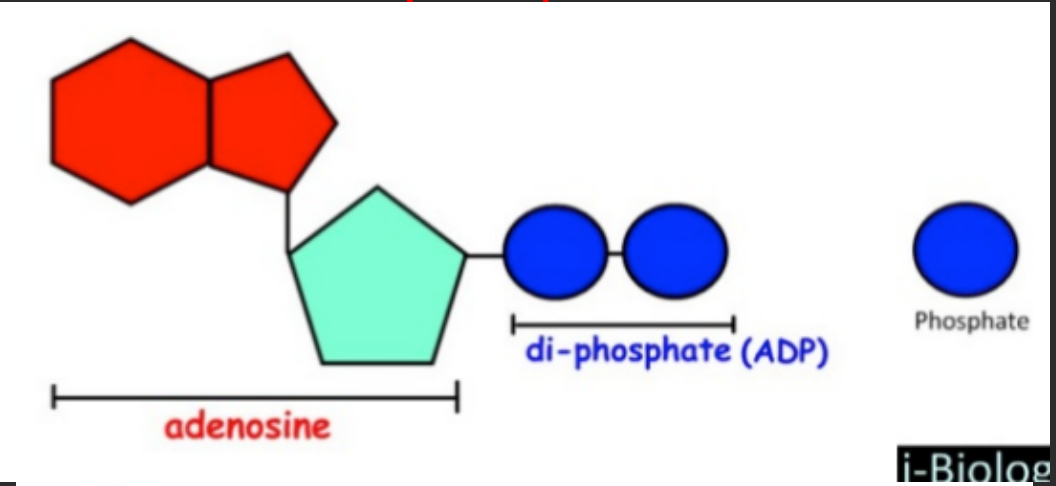
- Gain e-
- Gain H
- Lose O_2

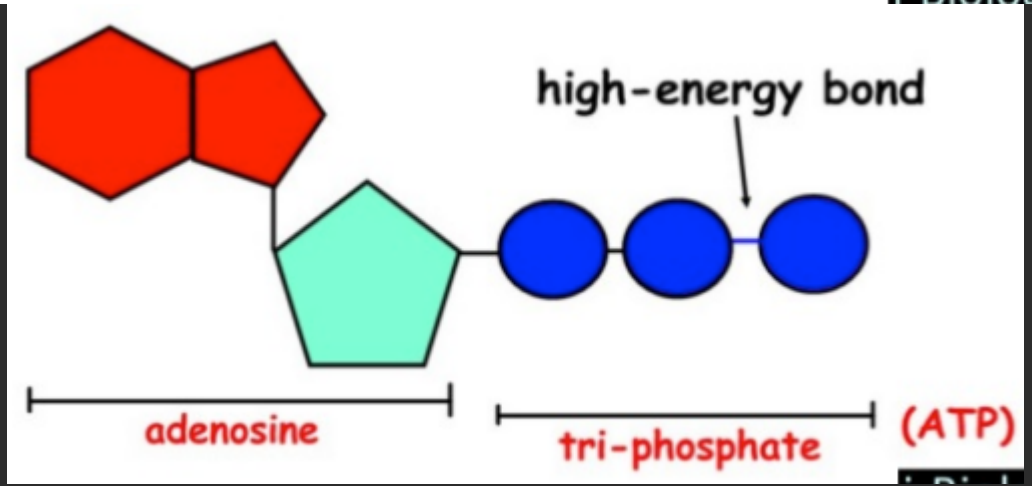
L E O the lion says **G E R**!

Lose **E**lectrons **O**xidation

Gain **E**lectrons **R**eduction

8.2.U3: Phosphorylation of molecules makes them less stable.

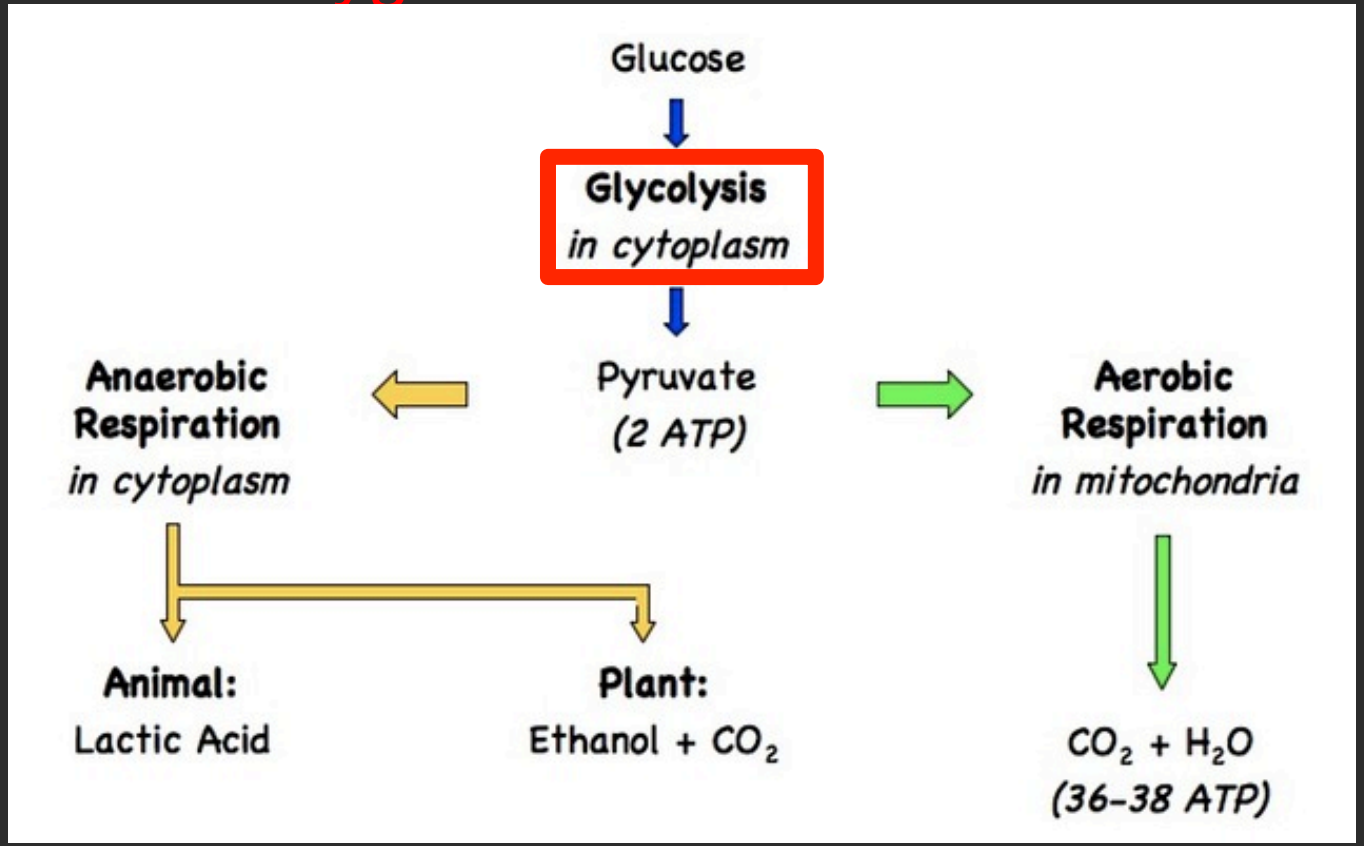




Bonds between phosphates contain large amounts of energy. When the bonds are broken, cells harvest that energy to carry out metabolic processes

Phosphorylation is addition of P

8.2U4 Glycolysis gives a small net gain of ATP without oxygen



Occurs in the cytoplasm

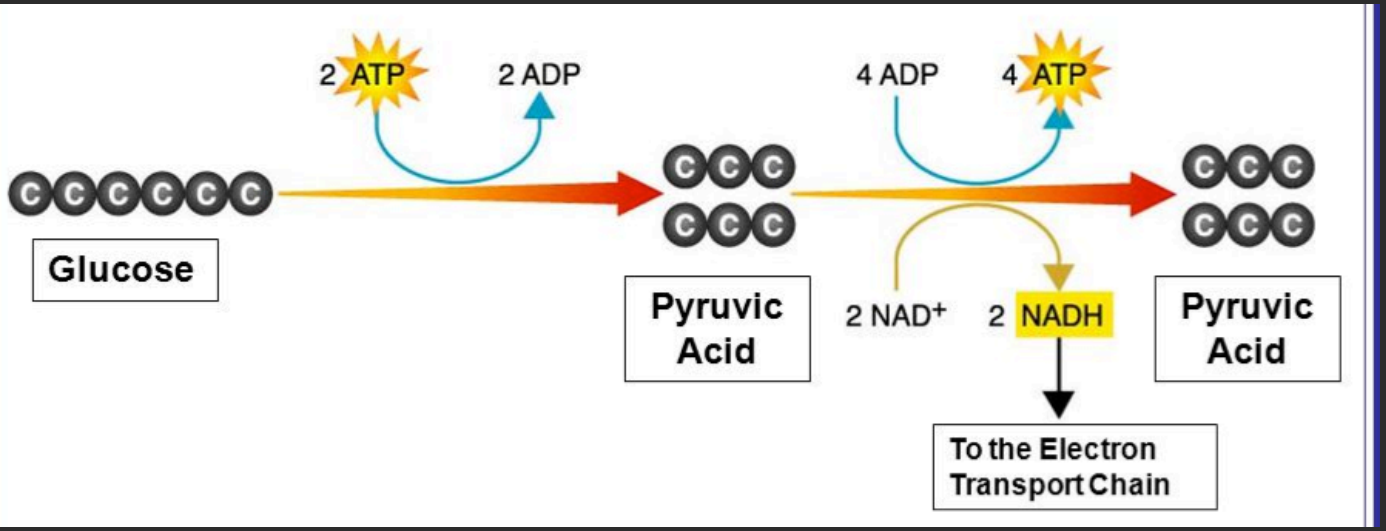
Goals of glycolysis:

Glucose → Pyruvate

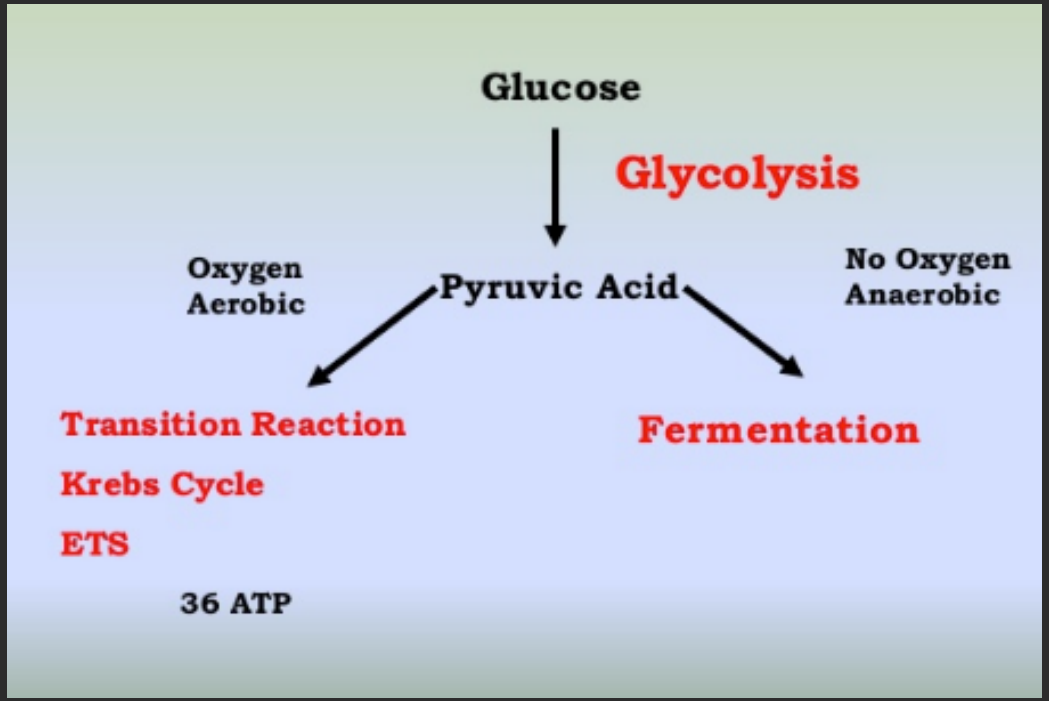
ATP is made by phosphorylation

Phosphorylation reduces activation energy so following reactions are more likely to occur

https://www.youtube.com/watch?v=XIJvVCA9RPs



Glycolysis:



Requires 2 ATP,

10 step pathway using oxidation and reduction reactions

NAD+ → NADH (reduction)

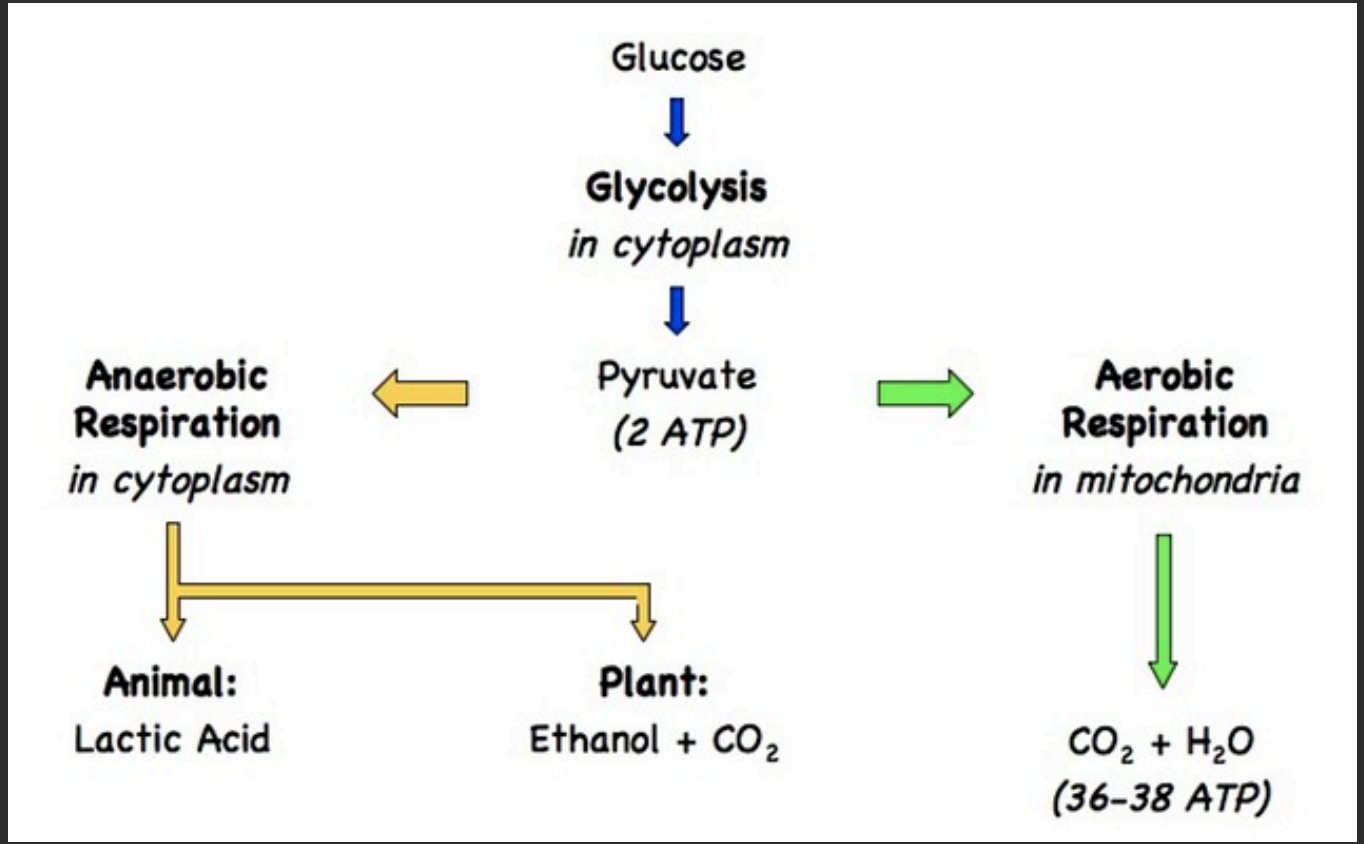
Replaces 2 ATP

Anaerobic respiration

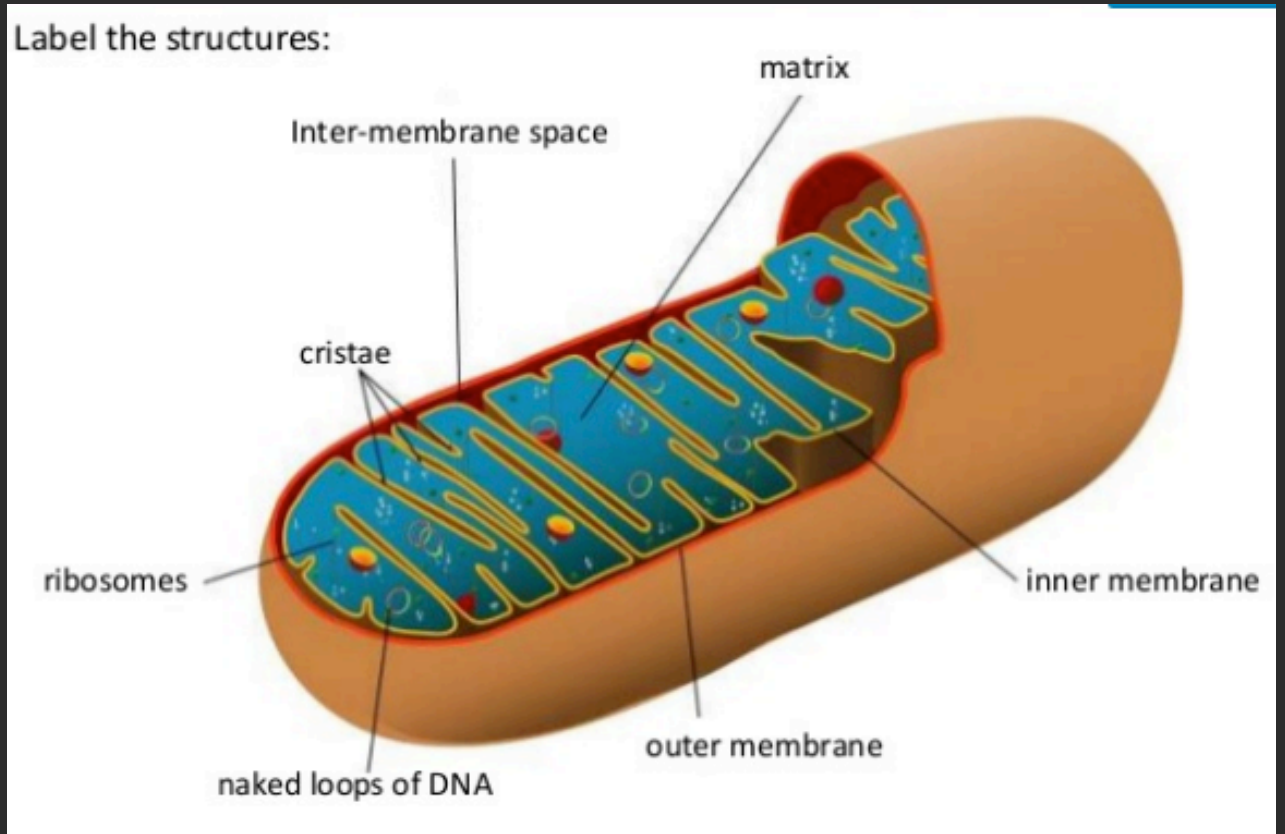
2.8U3: Anaerobic cell respiration gives a small yield of ATP from glucose

Useful for?

1. Short, rapid, ATP production is needed.
2. Oxygen runs out
3. Environments without oxygen


Glucose
Glycolysis
in cytoplasm
Pyruvate
(2 ATP)
Anaerobic Respiration
in cytoplasm
Aerobic Respiration
in mitochondria
Animal:
Lactic Acid
Plant:
Ethanol + CO_2
CO_2 + H_2O
(36-38 ATP)

8.2U2: Annotation of diagram to indicate the adaptations of mitochondria to its function



8.2.U12

Outer membrane- creates conditions for aerobic respiration

Inner membrane- contains ETC and ATP synthase

Cristae- increase surface area of membrane

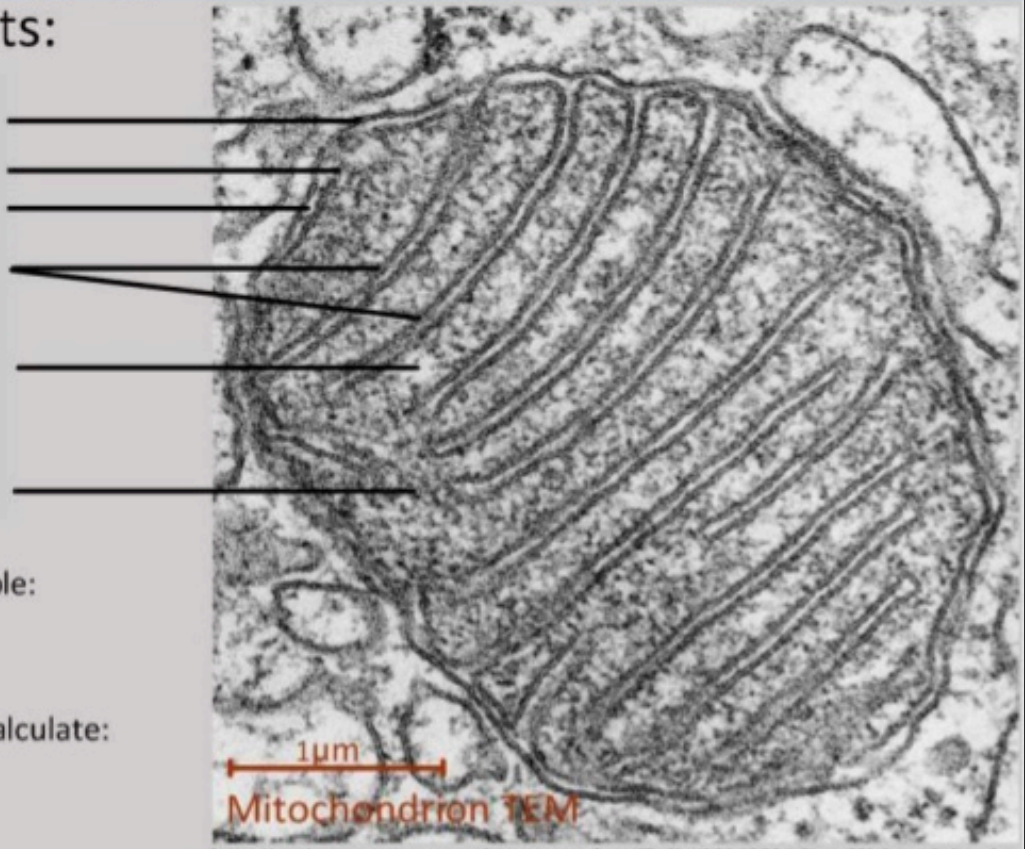
Matrix- contains enzymes for Krebs

Intermembrane space- small so concentration gradient builds up

Ribosomal DNA- expression of unique genes!

8.2.U11 The structure of the mitochondrion is adapted to the function it performs.
8.2.S2 Annotation of a diagram of a mitochondrion to indicate the adaptations to its function.

Label the parts:



http://antiparos.zoo.ox.ac.uk/presentations/Talks/20060526-DataWeb-tech.html

not easily visible:
- mDNA

Print this image and calculate:
- magnification
- maximum length
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