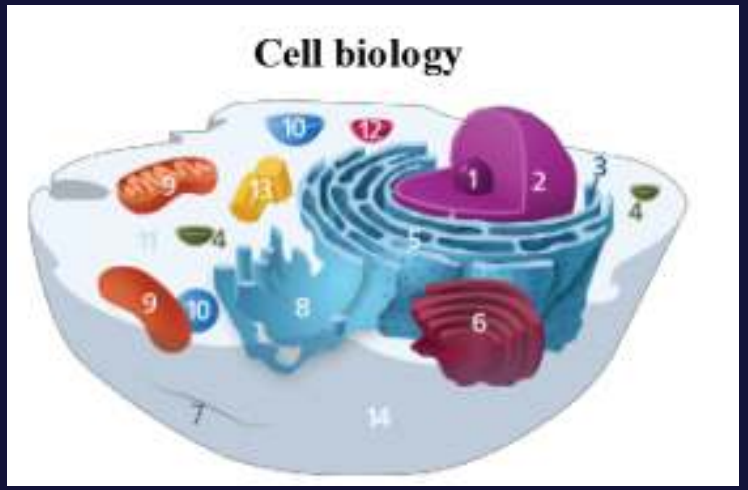

MITOCHONDRIA

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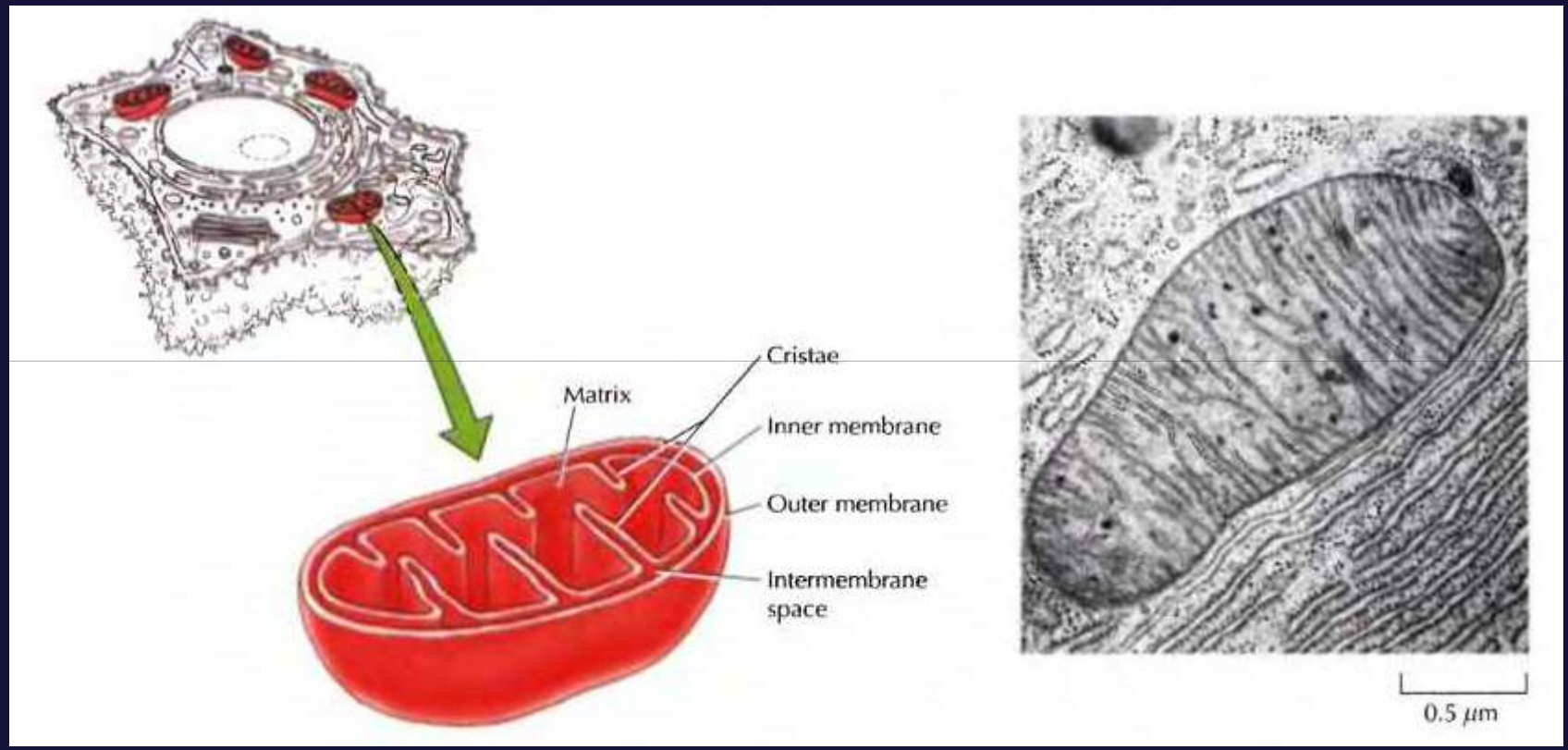
Mitochondria



Mitochondria

- The mitochondrion is a membrane-enclosed structure found in most eukaryotic cells (the cells that make up plants, animals, and many other forms of life).
- These organelles are sometimes described as "cellular power plants" because they generate most of the cell's supply of adenosine triphosphate (ATP), used as a source of chemical energy.

Two mitochondria from mammalian lung tissue displaying their matrix and membranes as shown by electron microscopy

Mitochondria

HISTORY

- First observe by – Kolliker 1850
- Name mitochondria was assigned by – Benda 1897
- The popular term "powerhouse of the cell" was coined by Philip Siekevitz in 1957

MORPHOLOGY

- Mainly globular in shape.
- Mitochondria range from 0.5 to 1.0 micrometer (µm) in diameter.
- Not visible under light microscope.

Mitochondria

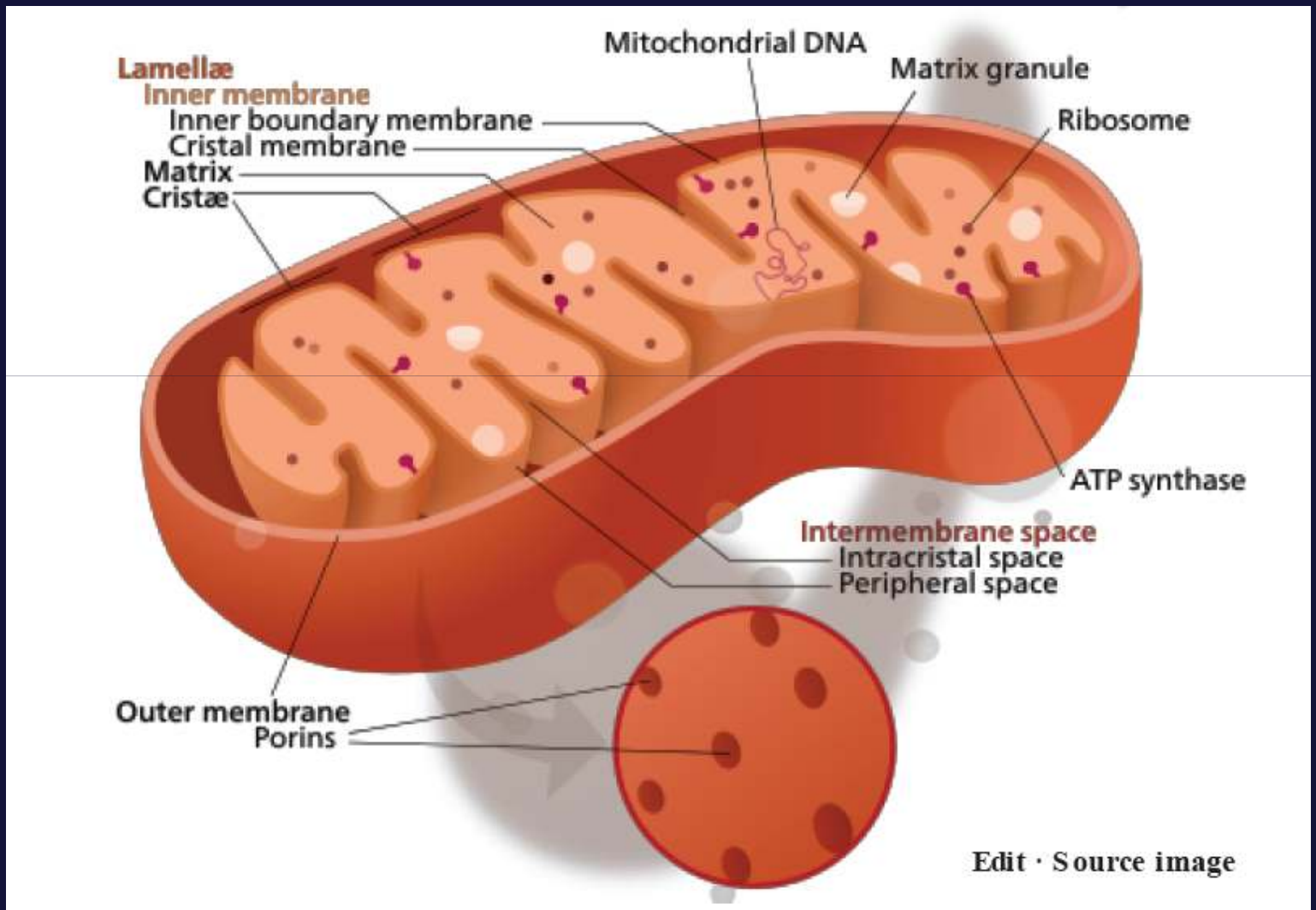
ULTRASTRUCTURE

- Surrounded by double membrane
- Inner and outer membrane
- Inter-membrane space between to membrane
- Outer membrane permeable for small molecules

- Inner membrane forms folds - cristae
- Extend in to matrix

- Matrix contain genetic system
- And some enzymes for oxidative metabolism

Mitochondria



Mitochondria

- Outer membrane
- The outer mitochondrial membrane, which encloses the entire organelle, has a protein-to-phospholipid ratio similar to that of the eukaryotic plasma membrane (about 1:1 by weight). It contains large numbers of integral proteins called *porins*.

Mitochondria

- Intermembrane space

- The intermembrane space is the space between the outer membrane and the inner membrane. It is also known as Perimitochondrial space.
- Because the outer membrane is freely permeable to small molecules, the concentrations of small molecules such as ions and sugars in the intermembrane space is the same as the cytosol.

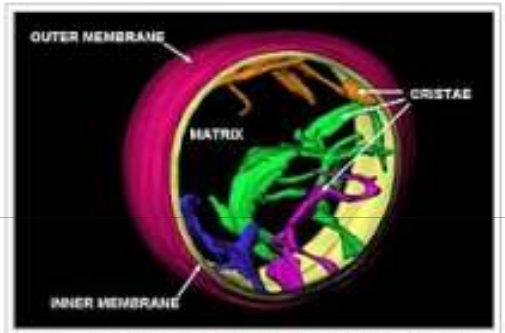
Mitochondria

- Inner membrane
- The inner mitochondrial membrane contains proteins which having some functions like –
- Those that perform oxidative phosphorylation
- ATP synthase, which generates ATP in the matrix
- Specific transport proteins that regulate metabolite passage into and out of the matrix

Mitochondria

CRISTAE

- The inner mitochondrial membrane is compartmentalized into numerous cristae, which expand the surface area of the inner mitochondrial membrane, enhancing its ability to produce ATP.
- This ratio is variable and mitochondria from cells that have a greater demand for ATP, such as muscle cells, contain even more cristae. These folds are studded with small round bodies known as F1 particles or oxysomes.



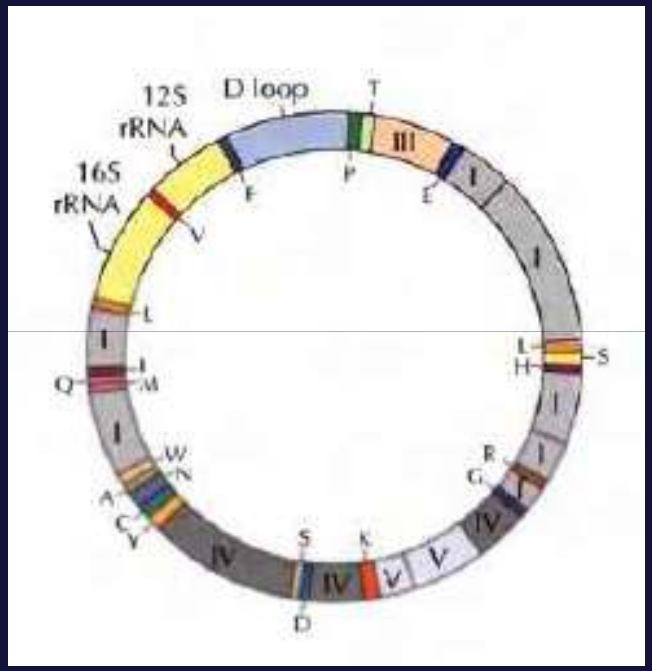
Cross-sectional image of cristae in rat liver mitochondrion to demonstrate the likely 3D structure and relationship to the inner membrane

MATRIX

- The matrix is the space enclosed by the inner membrane.
- The matrix is important in the production of ATP with the aid of the ATP synthase contained in the inner membrane.
- The matrix contains a highly concentrated mixture of hundreds of enzymes, special mitochondrial ribosomes, tRNA, and several copies of the mitochondrial DNA genome.
- Of the enzymes, the major functions include oxidation of pyruvate and fatty acids, and the citric acid cycle.[

MITOCHONDRIAL GENOME

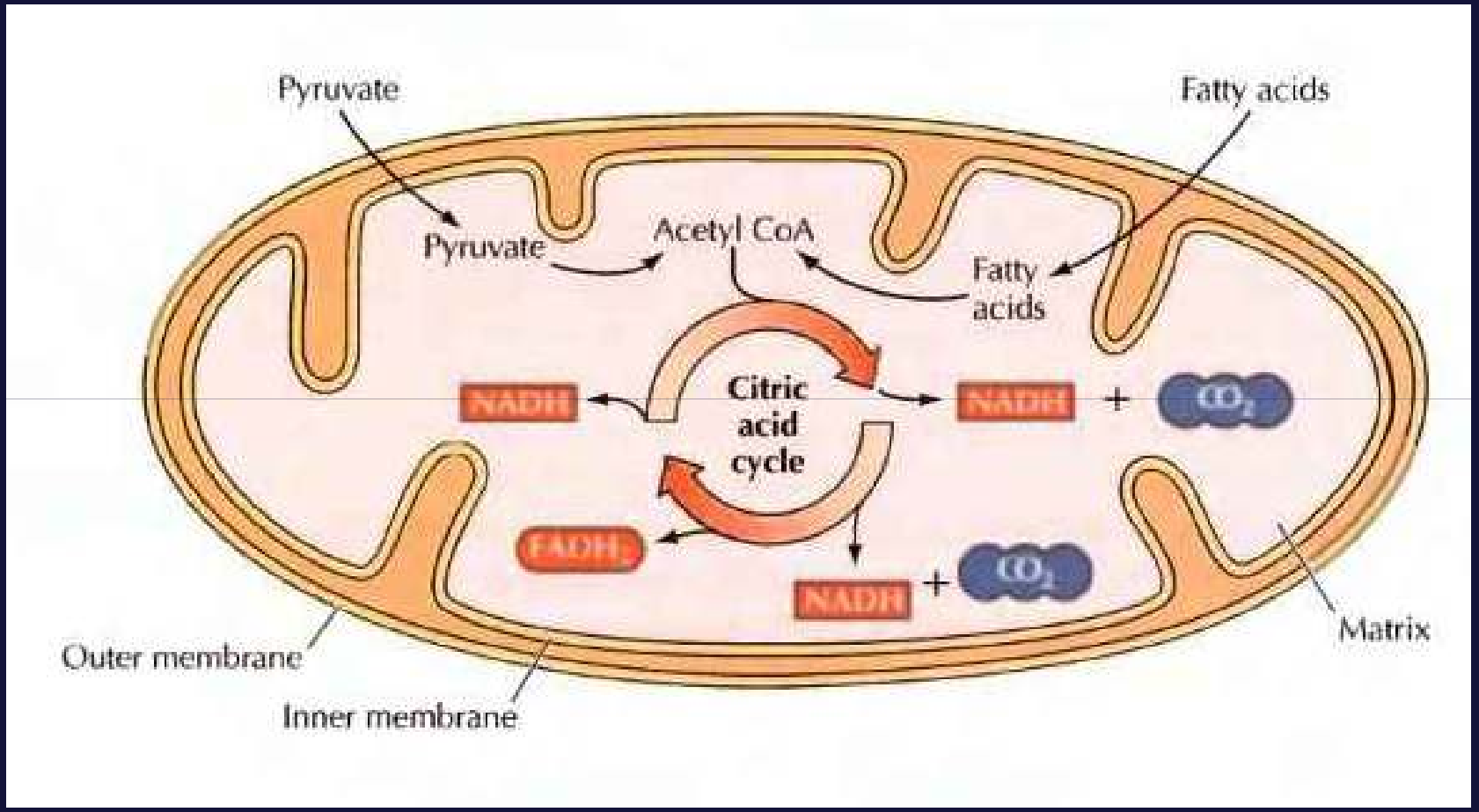
- Mitochondria have their own DNA
- All three RNA present in mitochondrial matrix
- Matrix contain ribosome
- Mitochondria synthesis some of their structural protein
- New mitochondria develop by division of pre existing mitochondrion.



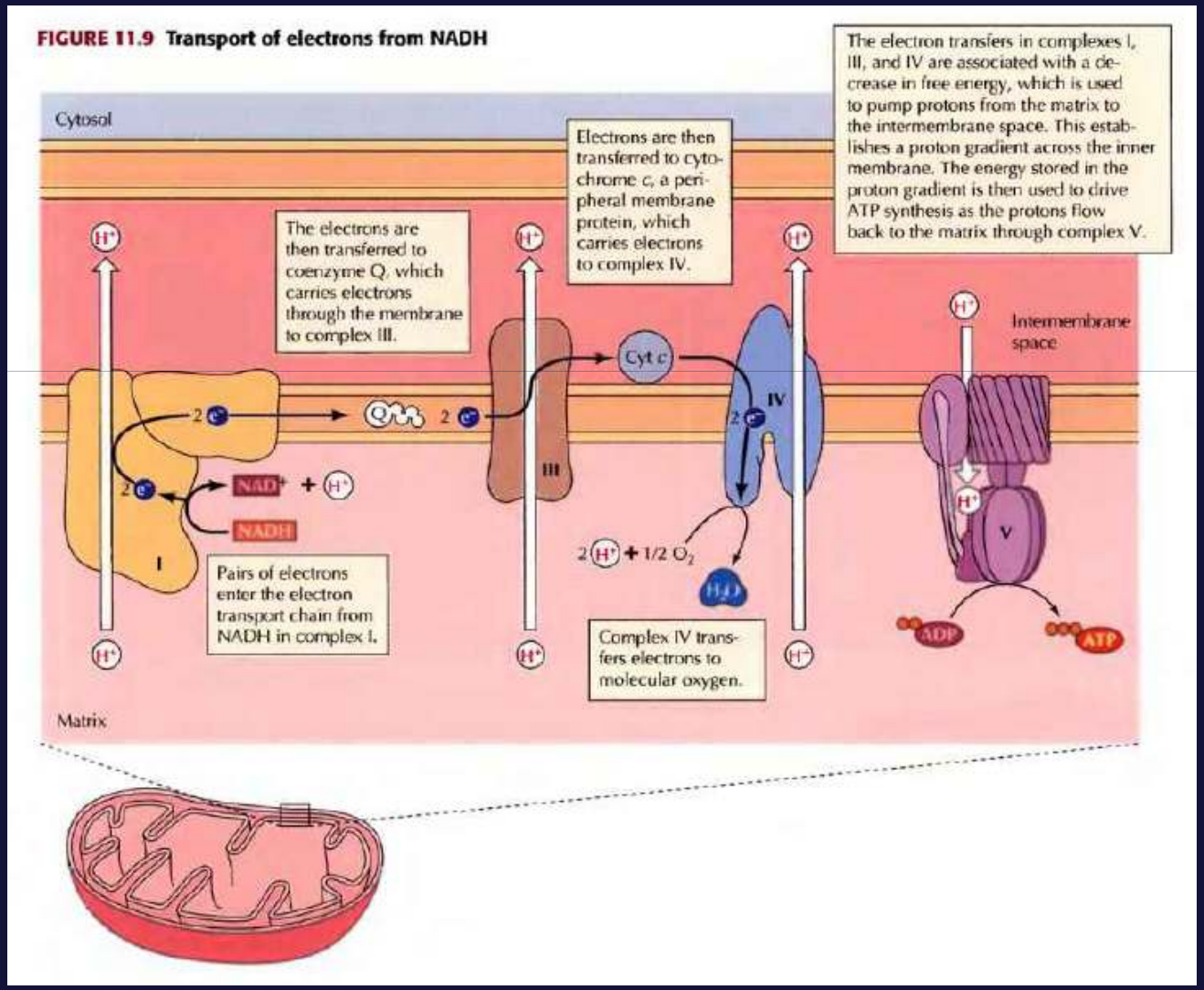
FUNCTIONS

- Supplying cellular energy,
- Signaling,
- Cellular differentiation,
- Cell death,
- Control of the cell cycle and cell growth,
- Synthesis amino acids – Glutamic acid, Aspartic Acid
- Regulate calcium ions in cell by storing and releasing as needed.

Mitochondria



Mitochondria



Thank you