Semi- Autonomous Nature of Mitochondria

(Paper code- Zoo CC-204 , Unit- 3, 1ST Year, 2nd semester)

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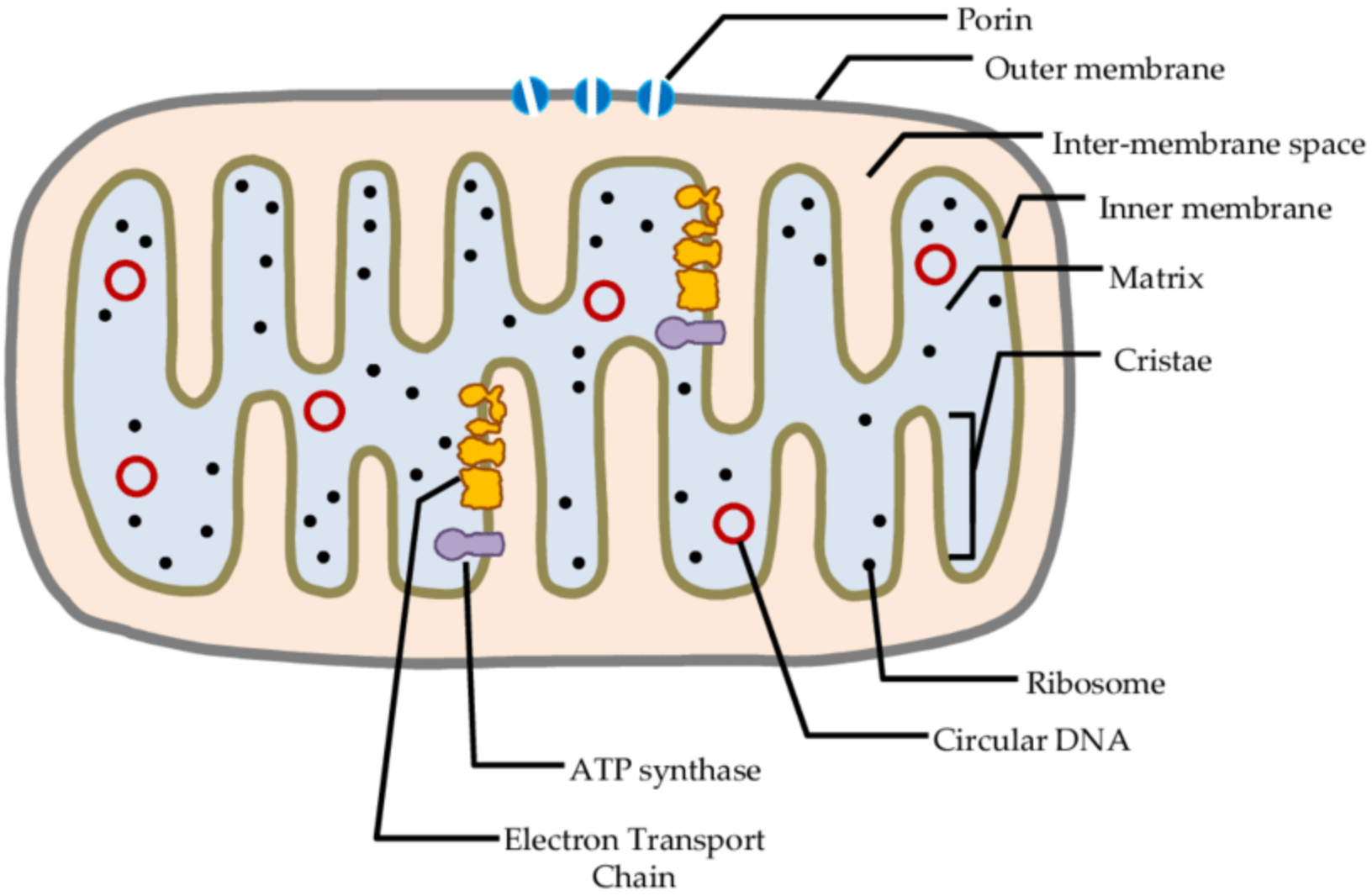
- Mitochondria performs many functions by using enzymes and proteins encoded by mitochondrial genes present on mitochondrial DNA.
- There are following features of mitochondria which shows that it is a semiautonomous cell organelle:-

1. Mitochondria have their own DNA which can replicate independently.
2. Mitochondrial contains its own ribosomes.
3. Mitochondrial DNA produces its own mRNA, tRNA and rRNA.
4. The organelles synthesise some of the enzymes required for their functioning.
5. New mitochondria develop by division/binary fission of pre-existing mitochondria.

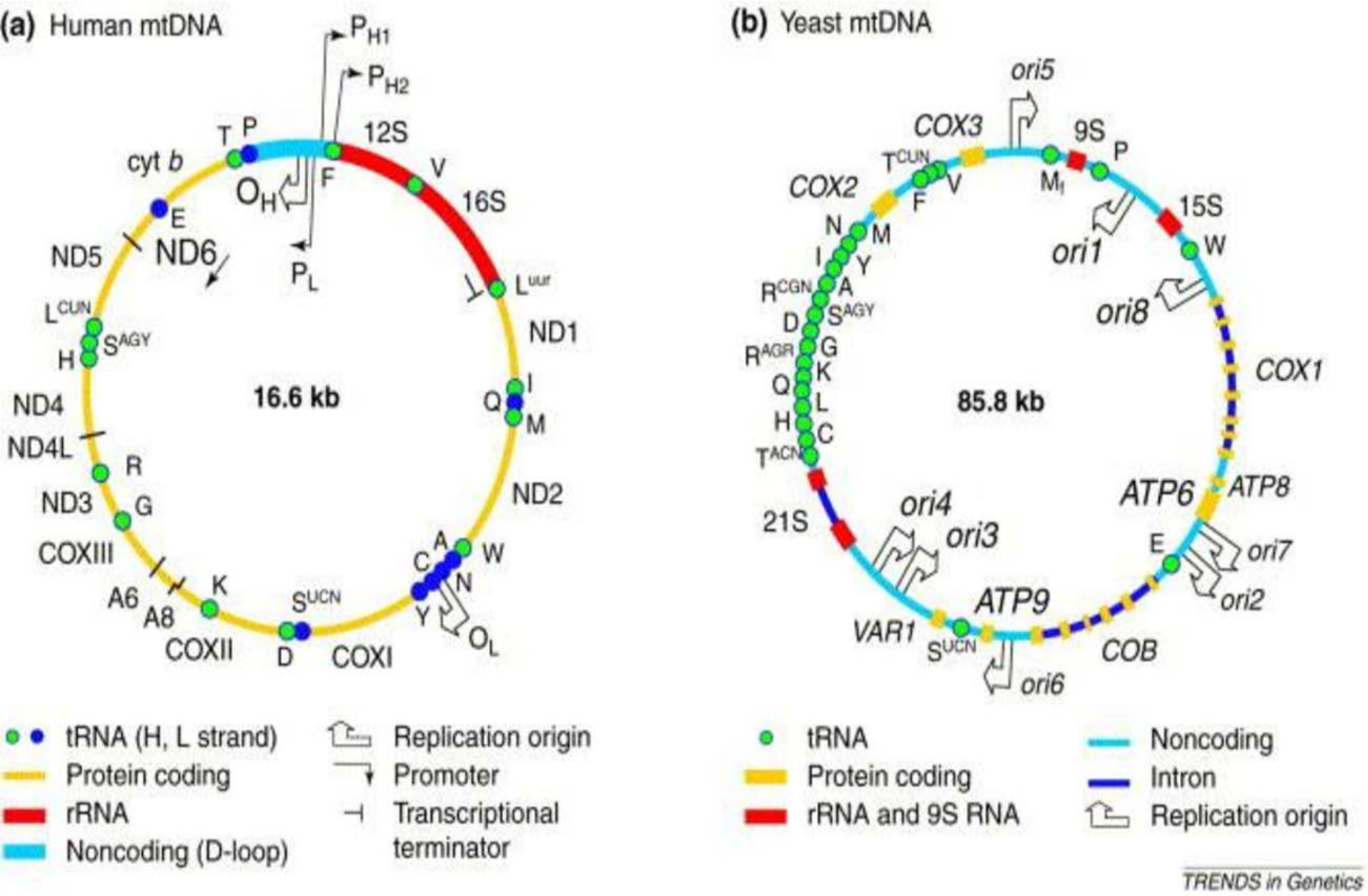
Mitochondria have their own DNA which can replicate independently

- Mitochondrial DNA (mt DNA) molecule is relatively small, simple, double-stranded and usually circular.
- The size of mitochondrial genome is very among organisms. For example plants usually have larger mt DNA than in animals.
- Thus, mt DNA varies in length from about 5 µm in most animal species to 30 µm or so and are higher in plants.
- The mt DNA is localized in the matrix and is probably attached to the inner membrane at the point where DNA duplication starts.

Structure Of Mitochondria



Size of Mitochondrial DNA varies in different organisms



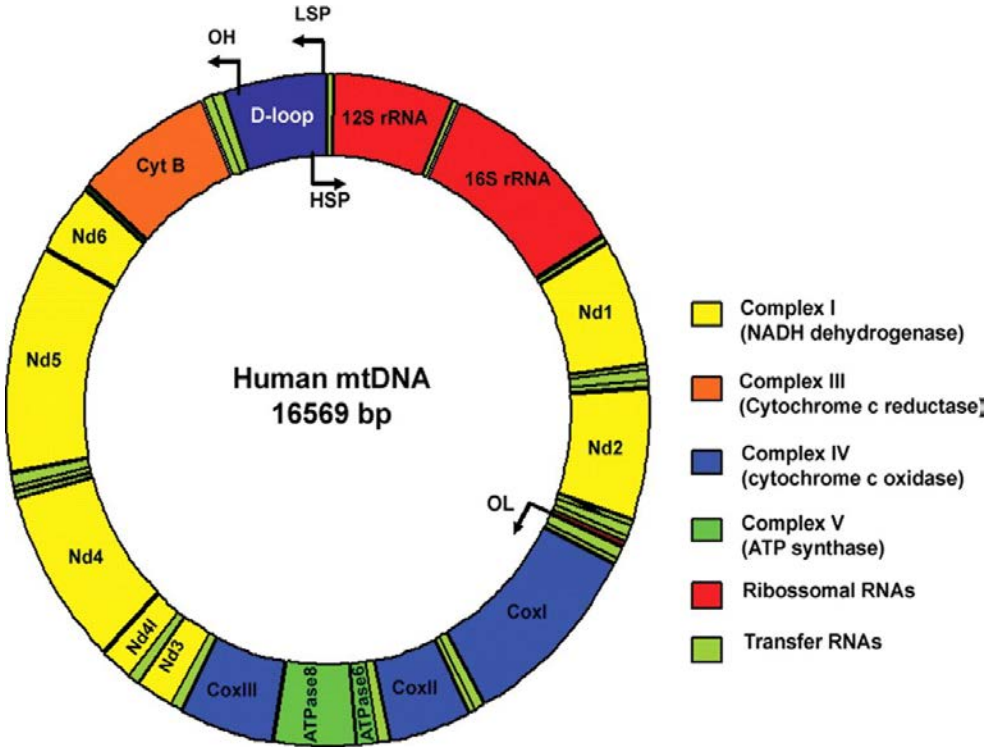
- **Mitochondrial contains its own ribosomes-** Mitochondria contain ribosomes (called **mitoribosomes**) and polyribosomes.
- Sedimentation coefficient of ribosomes vary in different organisms. For example in yeast and *Neurospora*, 70S ribosomes have been found, however, in mammalian cells mitoribosomes are smaller and have a total sedimentation coefficient of 55S, with subunits of 35S and 25S. In mitochondria, ribosomes appear to be tightly associated with the inner membrane.

Mitochondria synthesise some of their own structural proteins-

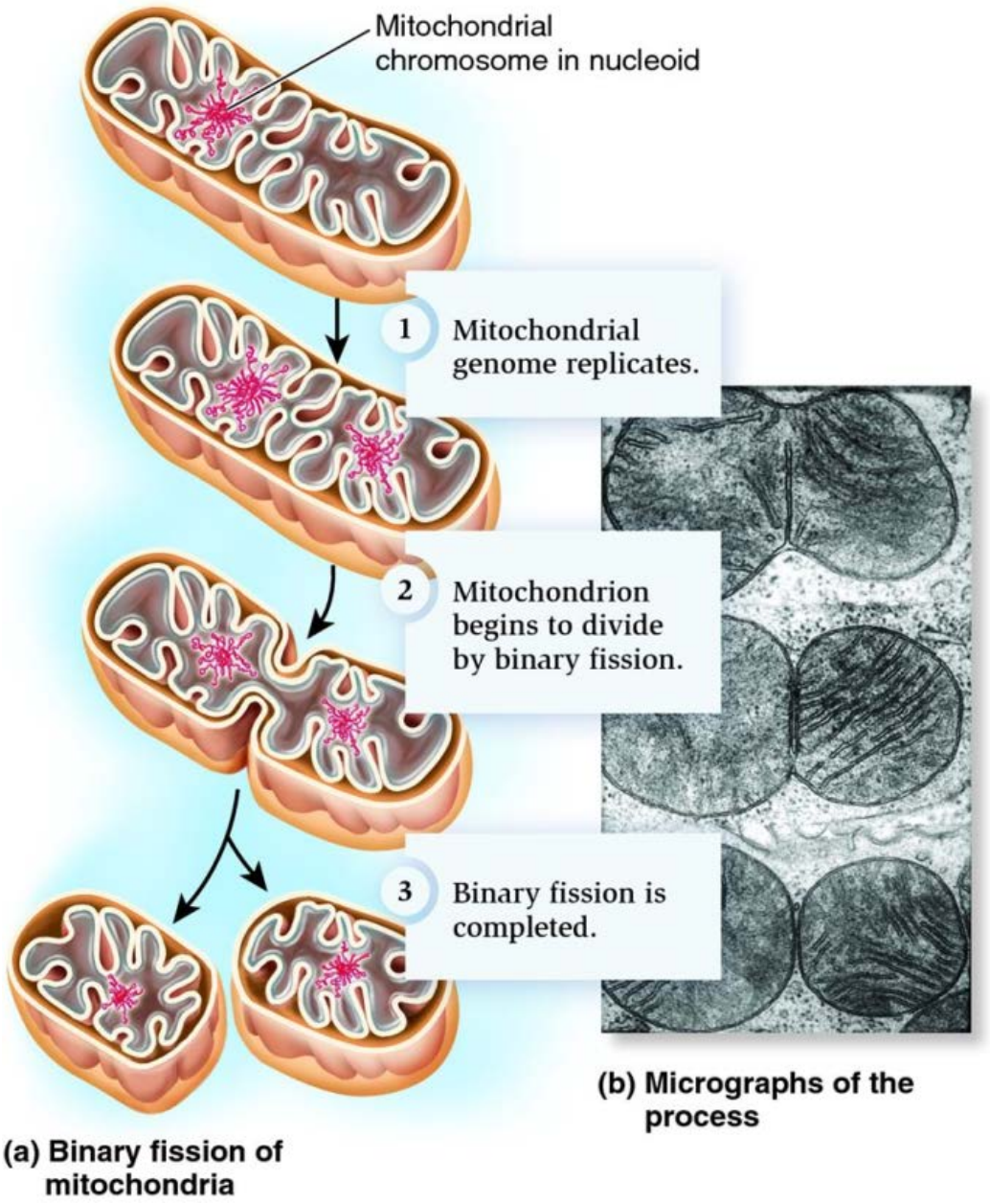
•Mitochondira can synthesize about 12 different proteins, which are incorporated into the inner mitochondrial membrane.

•For example mitochondria can synthesize one protein subunit of the cytochrome b-c1 complex, four subunits of ATPase and a few ydrophobic proteins.

Mitochondrial DNA produces its own mRNA, tRNA and rRNA as shown in adjecent figure.



New mitochondria develop by division/binary fission of pre-existing mitochondria



References

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- Karp, G.(2010). Cell and Molecular biology: Concepts and Experiments. VI Edition. John Wiley and Sons.Inc.