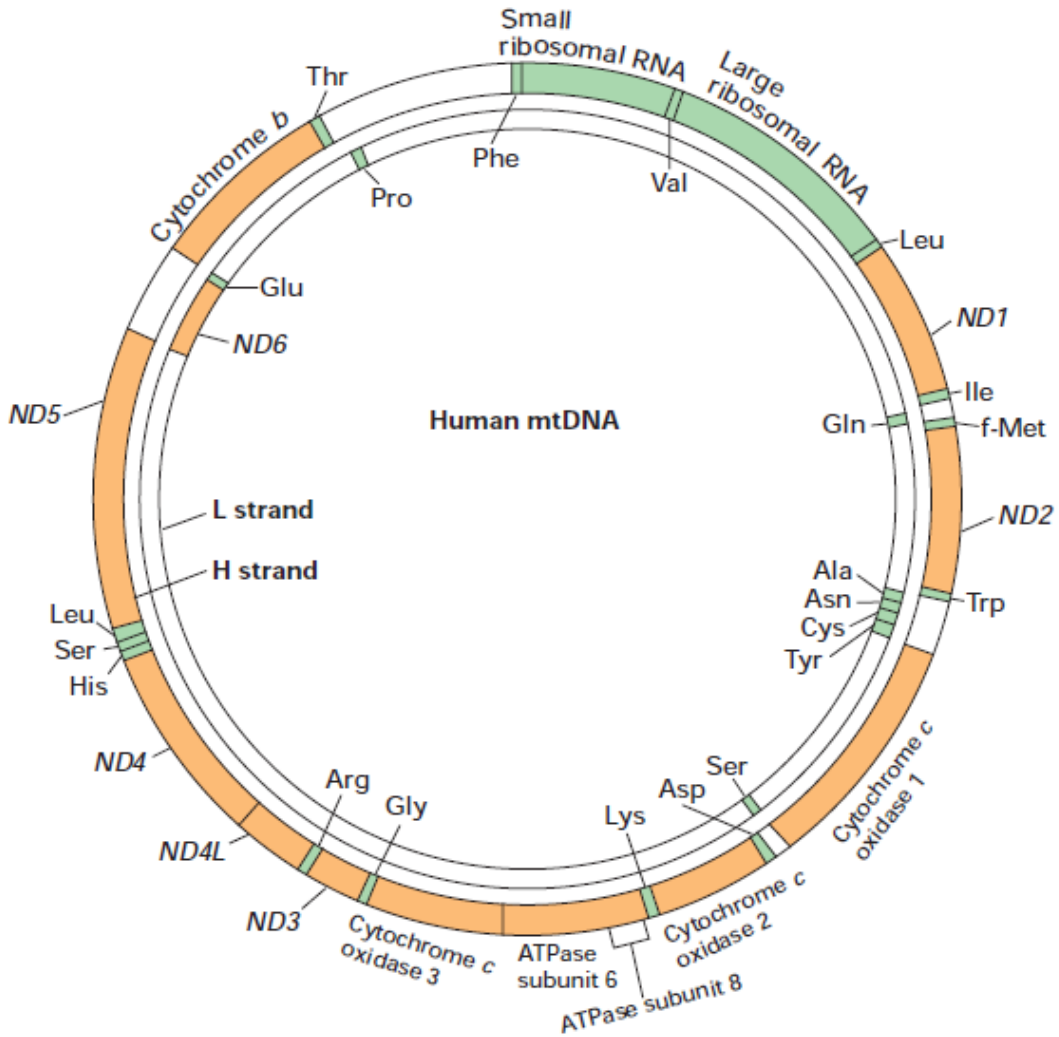
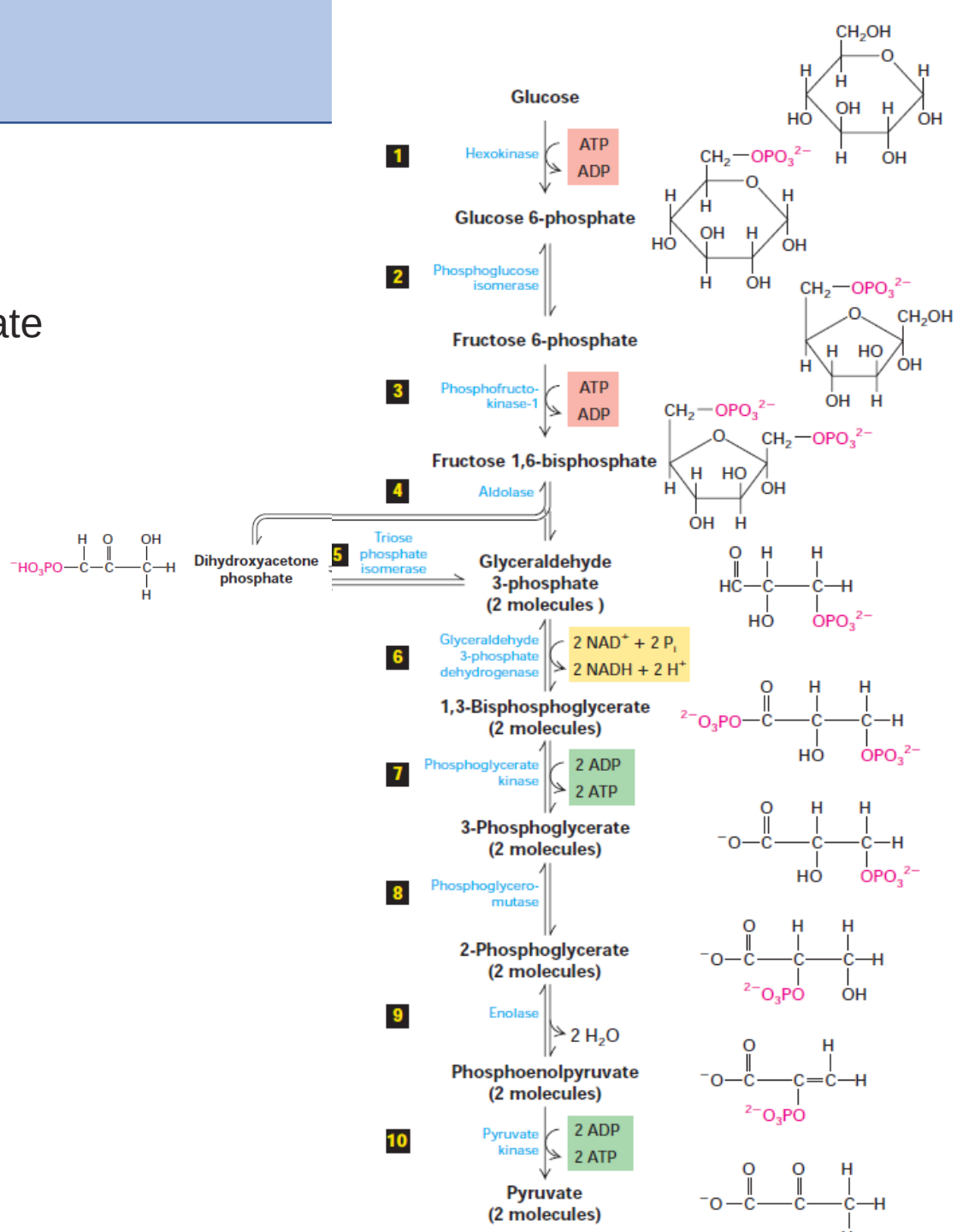
Lecture 13


Small ribosomal RNA
Large ribosomal RNA
Thr
Phe
Val
Pro
Cytochrome b
Leu
Glu
ND1
ND6
Ile
ND5
Human mtDNA
Gln
f-Met
L strand
ND2
H strand
Ala
Asn
Trp
Cys
Leu
Tyr
Ser
His
ND4
Arg
Ser
Asp
Gly
Lys
Cytochrome c oxidase 1
ND4L
ND3
Cytochrome c oxidase 3
ATPase subunit 6
Cytochrome c oxidase 2
ATPase subunit 8

The glycolytic pathway by which glucose is degraded to pyruvic acid.

A set of 10 water-soluble cytosolic enzymes catalyze the reactions constituting the *glycolytic pathway,* in which one molecule of glucose is converted to two molecules of pyruvate

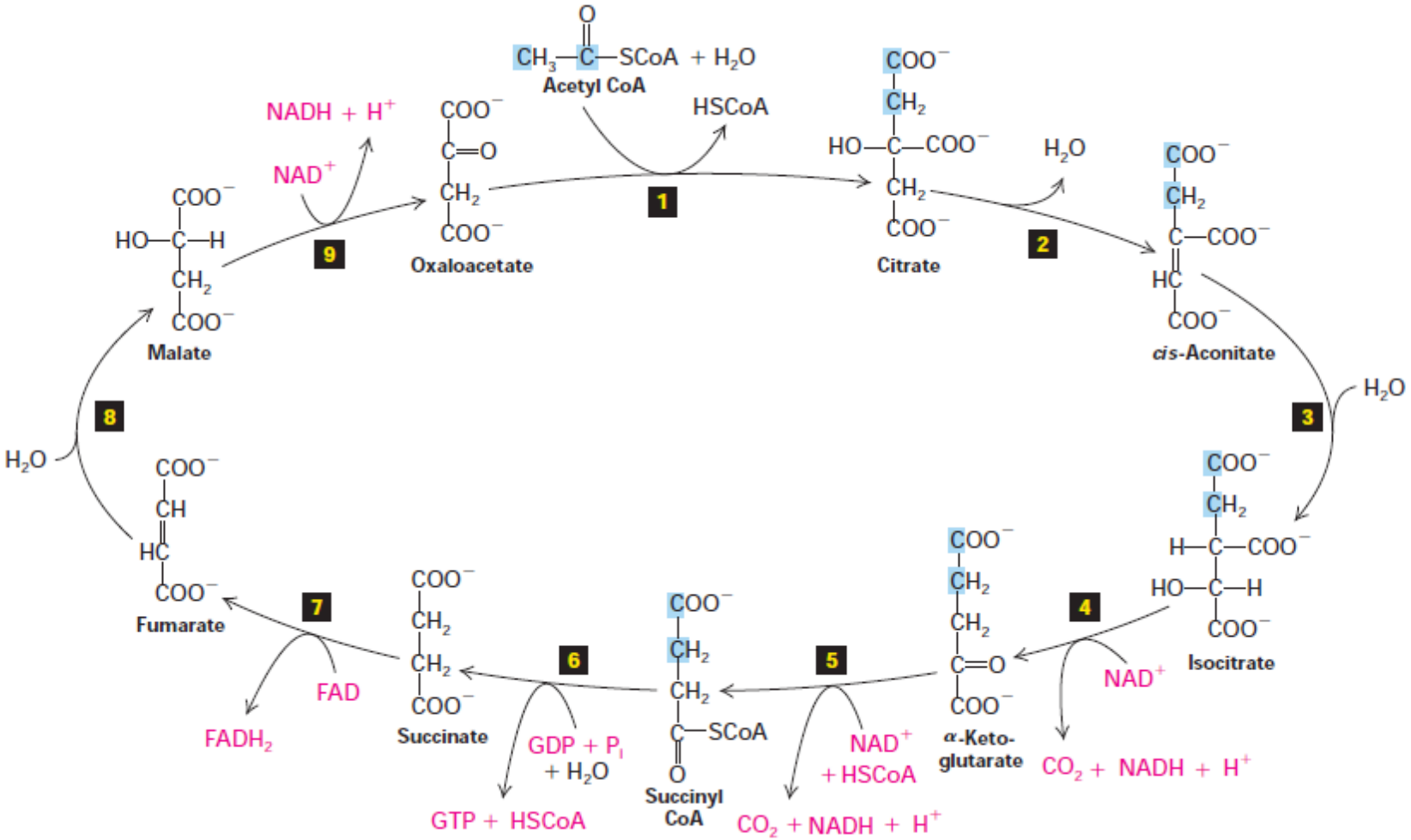
Four molecules of ATP are formed from ADP during glycolysis via **substrate-level phosphorylation,** which is catalyzed by enzymes in the cytosol



In the presence of oxygen, however, pyruvate formed in glycolysis is transported into mitochondria, where it is oxidized by O_2 to CO_2 in a series of oxidation reactions collectively termed **cellular respiration**.

These reactions generate an estimated 28 additional ATP molecules per glucose molecule, far outstripping the ATP yield from anaerobic glucose metabolism.

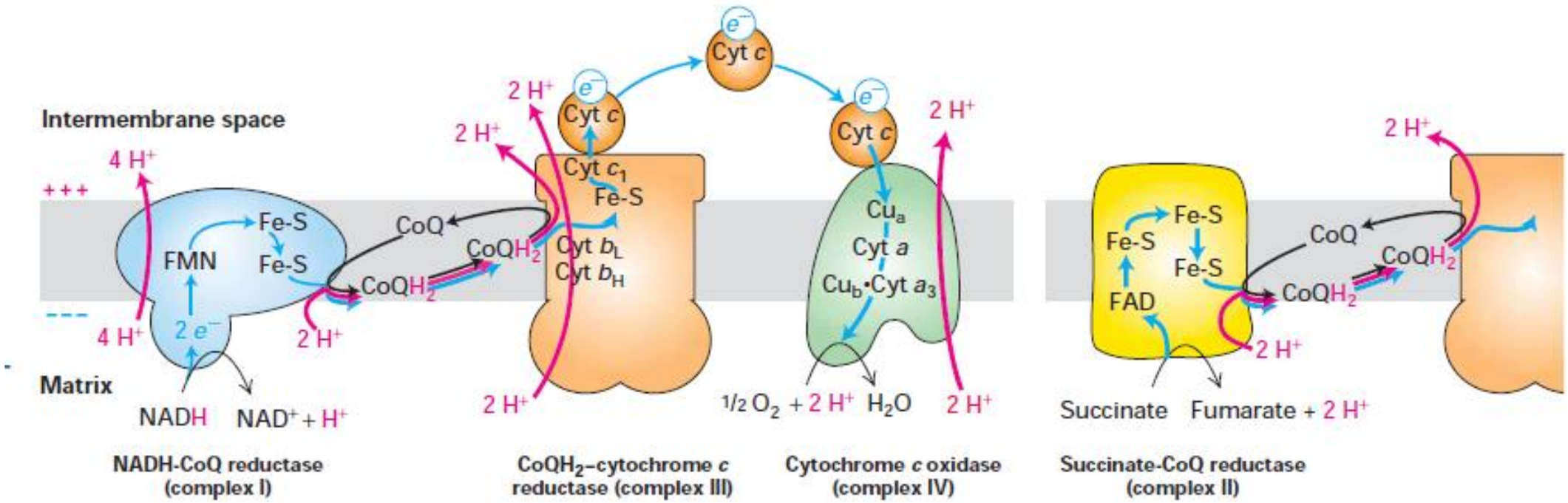
The citric acid cycle, in which acetyl groups transferred from acetyl CoA are oxidized to CO_2



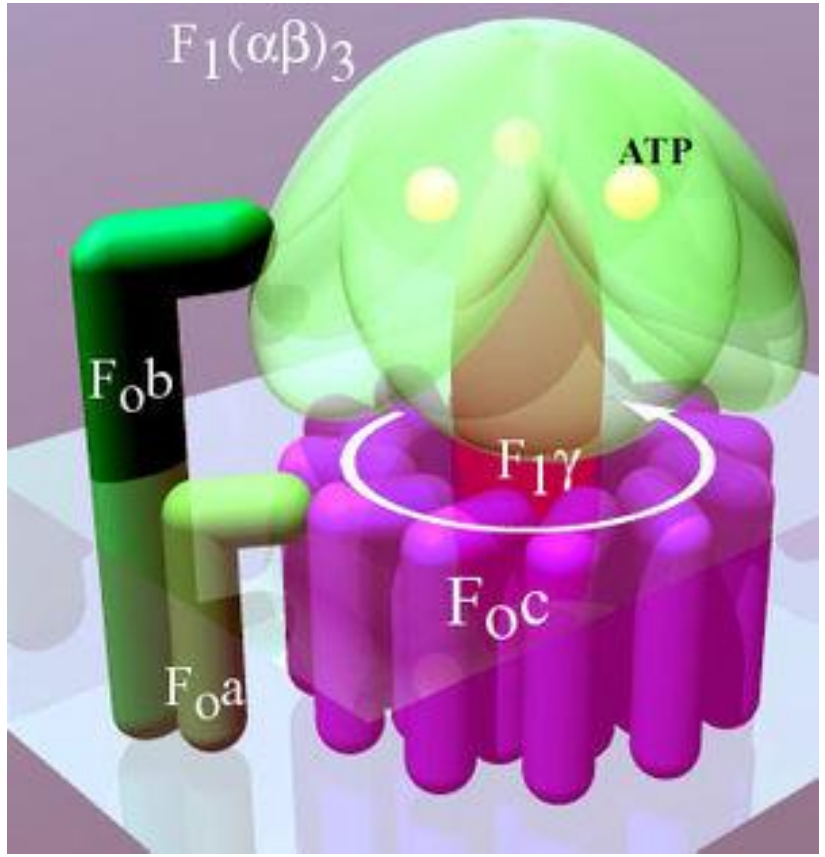
Synthesis of most of the ATP generated in aerobic oxidation is coupled to the reoxidation of NADH and $FADH_2$ by O_2 in a stepwise process involving the **respiratory chain,** also called the *electron transport chain.*

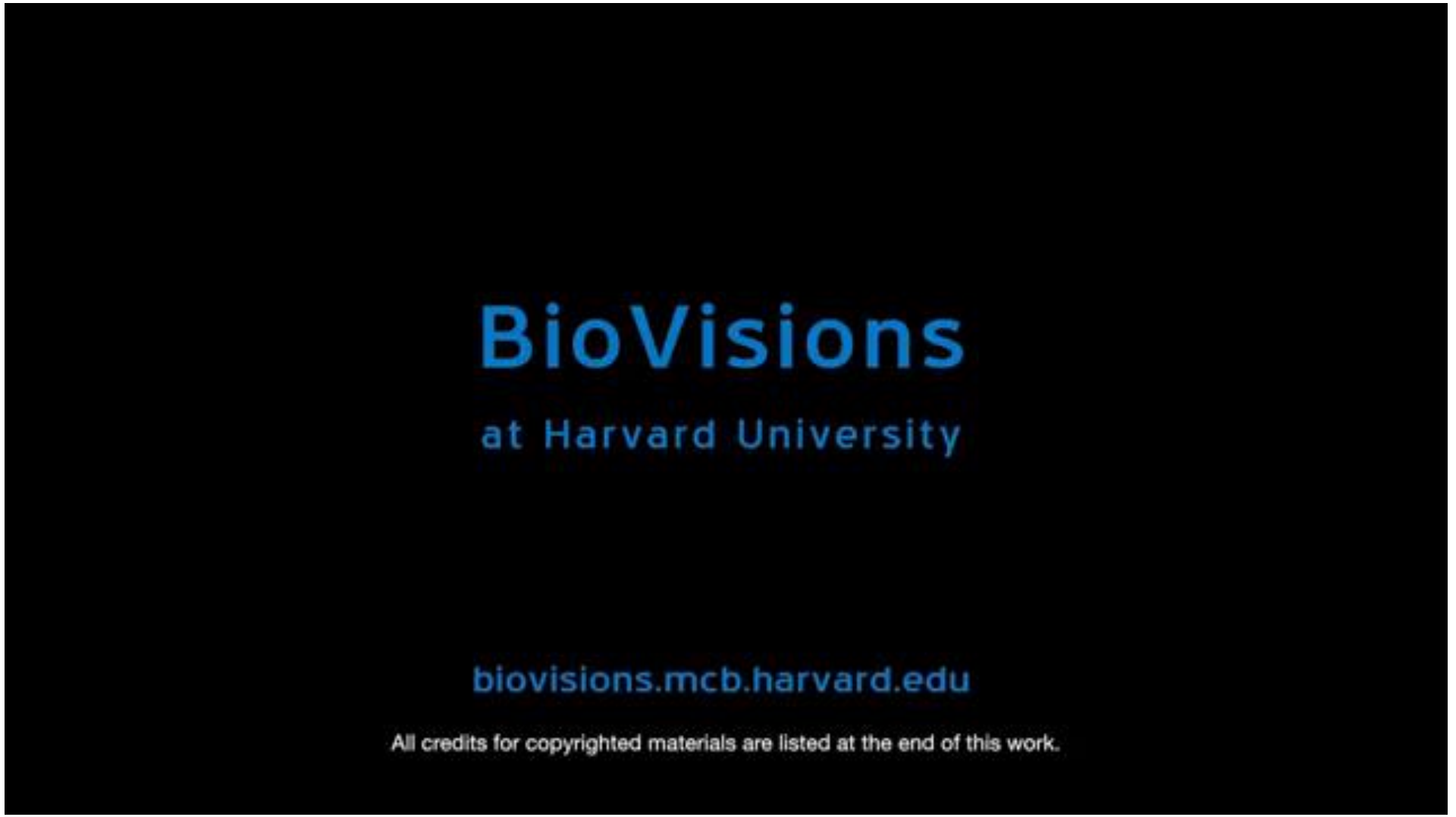
In the respiratory chain, electrons move through the cytochromes in the following order: *b,* c_1, *c, a,* and a_3

Overview of multiprotein complexes, bound prosthetic groups, and associated mobile carriers in the respiratory chain.



ATP Synthase (F_1F_0)

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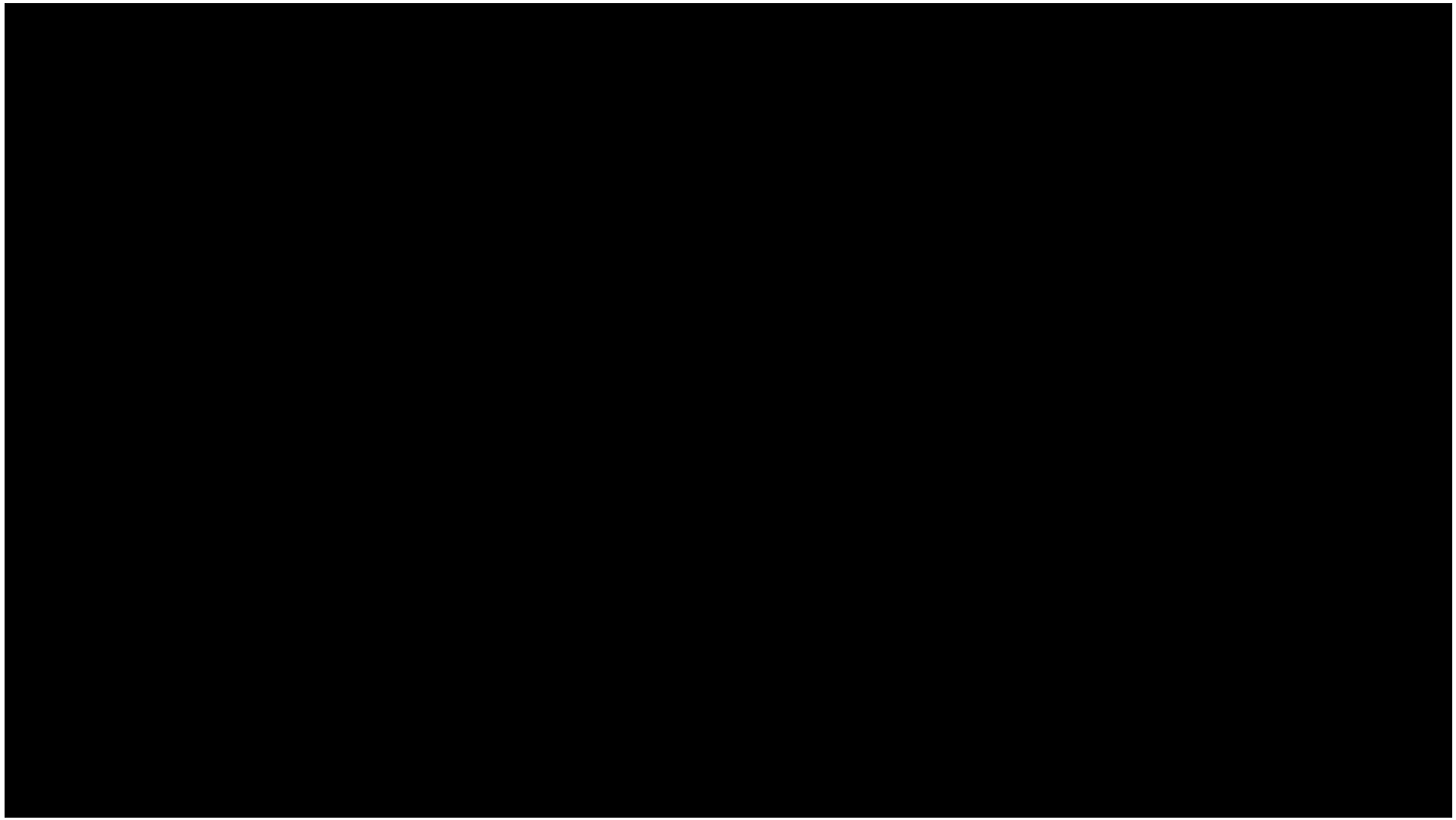

Peroxisome

Peroxisomes are bounded by a **single membrane** and have a single luminal compartment known as the ***matrix*.**

Unlike mitochondria and chloroplasts, peroxisomes **lack DNA and ribosomes**

Thus all peroxisomal proteins are encoded by nuclear genes, synthesized on ribosomes free in the cytosol, and then incorporated into preexisting or newly generated peroxisomes

The **size and enzyme composition of peroxisomes** vary considerably in different kinds of cells.

However, all peroxisomes contain enzymes that use molecular oxygen to oxidize various substrates, forming **hydrogen peroxide (H_2O_2).**

Catalase, a peroxisome-localized enzyme, efficiently decomposes H_2O_2 into H_2O.

Peroxisomes are most abundant in liver cells, where they constitute about 1 to 2 percent of the cell volume.

Priniciple site of synthesis of **plasmalogens**


2 H2O2
Catalase
2 H2O + O2