

What is cellular respiration?

All organisms require energy to power their cells.

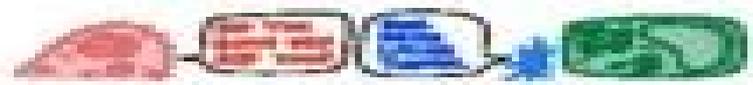
Remember: Passive transport does not require energy. Cells need energy for all other activities!

Cellular respiration is the process cells use to create energy (in the form of ATP)

Cells break down organic molecules (like glucose) to create ATP energy.

Autotrophs make their own food (glucose) but still need to break it down to make ATP

Heterotrophs eat organic material (they can't make their own food)



What is needed for aerobic cellular respiration?

Cellular respiration is the chemical equation for that

Think about what YOU breathe in when you go outside!

O₂ = **Oxygen**

Glucose + **Oxygen** → **Carbon Dioxide** + **Water** + **Energy**

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



Why do cells make ATP?

ATP is a very energy dense molecule.

Cells "pop off" the last phosphate to release the energy.

ATP is composed of:

1. **Adenine** (nitrogenous base 'A')
2. **Ribose** (sugar base)
3. **Phosphate** groups (they pack very negatively charged)



Energy stored in the bonds of your food is used to add another phosphate group to ADP turning it into ATP

ADP = adenosine diphosphate (2 phosphates)

ATP = adenosine triphosphate (3 phosphates)



ATP is used for:

- **Mechanical work** = physically moving stuff. Ex: moving a molecule from one strand of a cell to another, muscle fiber movement, contraction (protein pulling itself)
- **Transport work** = transporting materials against a concentration gradient. Transporting large molecules across a membrane. Ex: transporting Na⁺ from an area of low concentration to high concentration.
- **Chemical work** = building new molecules. Ex: polymerizing synthetase of macromolecules (polymers) from monomers.



Why does ATP have so much energy?

ATP is a **high potential energy**

Its unbalanced way you must understand:

- **negative charges (and) other negative charges**
- **phosphate is a very negatively charged functional group**



Just like when the plates have lots of positive charges, they repel. This phosphate functional group makes that what is called **high energy**.

What is ATP used for?

ATP is the **currency** for the cell because every cell processes uses ATP to power its work.

Anything that uses new energy from the cell, requires ATP (because life is energy energy is a bond)

Think about all the things you like to do for fun. Most of these require **energy** (directly or indirectly)

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- **Chemical work** = building new molecules. Ex: polymerizing synthetase of macromolecules (polymers) from monomers.



ATP has been shown used for **ion transport** across ATP. Ex: transport of sodium to have them - chloride ions, moving to outside.



Active transport moves up concentration. This uses ATP. Ex: moving Na⁺ from outside to inside.



Polymerization synthesis needs energy. Ex: building glycogen to store glucose. This is an essential step of cells. (storing it away)

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web in theory solar energy was used by humans as early as the 7th century b c when history tells us that humans used sunlight to light fires with magnifying glass materials later in the 3rd century b c the greeks and romans were known to harness solar power with mirrors to light torches for religious ceremonies

history of solar energy museum of solar energy - Dec 27 2022

web 1800 s light and electricity in the first chapter of solar history was the discovery that light was related to electricity the first solar cells or photocells did not produce much power and used an element called selenium se

