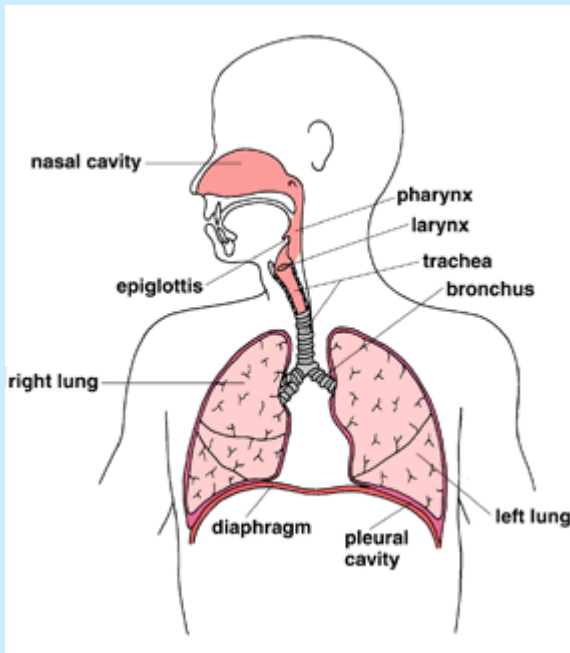


Respiration

Respiratory System

Function of respiratory system is to obtain oxygen for use by body's cells & eliminate carbon dioxide that cells produce (i.e. gas exchange)



Mechanism of breathing

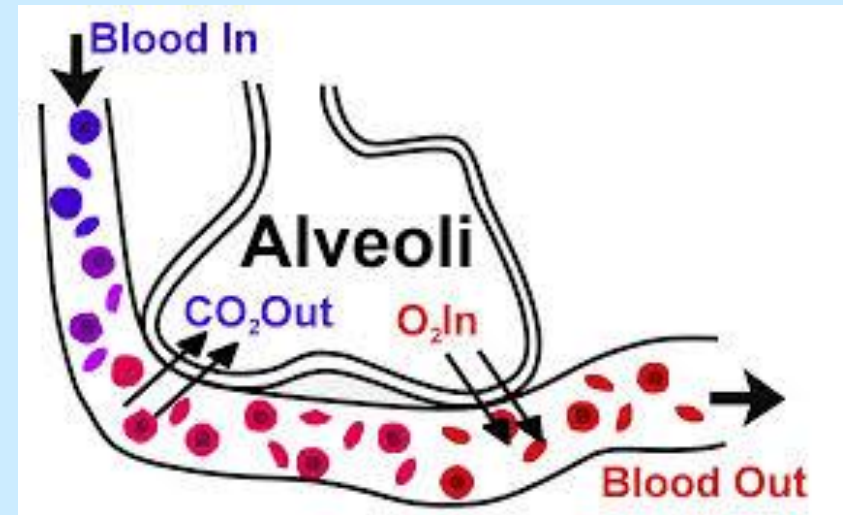
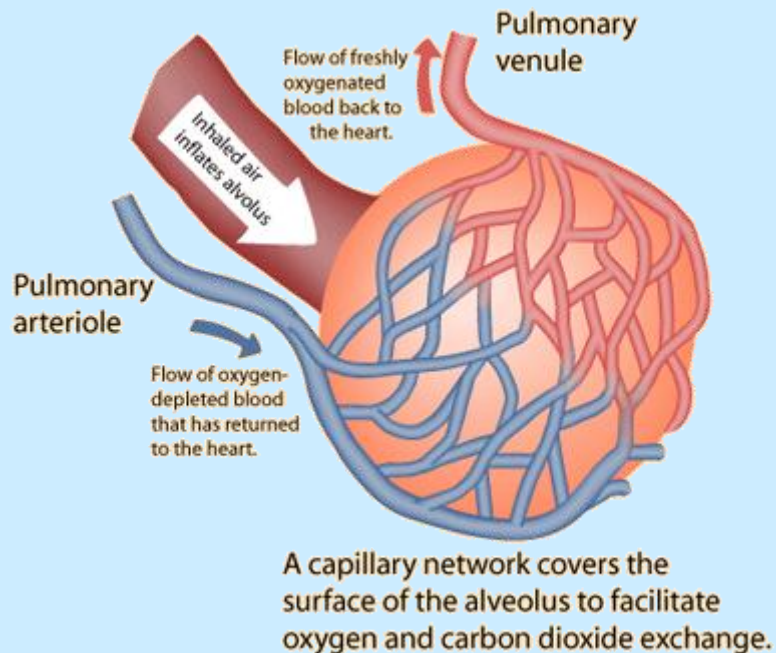
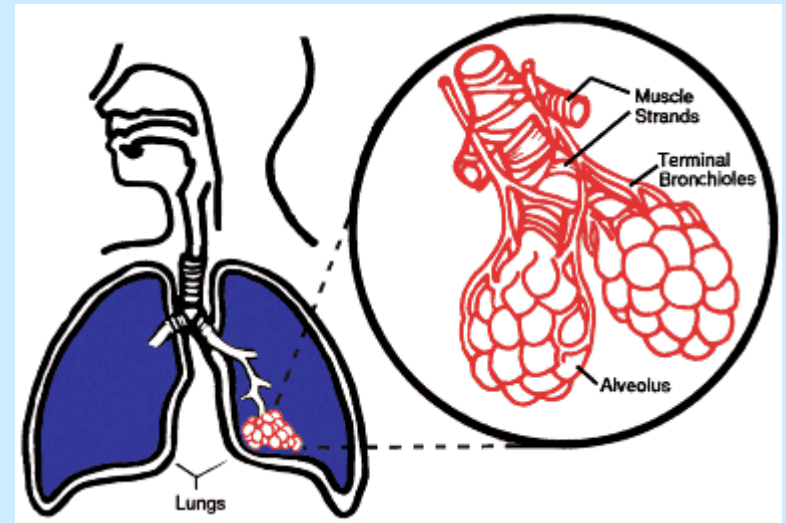
https://www.youtube.com/watch?v=sU_8juD3YzQ#t=44

- Includes respiratory airways leading into (& out of) lungs plus the lungs themselves.

- **Pathway of air:** nasal cavities (or oral cavity) > pharynx > trachea > primary bronchi (right & left) > secondary bronchi > tertiary bronchi > bronchioles > alveoli (site of gas exchange)

Gas Exchange occurs between alveoli and circulatory system.

- <https://www.youtube.com/watch?v=DoSTehS7iq8>



What is Cellular Respiration?

Cells require energy for all their activities (movement, metabolism, elimination of wastes and replication).

Cells use chemical energy to carry out these activities.

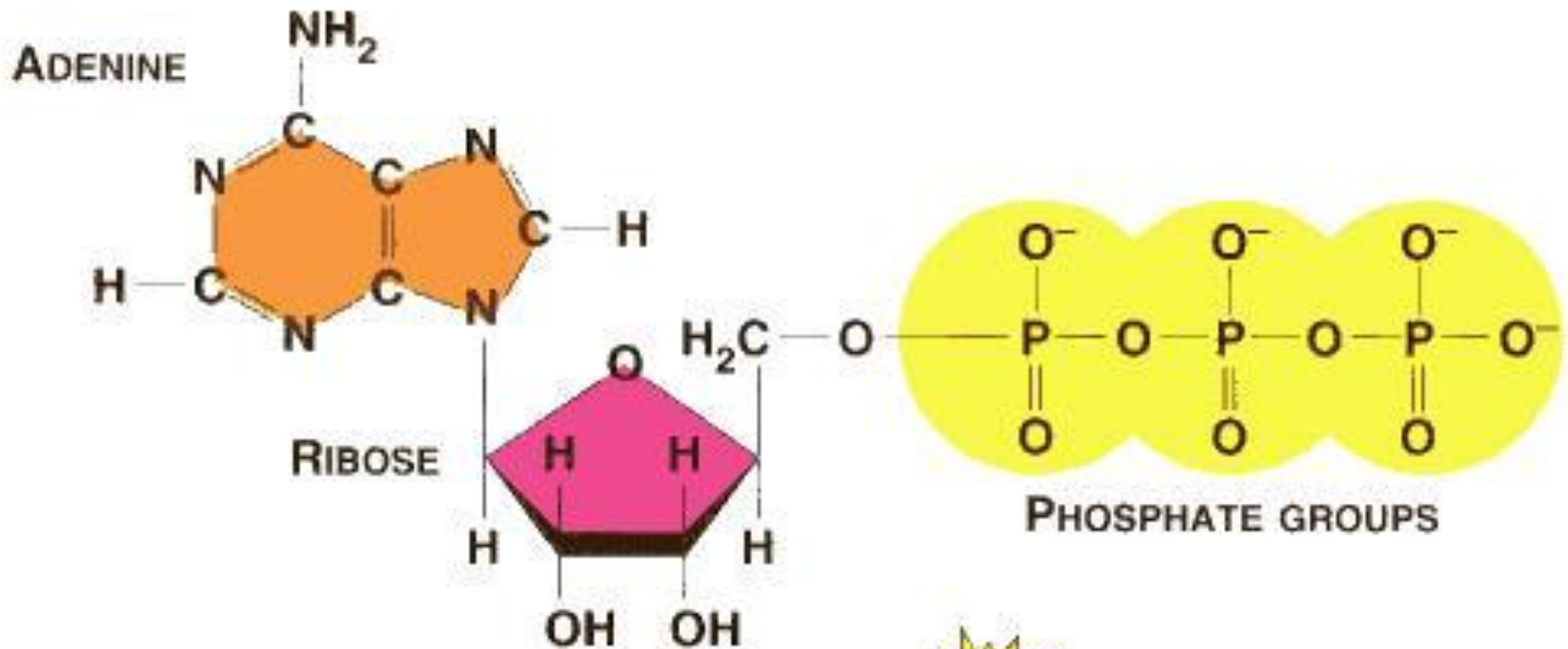
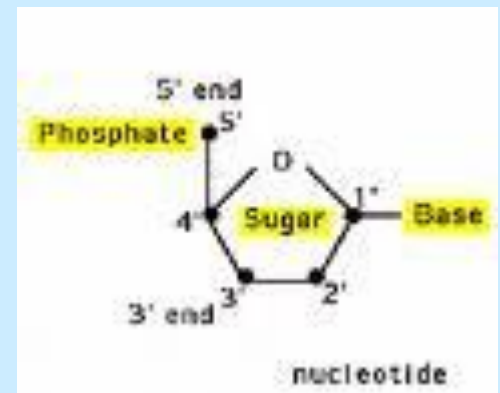
Chemical energy is stored in the bonds or connections that join atoms together in molecules. If a molecule is broken apart the energy is released.



Glucose oxygen \longrightarrow Carbon dioxide + water + energy

Respiration is the process whereby cells breakdown energy rich organic molecules into energy poor inorganic ones and in the process produce ATP.

What is ATP?

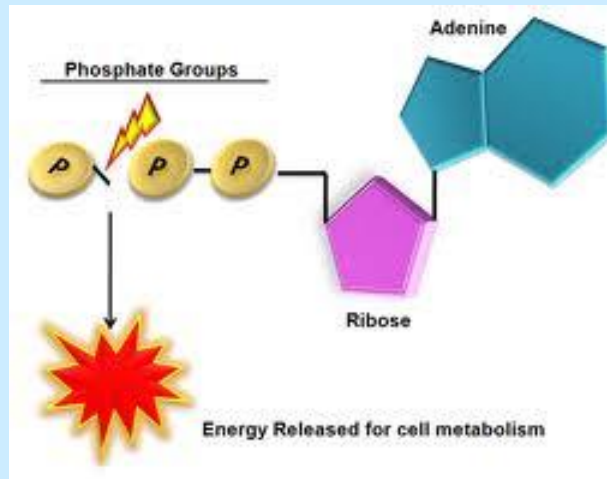


(a) Adenosine triphosphate

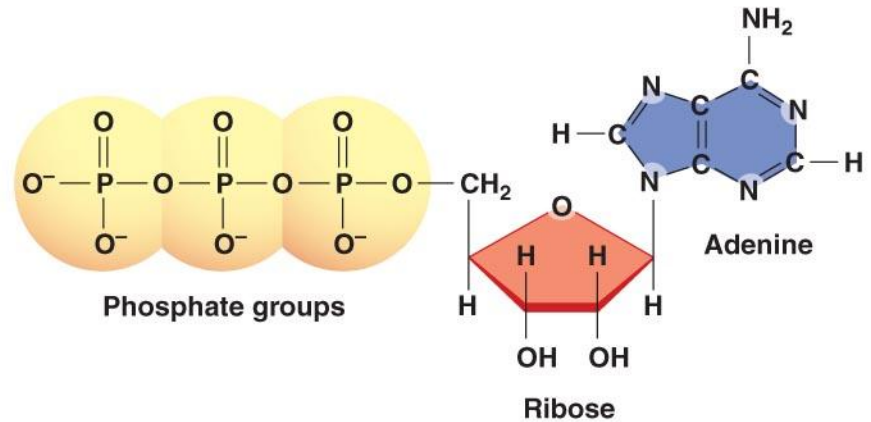


ATP is called Adenosine TriPhosphate

It is a molecule that all cells use as an immediate energy source.

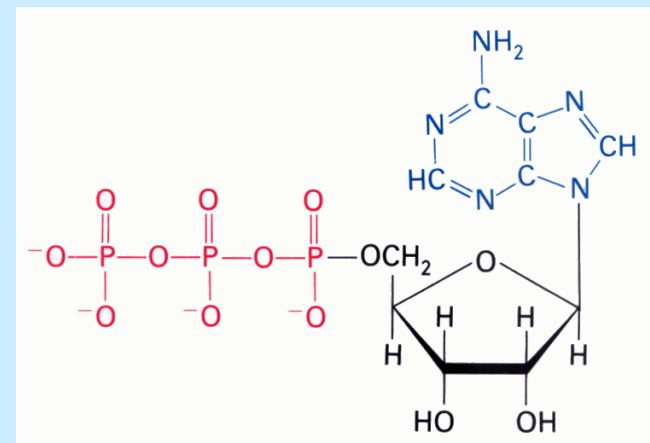


(a) ATP consists of three phosphate groups, ribose, and adenine.

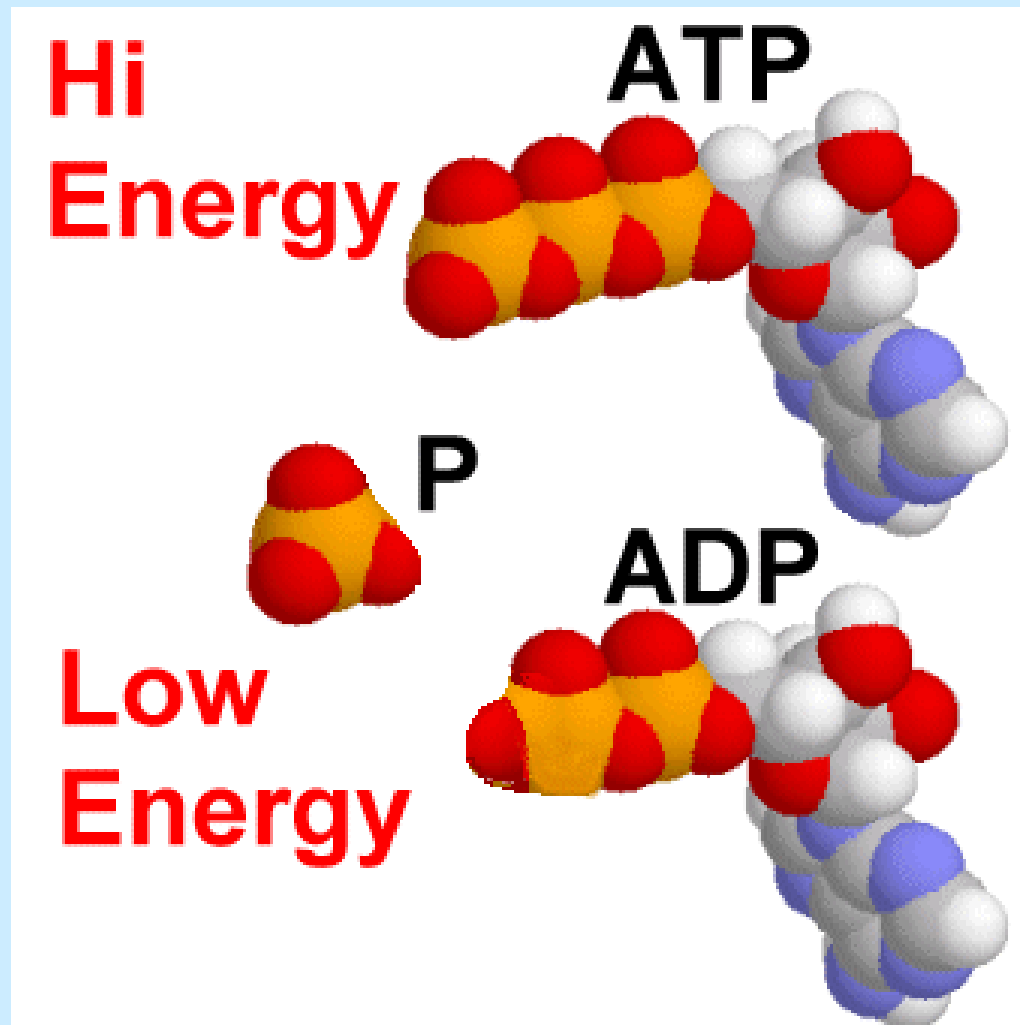


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ATP releases its energy to form ADP and Phosphate.



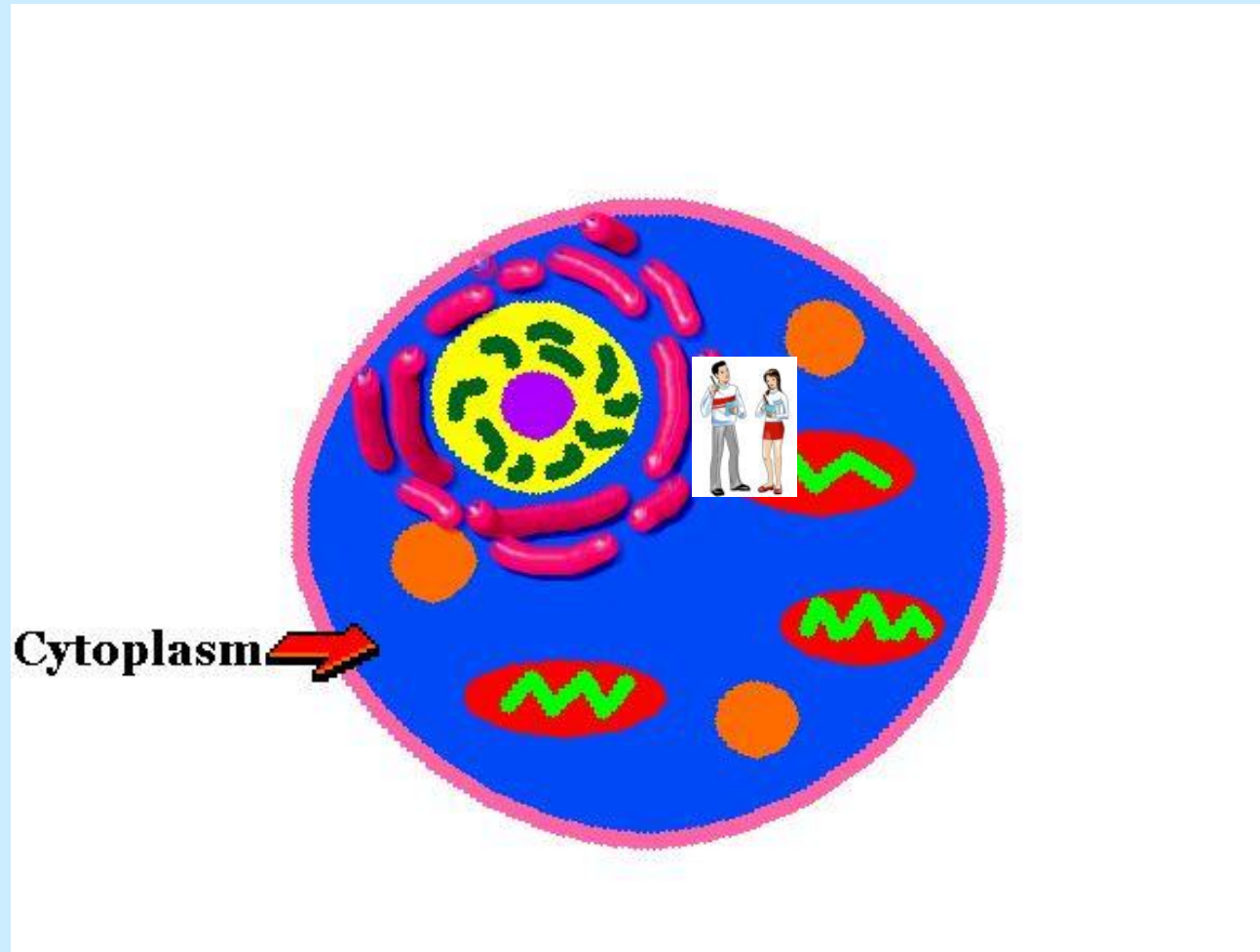
ATP and ADP



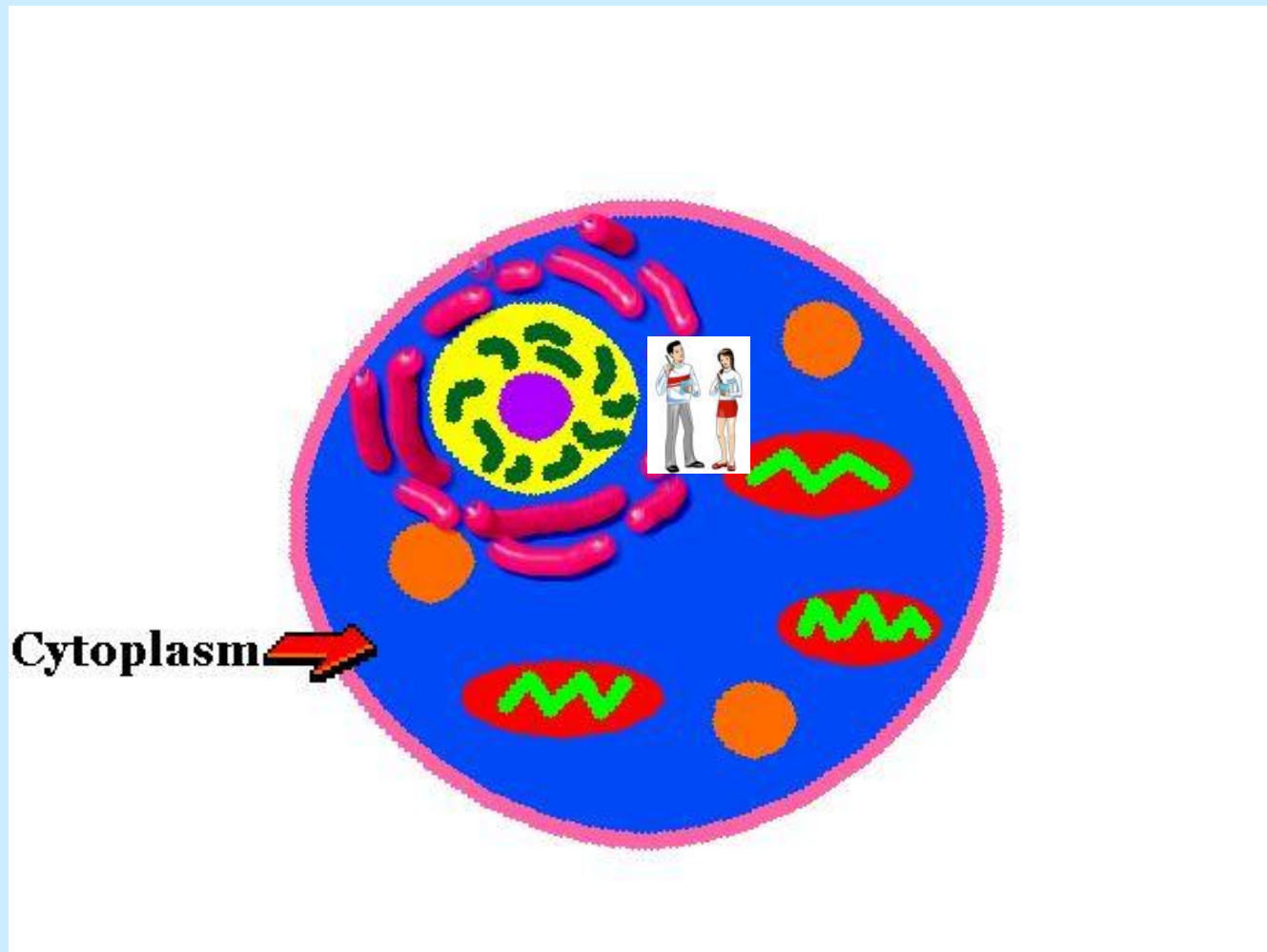
Why do our cells need ATP?

1. To make polypeptides from amino acids.
2. For active transport.
3. To conduct nerve impulses.
4. To allow muscle cells to contract.
5. To make DNA from nucleotides.
6. etc.....

Where does it all start? Let's take a trip into the cytoplasm.



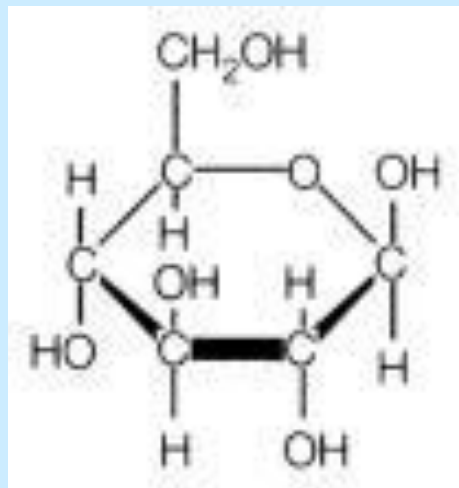
We have to get through the cell membrane.



So here we are.....

What energy rich molecules can you see?

There's one.....



What's its name?????????

It's Mr Glucose

What is happening to it???

Some enzymes are gathering around it.

It's being catabolised.....poor thing.

It's breaking down so quick. Look at those enzymes go. There's new compounds being made so fast. I'm hyperventilating.

Serious Tone:

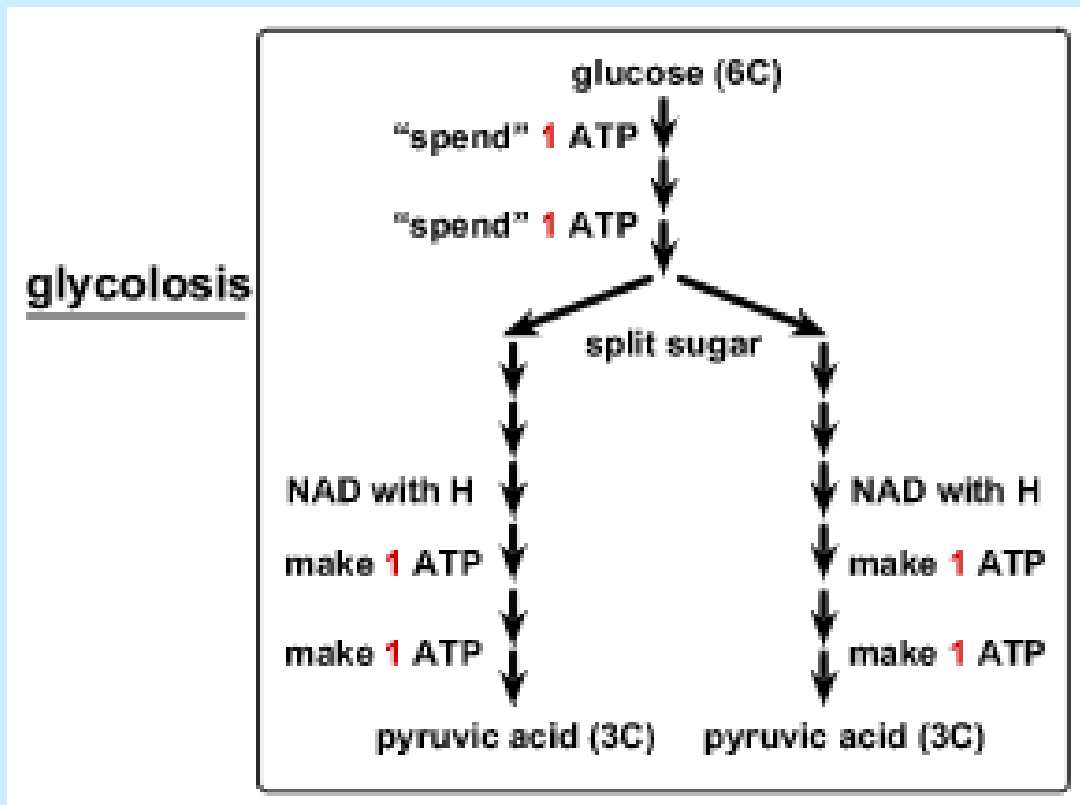
What process has occurred to the glucose molecule in the cytoplasm????

Ans: Glycolysis

Was Oxygen involved??

Nooooooooooooooooooooo! This process
in anaerobic

Glycolysis



How many molecules of glucose, glycolysis produces
how many molecules of ATP?

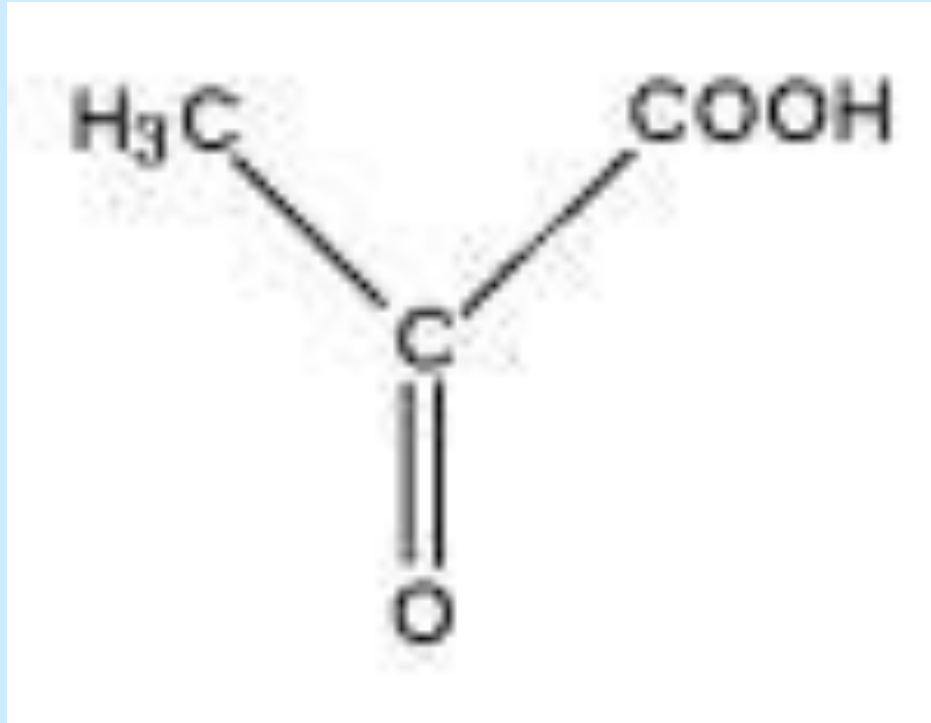
What is produced in glycolysis???

Two molecules of pyruvate

Two ATP

What does pyruvate (pyruvic acid) look like????

Pyruvate



How many carbon atoms????

Ans: Three

What happens to the pyruvate???????

If there is **limited/no oxygen** available, it will undergo fermentation.

In plants, the pyruvate is converted to alcohol and carbon dioxide. No extra ATP is produced.

In animals, something similar happens. The pyruvate is converted to lactic acid (no CO₂ this time and no extra ATP).

In these two cases, anaerobic respiration is complete.

What are those equations???????

In plants, fungi

Glucose \longrightarrow Alcohol + CO₂ + 2ATP

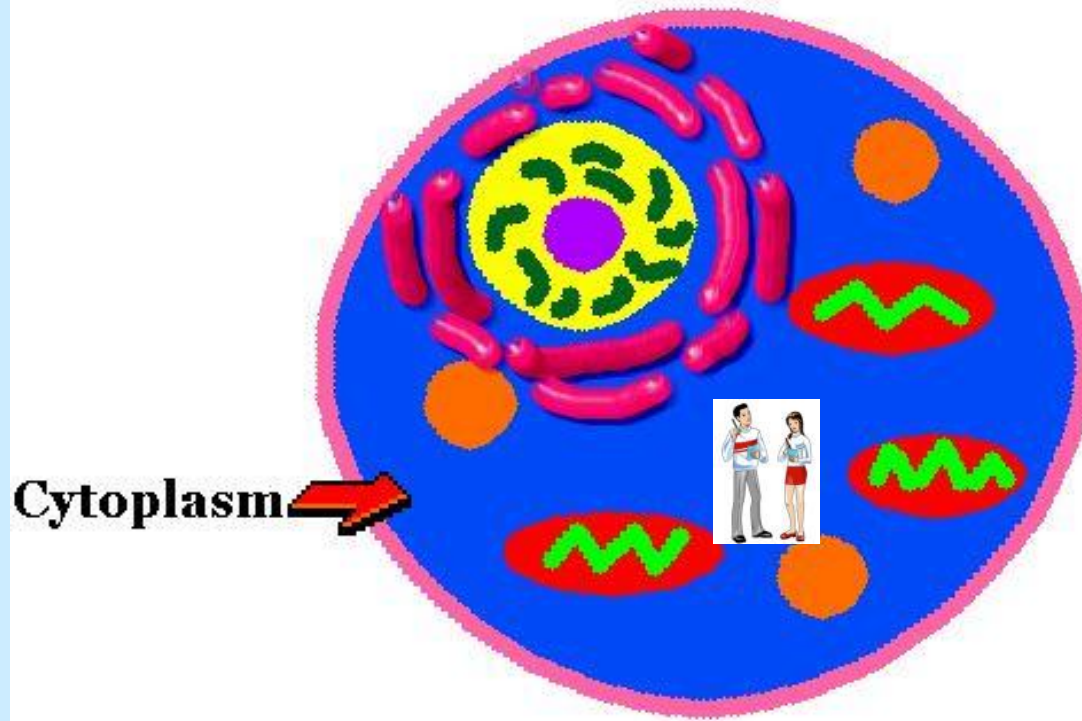
In animals

Glucose \longrightarrow Lactic Acid + 2ATP

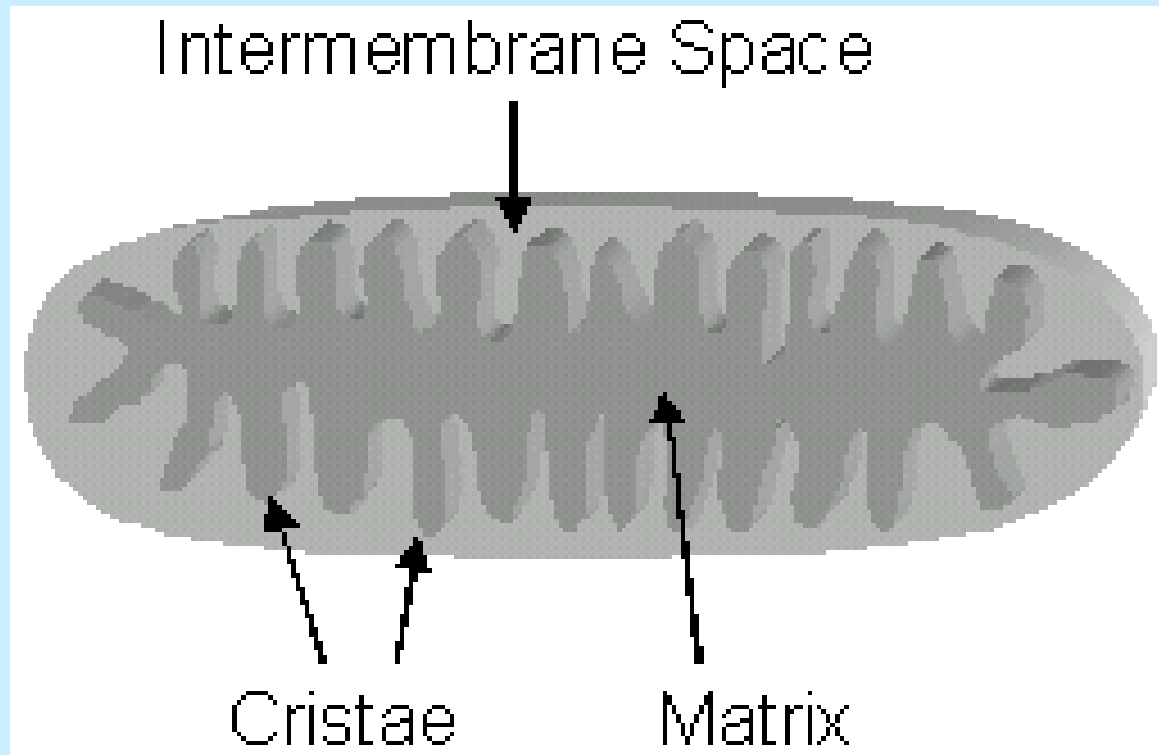
What happens if oxygen is
available??????

Let's take a trip into a mitochondrion

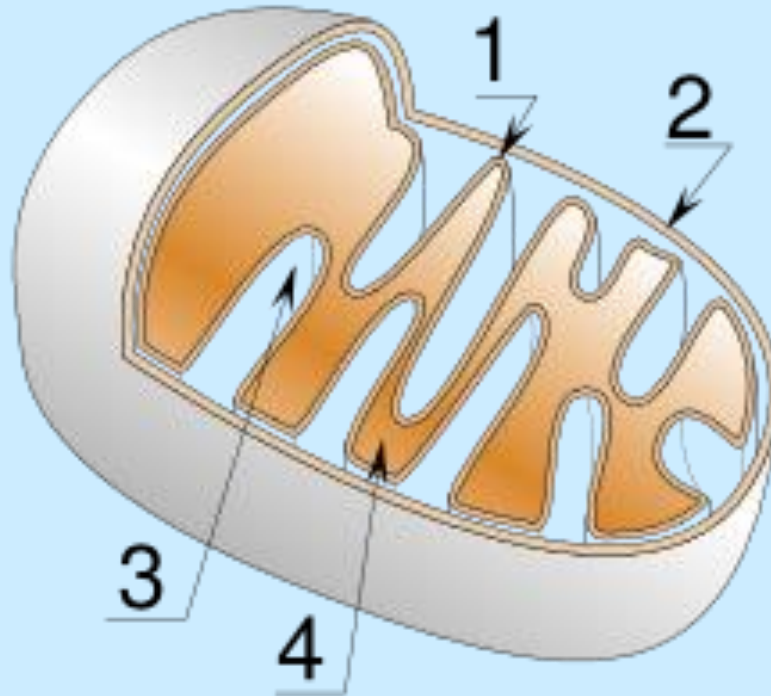
More bloody membranes to cross.



Remember, this is where we are. We're now going into a mitochondrion. Scary stuff. I hope you've got your excursion form signed.....

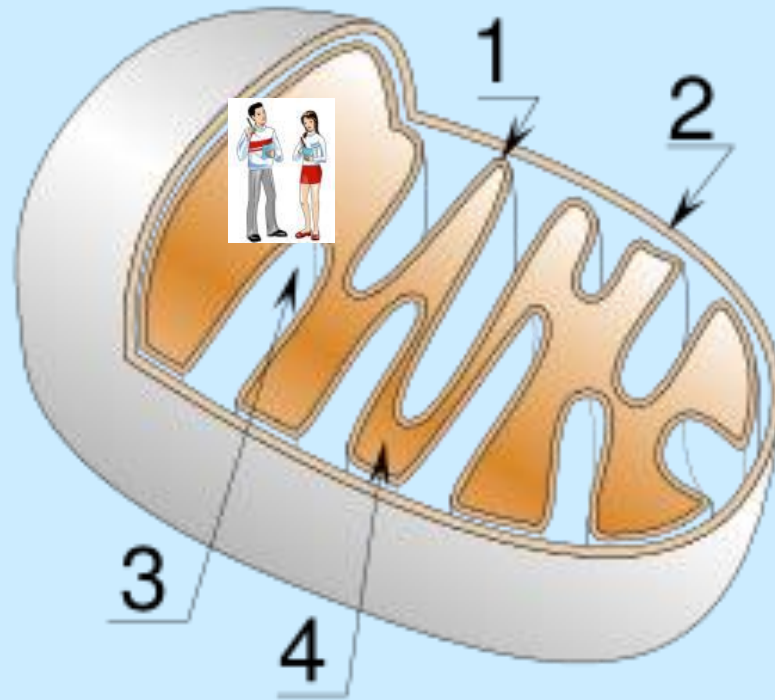


I don't like that mitochondrion. Let's try another



1. Inner membrane
2. Outer membrane
3. Crista (folds made by inner membrane)
4. Matrix

Let's Enter One!



The cytoplasm was busy but a mitochondrion is full of action. Look at those enzymes breaking down pyruvic acid. . It's lucky we're wearing enzyme resistant clothes.

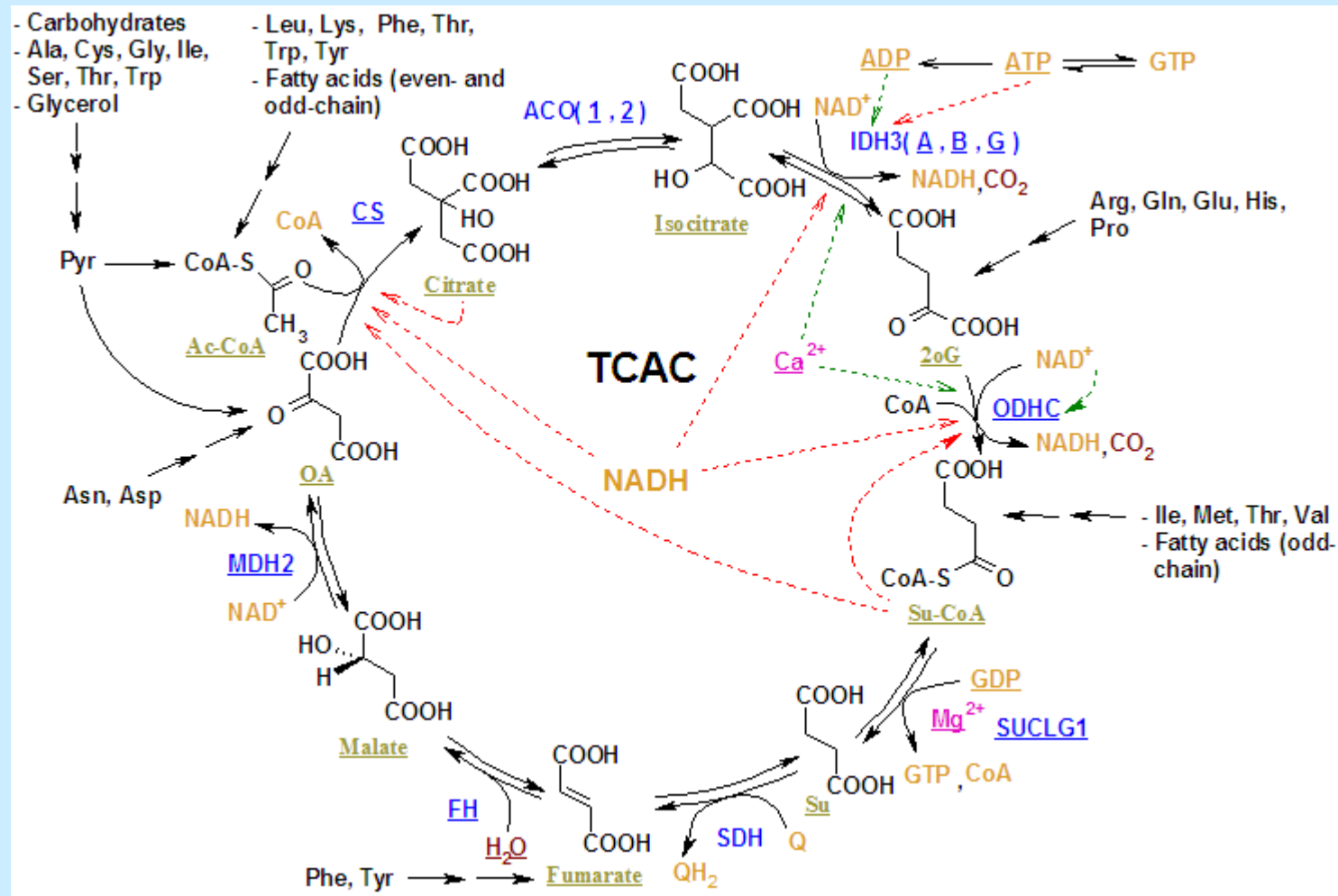
Serious Tone.....

What happens in the mitochondrion?

Two main stages:

1. Krebs's Citric Acid Cycle (occurs in the matrix)
2. Electron Transport Chain (occurs on the cristae)

Kreb's Citric Acid Cycle



Lucky we don't need to know this level of detail.

Kreb's Citric Acid Cycle

What is formed????

A small amount of ATP (2 molecules)

Lots of carbon dioxide (CO₂)

The Electron Transport System

What happens here????

Lots of ATP and Water are
produced.

Lots of oxygen is used up

What is the basic equation for aerobic respiration???



Where do all these molecules fit into what we've just discussed?????

Glucose: starts to be broken down in the cytoplasm in the process known as glycolysis.

Oxygen: needed in the electron transport chain of aerobic respiration in the mitochondria.

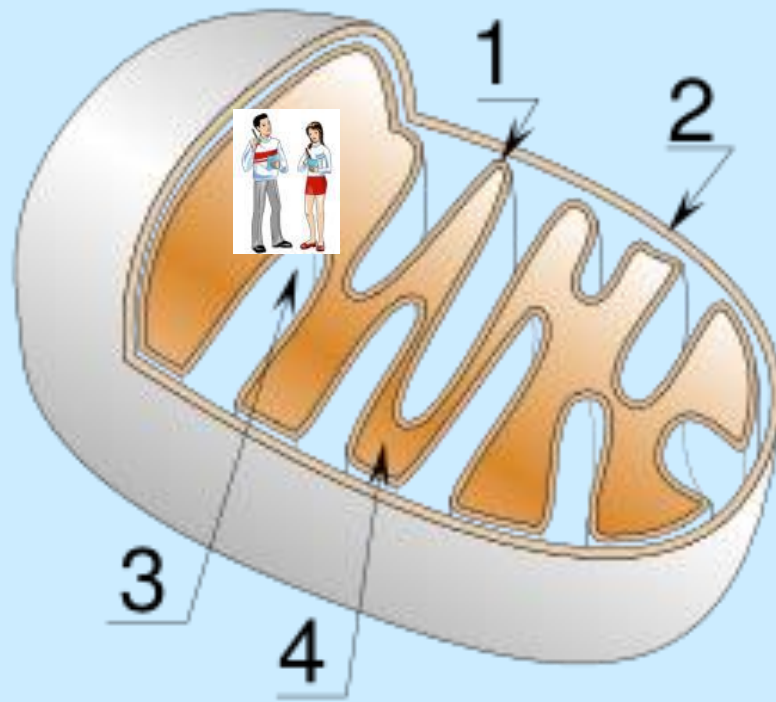
Carbon Dioxide: Produced in Krebs's Citric Acid Cycle.

Water: Produced in the electron transport chain when oxygen combines with H^+ ions.

ATP: Some produced in glycolysis (2ATP).

Some produced in Krebs's Citric Acid Cycle (2ATP).

Most produced in the Electron Transport Chain (The Rest).



I think it's time to go.

