

Cell respiration Structure of ATP	Cell respiration Properties that suit ATP as energy currency
Cell respiration Three uses of ATP in cells	Cell respiration ATP ↔ ADP energy transfers
Cell respiration Cell respiration	Cell respiration Word equations for respiration in humans
Cell respiration Where do aerobic and anaerobic respiration happen?	Cell respiration How does a respirometer measure respiration rate?

Soluble, stable without enzymes, cannot cross membranes freely, releases a useful amount of energy, rapidly regenerated.

A nucleotide: adenine, ribose and three phosphate groups. Full name: adenosine triphosphate.

Hydrolysis of ATP to ADP + phosphate releases energy; making ATP from ADP + phosphate requires energy.

Active transport, synthesis of macromolecules (anabolism), movement of cells or chromosomes.

Aerobic: glucose + oxygen → carbon dioxide + water. Anaerobic: glucose → lactate.

A system for producing ATP within the cell using energy released from carbon compounds, mainly glucose and fatty acids.

Alkali absorbs CO₂, so oxygen uptake moves a liquid drop; distance × tube area ÷ time ÷ mass gives rate.

Anaerobic: cytoplasm only. Aerobic: starts in the cytoplasm, then mitochondria (which are required).

Cell respiration

Variables affecting respiration rate

Cell respiration **HL only**

Oxidation by dehydrogenation

Cell respiration **HL only**

Four stages of glycolysis and its net yield

Cell respiration **HL only**

Why do human cells make lactate?

Cell respiration **HL only**

Anaerobic respiration in yeast: products and uses

Cell respiration **HL only**

The link reaction

Cell respiration **HL only**

Krebs cycle summary

Cell respiration **HL only**

Where does reduced NAD for the electron transport chain come from?

Removal of hydrogen (with its electron) from a substrate; the substrate is oxidised and NAD is reduced.

Temperature, oxygen concentration, substrate availability, type and activity of organism.

Pyruvate accepts hydrogen from reduced NAD, regenerating NAD so glycolysis continues (net 2 ATP per glucose).

Phosphorylation, lysis, oxidation, ATP formation. Net per glucose: 2 ATP, 2 reduced NAD, 2 pyruvate.

Pyruvate is oxidised and decarboxylated in the matrix; the 2C acetyl group is carried by coenzyme A to the Krebs cycle.

Ethanol and carbon dioxide. Brewing uses ethanol; baking uses CO₂ to make dough rise.

Glycolysis, the link reaction and the Krebs cycle.

Acetyl (2C) + oxaloacetate (4C) → citrate (6C); two decarboxylations, four oxidations, regenerate oxaloacetate; yields CO₂, reduced NAD, ATP.

Cell respiration **HL only**

How is the proton gradient generated in mitochondria?

Cell respiration **HL only**

Chemiosmosis

Cell respiration **HL only**

Oxygen as terminal electron acceptor

Cell respiration **HL only**

Why do lipids yield more energy per gram than carbohydrates?

Protons diffuse down their gradient through ATP synthase, which couples the energy released to phosphorylation of ADP.

Energy from electrons flowing along the chain pumps protons from the matrix into the intermembrane space.

Less oxygen and more oxidisable hydrogen and carbon. Fatty acids enter as acetyl CoA, not via glycolysis.

Accepts electrons from the chain and protons from the matrix, forming metabolic water, so electron flow continues.