

TOPIC 8.1: METABOLIC PROCESSES

Photosynthesis

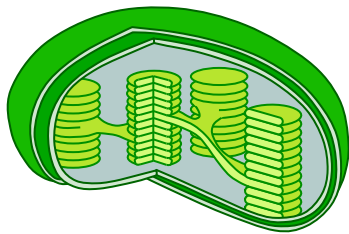
Photosynthesis converts **light** energy (from the sun) into **stored** chemical energy (organic compounds)

- The conversion of light energy into chemical energy requires energy transfer molecules (i.e. electron carriers) and ATP
- This process requires photosynthetic pigments (e.g. chlorophyll), which are found in **chloroplasts** in most eukaryotic cells

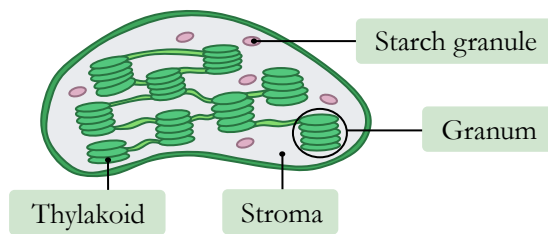
Chloroplasts

The structure of a chloroplast is adapted to the function it performs (photosynthesis):

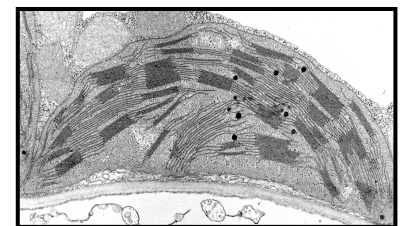
- Granum are made up of stacks of thylakoids to increase the surface area available for the electron transport chain
- The thylakoid lumen is very small (maximises the electrochemical gradient that results from proton accumulation)
- The stroma contains suitable enzymes and an appropriate pH for the Calvin cycle to occur (light independent reactions)



3D representation



2D cross-section diagram



Electron micrograph

Cell Respiration

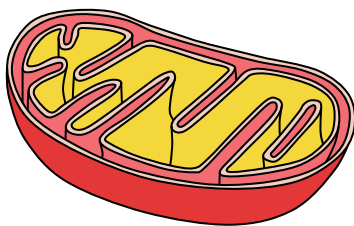
Cell respiration converts **stored** chemical energy (organic compounds) into an immediate and **usable** energy molecule (ATP)

- The conversion of energy between stored and usable forms requires energy transfer molecules (i.e. electron carriers)
- The majority of ATP is produced via **aerobic** respiration which occurs within the mitochondria of a cell (requires oxygen)

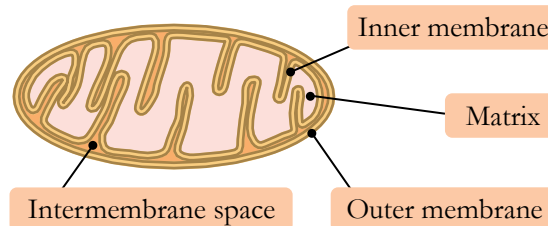
Mitochondria

The structure of a mitochondrion is adapted to the function it performs (aerobic cell respiration):

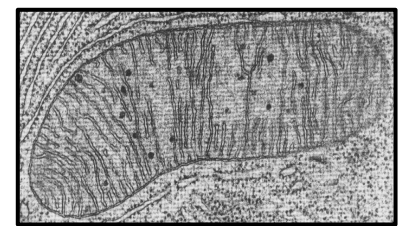
- The inner membrane is folded into **cristae** to increase the surface area available for the electron transport chain
- The intermembrane space is very small (maximises the electrochemical gradient that results from proton accumulation)
- The mitochondrial matrix contains suitable enzymes and an appropriate pH for the Krebs cycle to occur
- The outer membrane contains the necessary transport proteins for shuttling pyruvate into the mitochondria (link reaction)



3D representation



2D cross-section diagram



Electron micrograph

Electron Tomography

Electron tomography is a technique by which a 3-dimensional image of an internal cellular structure can be generated

- Samples are repeatedly imaged at different angles (using a transmission electron microscope) and the images are compiled