CBSE TEST PAPER-01

CLASS - XI BIOLOGY (Respiration in Plants)

General Instruction:

- All questions are compulsory.
- Question No. 1 to 3 carry one marks each. Question No. 4 to 6 carry two marks each. Question No. 7 and 8 carry three marks each. Question No. 9 carry five marks..

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1. Define fermentation and aerobic respiration.

2. What are the different types of respiration occurs in plants?

3. Name the energy currency of the cells.

4. Define RQ. What is its value for fats?

5. What is the importance of F_0-F_1 particles in ATP production during aerobic Respiration?

6. What is oxidative decarboxylation? What happens to pyruvate immediately after this reaction?

7. Describe the mechanism of Respiration.

8. What are the various steps involved in glycolysis?

9. Describe the process and role of citric acid cycle in living organisms.

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[ANSWERS]

Ans 01. Fermentation is partial breakdown of glucose.
In Aerobic respiration glucose is completely degraded into CO_2 and H_2O.

Ans 02. Aerobic respiration and Anaerobic respiration.

Ans 03. ATP.

Ans 04. Respiratory Quotient (RQ) : The ratio of the volume of CO_2 evolved to the volume of O_2 consumed in respiration is termed as the respiratory quotient or respiratory ratio.

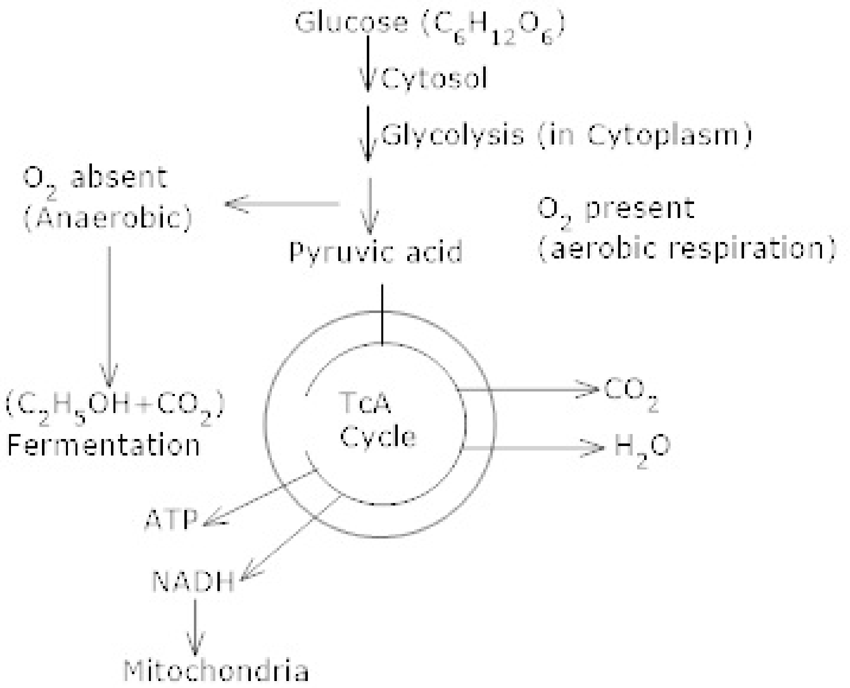
$$R.Q = \frac{\text{Volume of } CO_2 \text{ evolved}}{\text{Volume of } O_2 \text{ consumed}}$$

Its value for fats is less than one.

Ans 05. F_1 head piece contains the site for ATP synthesis from ADP and phosphate.
F_0 forms the channel through which protons cross the inner membrane.

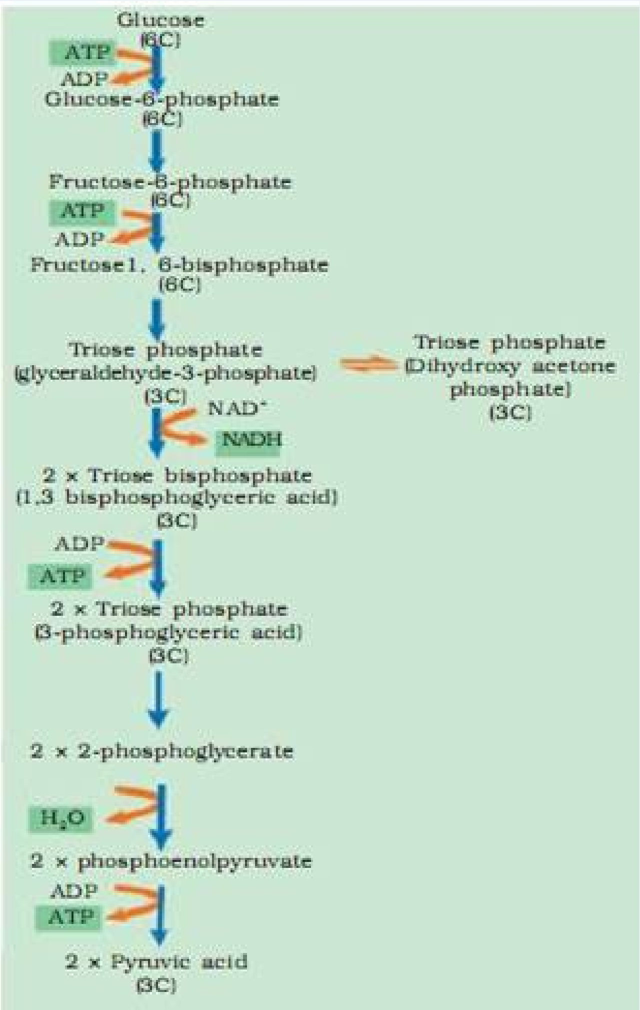
Ans 06. Oxidative decarboxylation – It is the process in which carbon is removed from a compound as carbon-dioxide and the compound is oxidized.
Pyruvate is oxidatively decarboxylated into 2C acetate unit, which joins coenzyme A (COA) to form acetyl CO – A.

Ans 07. Mechanism of respiration – Glucose molecule is broken down into an intermediate molecule, Pyruvic acid.
a) Breakdown of pyruvic acid in anaerobic respiration – In this process in absence of oxygen the pyruvic acid is incompletely reduced to ethyl alcohol.
Glucose → Ethyl alcohol + CO_2 + 2ATP
b) Breakdown of pyruvic acid in aerobic respiration – In this process the pyruvic acid is completely oxidized into carbon dioxide and water in the presence of oxygen. This process occurs in the mitochondria of the cell and is known as kreb's cycle.



The broad schene of respiration.

Ans 08. **Steps of Glycolysis –**



Ans 09. It is called “tricarboxylic acid cycle”. Following steps are present for completing this

cycle-

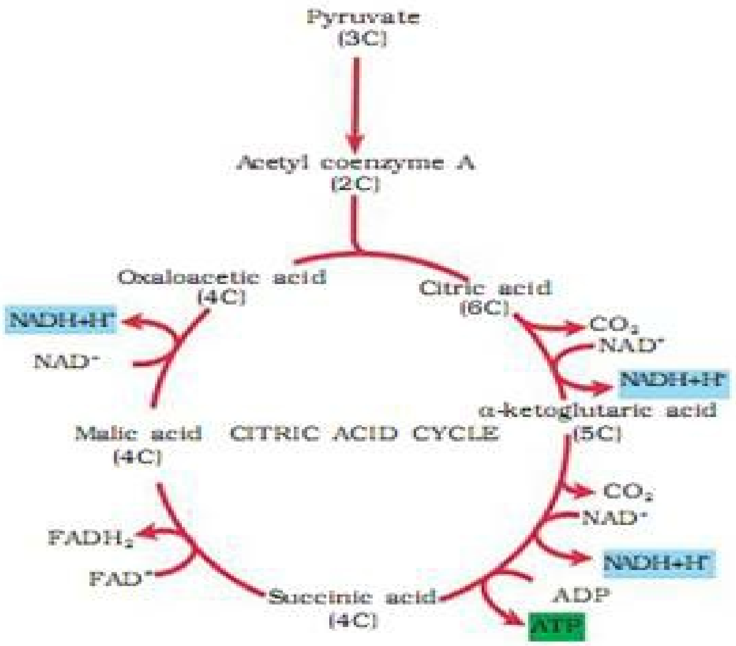


Figure 14.3 The Citric acid cycle

i) In this step, CO_2 is removed from pyruvic acid and resulting 2- carbon unit with the sulphur containing compound coenzyme A forming Acetyl CoA. During this process the hydrogen released is accepted by NAD and $NADH_2$ is produced.

Pyruvic acid +CoA + NAD → Acetyl CoA + NADH2 + CO_2

(ii) Acetyl coenzyme A reacts with a 4 – carbon compound oxaloacetic acid to form citric acid.

(iii) The citrate remains in equilibrium with cisaconitic acid and isocitric acid in the presence of the enzyme aconitase.

Citric acid → Isocitric acid.

(iv) Isocitrate is dehydrogenated in the presence of isocitrate dehydrogenase enzyme to form oxalosuccinate. The hydrogen released is accepted by NAD to form $NADH_2$.

Isocitric acid + NAD → Oxalosuccinate + $NADH_2$.

(v) A molecule of CO_2 is lost from oxalosuccinate and a 5 – carbon compound $\propto$–ketoglutaric acid is formed in the presence of decarboxylate enzyme.

(vi) $\propto$ – ketoglutarate loses a molecule of CO_2 and 4 – carbon compound succinyl CoA is formed.

$\propto$ – keloglutarate + CoA + NAD → succinyl + CoA + $NADH_2$ + CO_2

(vii) Succinyl CoA forms succinate, and ATP is found by linking ADP and inorganic phosphate (Pi)

Succinate CoA + ADP + Pi → Succinylate + CoA + ATP

(viii) Succinate is oxidized into fumarate in the presence of succinate dehydrogenase enzyme. The hydrogen liberated is accepted by FAD and $FADH_2$ is formed.

Succinate + FAD → Fumerate + $FADH_2$

(ix) In this step the fumarate is converted into malate in the presence of enzyme fumarate hydrase (fumarase)

Fumarate → Malate.

(x) Malate is changed into oxaloacetate in the presence of the enzyme malate denydrogenase. NAD is reduced to $NADH_2$ by the liberated hydrogen.

Thus oxaloacetic acid produced is ready to combine with the fresh acetyl CoA obtained from pyruvic acid for completing one cycle.

Net yield kreb's cycle :- 1 Pyruvic acid + 1ADP + 4NAD + 1FAD à3CO_2 + 1$FADH_2$ + 4$NADH_2$ + 1ATP

Thus total yield of energy

1ATP	= 1 ATP
3×4NADH2	= 12ATP
2×1FADH2	= 2ATP
Total	= 15 ATP

Thus 2 Pyruvic acid in ghycolysis yield, 15×2=30ATP.