MADE WITH LOVE ❤️



BY ISHITA KHURANA

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MOBILE APP - ISHITA KHURANA

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Respiration.

phosphorylation → ATP production.
Energy → From oxidation of food.

Cellular respiration: At the level of cell
(Intracellular Breakdown of Food).

C-C
Breakdown.

↓
Energy. → (ATP).

Respiratory substrate: → produce Energy through oxidation.

↓
Carbs, Proteins, Fats, Organic Acids.

During oxidation within a cell, all the energy contained in respiratory substrates is not released free into the cell, or in a single step. It is released in a series of slow step-wise reactions controlled by enzymes, and it is trapped as chemical energy in the form of ATP. Hence, it is important to understand that the energy released by oxidation in respiration is not (or rather cannot be) used directly but is used to synthesise ATP,

ATP:- ENERGY CURRENCY.

DO PLANTS BREATHE?

No specialised organs.

STOMATA

and lenticels for this purpose. There are several reasons why plants can get along without respiratory organs. First, each plant part takes care of its own gas-exchange needs. There is very little transport of gases from one plant part to another. Second, plants do not present great demands for gas exchange. Roots, stems and leaves respire at rates far lower than animals do. Only during photosynthesis are large volumes of gases exchanged and, each leaf is well adapted to take care of its own needs during these periods. When cells photosynthesise, availability of O_2 is not a problem in these cells since O_2 is released within the cell. Third, the distance that gases must diffuse even in large, bulky plants is not great. Each living cell in a plant is located quite close to the surface of the plant.

Yes, they need O_2 and also give out CO_2

THICK, WOODY STEM?
↳ living cells
↓
Thin layers inside & beneath bark.
LENTICELS

Story of Respiration

$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O +$ Energy

Energy → Utilisation ?

Catabolised in such a way, not all energy liberated goes out as heat

Energy → ATP.

All Organisms Retain the Enzymatic Machinery,
↓
To partially oxidise Glucose without O_2

Glycolysis.

GLYCOLYSIS.

Glycos: sugar ‖ splitting

Site: Cytoplasm

* All living organisms.

Glycolysis. → partial oxidation.
→ Glucose → Pyruvic acid.
→ Gustv, Embden, Parnas.

Glycose + lysis.
sugar splitting.

EMP pathway

In Anaerobes → Respiration only by Glycosis.

Photosynthesis.
↳ Sucrose (end prt. of photosyn).
invertase → glucose + fructose. → 2 Pyruvic acid.

GLYCOLYSIS.

Glucose —Hexokinase (ATP → ADP + iP)→ Glu 6 Phos

Isomerase.

(6c) Fruc. 6. phosphate. (Ketone). ✓

Phospho fructo kinase (ATP → ADP + iP)

(6c) Fruc. 1.6 Biphos.

ALDOLASE

(3C) 3-PGAL ⇌ DHAP. (3C).

iP, 2NAD → 2NADH+H

2x 1,3 BisPGA

PHOSPHO glycerate kinase (2ADP + iP → 2ATP)

2x 3 PGA

2x 2 PGA

Enolase. → H_2O.

2x PEP.

Pyruvate Kinase (2ADP + iP → 2ATP)

2x pyruic Acid. (Aerobic) → Krebs Cycle

FERMENTATION

Pyruvic Acid.

Lactate dehydrogenase → Lactic Acid (2NADH+H+ → 2NAD+)

Pyruvate decarboxylase, Alcohol Dehydrogenase. → 2 ethanol + CO_2 (2NADH+H+ → 2NAD+)

- Lactic Acid: BACTERIA; muscles during exercise.
- 2 ethanol + CO_2: YEAST → Poison themselves to Death when conc^n of Alcohol Reaches 13%.

Less than 7% energy in glucose is released.

TRICARBOXYLIC ACID cycle

(TCA or Krebs cycle)

(4C) OAA —Acetyle CoA (2C)→ Citrate (6C) (+H_2O, −CoA)

Citrate (6C) —(H_2O)→ Cis aconitase —(H_2O)→ Iso aconitase

Iso aconitase —(NAD+ → NADH+H+)→ Oxalo-succinate (6C)

Oxalo-succinate —CO_2→ α-Keto gutarate (5C)

α-Keto gutarate —(NADH2 → NAD+)→ Succinyl CoA (4C) —CO_2

Succinyl CoA —(GTP → GDP)→ succinate

succinate —($FADH_2$ → FAD+)→ Fumerate

Fumerate —(H_2O)→ Malate

Malate —($NADH_2$ → NAD+)→ OAA

LINK RXN

Pyruvate (3C) — After entering Mitochondrial Matrix

- CoA →
- (Mg^{+2}, NAD+ → $NADH_2$) Pyruvate dehydrogenase
- Oxidative Decarboxyl^n. → CO_2

Acetyl CoA (2C)

Aerobic Respiration

Complete Oxd^n — P.A → Mitochondrial Matrix → $3CO_2$ Release

ETS & ATP Syn. ! → Inner mitochondrial memb.

↓ synthesis of ATP

Amphibolic Pathway

FATS → Fatty acid + Glycerol.

CARBOHYDRATE → Sugar eg. Glucose. → Glucos-6-phosphate → Fruct. 1,6-Biphosp → DHAP ⇌ PGAL

PROTIEN. → Amino acid.

Fatty acid + Glycerol. → A.CoA.

DHAP ⇌ PGAL → P.A. → A.CoA.

A.CoA. → Krebs cycle. → H_2O, CO_2

Respiratory Balance sheet.

Calculation.

	ATP	$NADH_2$	CO_2	Net
Glycolysis	2	$2 \times 3 = 6$	0	8.
Link exn	0	$2 \times 3 = 6$.	2	6.
Kreb.	2	$6 \times 3 = 18$	$2 \times 2 = 4$	24.
		$FADH_2 = 2$.		

38 ATP

Fermentation → Net gain = 2ATP for 1 glucose molecules.

NADH → NAD+

Slowly: Fermentation. Very vigorous!- Aerobic Respn.

ETS

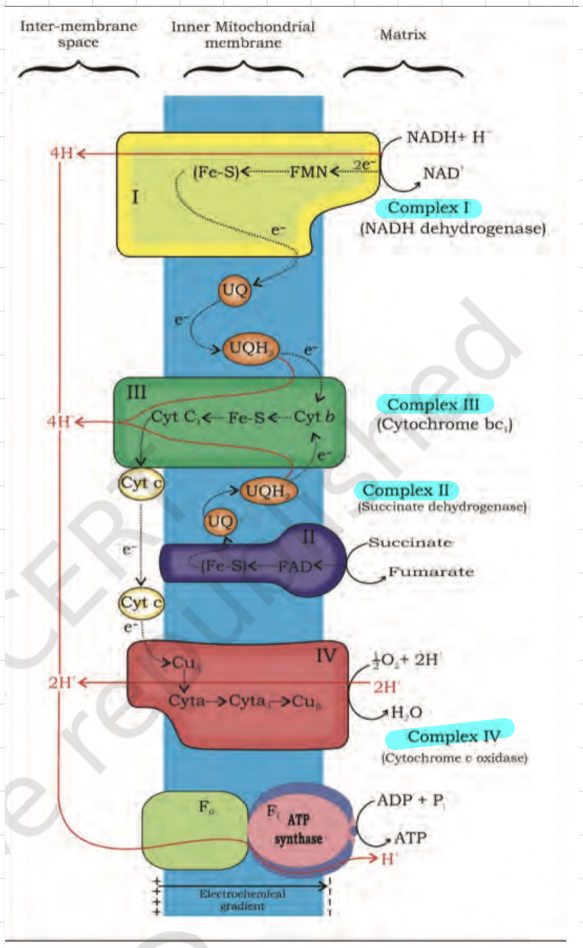


Figure 14.4 Electron Transport System (ETS)

- NADH + H+ & $FADH_2$ are oxidised.
  ⇓
  electrons passed to O_2.
  ⇓
  Formⁿ of H_2O.

Ubiquinone → Ubiquinol
↓
cyt bc_1 (C-III)
↓
cyt c (Mobile carrier)
↓
(cyt c oxidase) Complex-IV
e^- pass from one carrier to another
⇓
coupled with ATP synthase (complex-V)
⇓
For prodⁿ of ATP.

Oxidation of
1 NADH → 3ATP
1 $FADH_2$ → 2ATP

ROLE of O_2
- ↳ limited to terminal stage
- Vital — Presence of O_2
- Drives the whole process., by removing hydrogen.
- O_2 final acceptor of hydrogen.

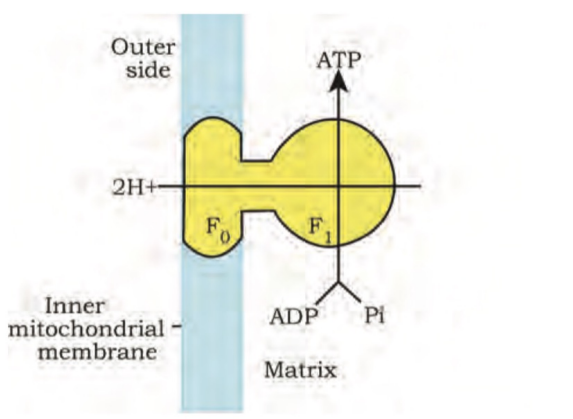
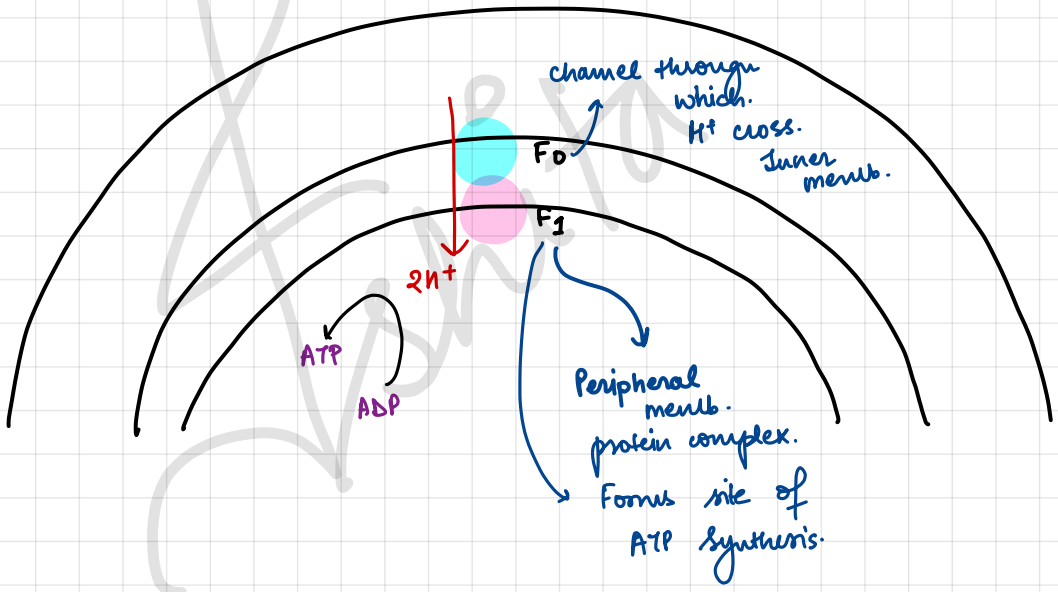


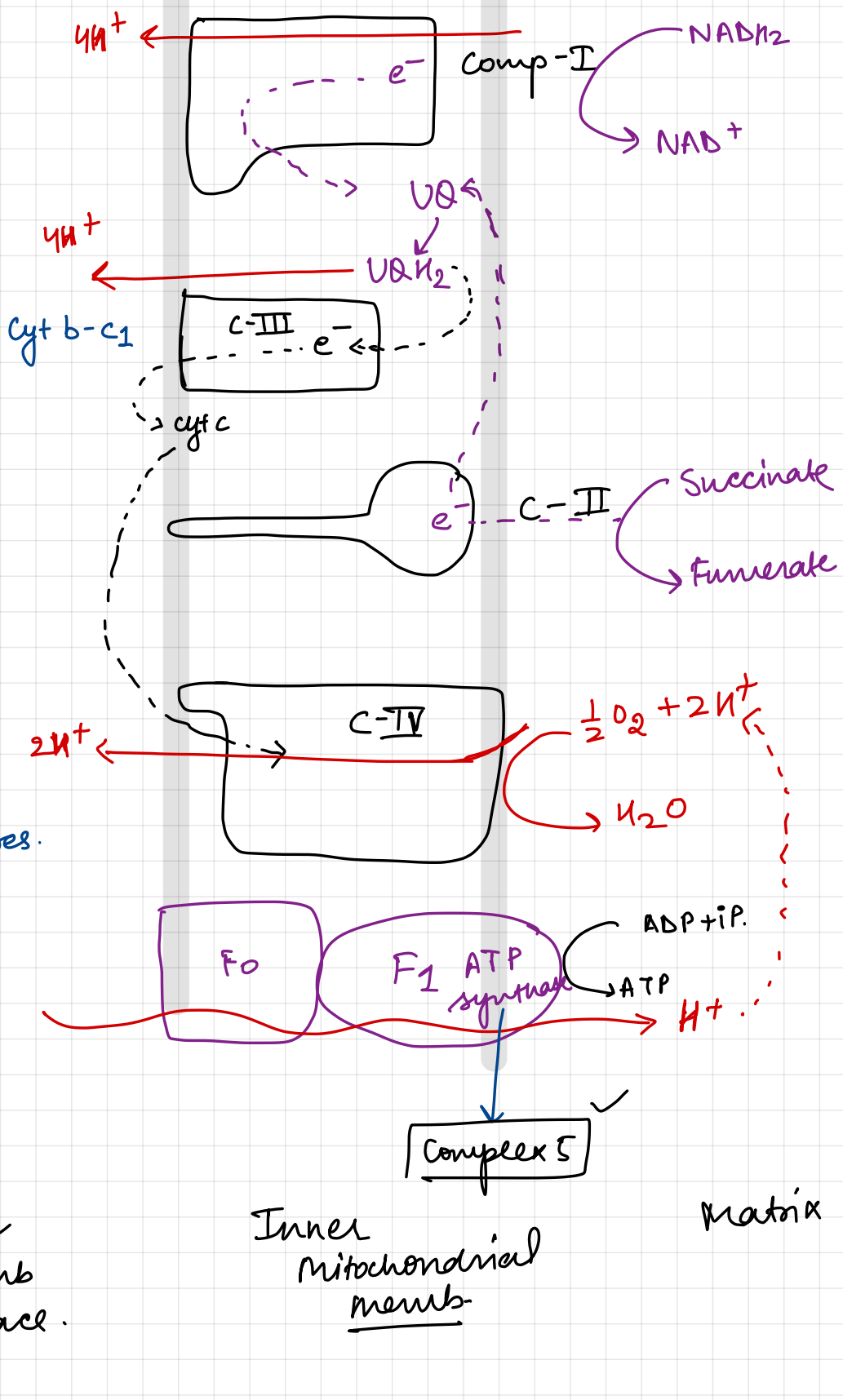
Figure 14.5 Diagramatic presentation of ATP synthesis in mitochondria



Complex 1 Complex 2
↓
UQ
↓
Complex 3 (bc_1)
↓
Cyt c
↓
Complex 4 (a-a3)
↳ has 2 Cu Centres.

F_1 → peripheral protein complex.
↳ site for synthesis of ATP.

Fo → Integral membr Protein Complex.



RESPIRATORY QUOTIENT

Respiratory Quotient:

$$RQ = \frac{\text{evolved } CO_2}{\text{consumed } O_2}$$

↳ depend on Type of substrate.

Carbs = 1

Fats < 1

(eg Tripalmitin = 0.7)

$$C_6H_{12}O_6 + 6CO_2 \longrightarrow 6CO_2$$

$6/6 = 1$.

Protein = about 0.9.

Fermentation = ∞

Organic Acid = >1

exception: Acetic acid = 1

Germinating seed < 1

Mature seed > 1

Ishita Khurana

DETAILED EXPLANATION

16 July 10 pm

LIVE on Youtube Channel - ISHITA KHURANA.