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Mcb 202 Assignment

- 1) Describe the mechanism of Aerobic respiration.

Answer

Aerobic respiration is defined as the process in which energy is produced in the body from food by using oxygen . It is an enzymatically controlled release of energy in a step-wise catabolic process of complete oxidation of organic food into carbon dioxide and water with oxygen acting as terminal oxidant. The common mechanism of aerobic respiration is also called “ **common pathway**” because its first step, called glycolysis is common to both aerobic and anaerobic modes of respiration.

The mechanism of aerobic respiration are as follows:

- 1) Glycolysis: It is also called EMP pathway because it was discovered by three German scientists:- Embden, Meyerhof and Parnas. Glycolysis is the process of breakdown of glucose or similar hexose sugar to molecules of pyruvic acid through a series of enzyme mediated reactions releasing some energy (as ATP) and reducing power (as NADH_2). It occurs in the cytoplasm and it takes place in the following sub steps:

- Phosphorylation- glucose is phosphorylated to glucose-6-phosphate by ATP in the presence of enzyme hexokinase.
- Isomerization- glucose-6-phosphate is changed to its former fructose -6-phosphate with the help of enzyme phosphohexose isomerase.
- Phosphorylation:- fructose-6-phosphate is further phosphorylated by means of ATP in presence of enzyme phosphofructokinase and Mg^{2+} . The product is fructose-1,6 diphosphate.
- Splitting- fructose-1,6-diphosphate splits up enzymatically to form one molecule each of 3-carbon compounds, glyceraldehyde 3-phosphate (= GAP or 3-phosphoglyceraldehyde = PGAL) and dihydroxy acetone 3-phosphate (DIHAP).
- Dehydrogenation and phosphorylation: In the presence of enzyme glyceraldehyde phosphate dehydrogenase ,glyceraldehyde 3-phosphate loses hydrogen to NAD to form $NADH_2$ and accept inorganic phosphate to form 1,3-diphosphoglyceric acid.
- Isomerization- 3-phosphoglyceric acid is changed to its isomer 2-phosphoglyceric acid by enzyme phosphoglyceromutase.
- Formation of ATP- direct synthesis of ATP from metabolites is called substrate level phosphorylation.

- Dehydration. Etc.

2) Krebs cycle- discovered by Hans Krebs (1937,1940 Nobel prize 1953). It occurs inside mitochondria. The cycle is also named as citric acid cycle or TCA cycle after the initial product Krebs cycle is step-wise oxidative and cyclic degradation of activated acetate derived from pyruvate. Krebs cycle moves two decarboxylations and four dehydrogenations. Some various components of Krebs cycle are as follows :

- Condensation
- Dehydration
- Hydration
- Dehydrogenation
- Decarboxylation
- Dehydrogenation and decarboxylation
- Formation of ATP/GTP
- Dehydrogenation
- Hydration
- Dehydrogenation. Etc.

3) Terminal oxidation- It is the name of oxidation found in aerobic respiration that occurs towards the end of catabolic process and involves the passage of both electrons and protons of reduced coenzymes to oxygen.

