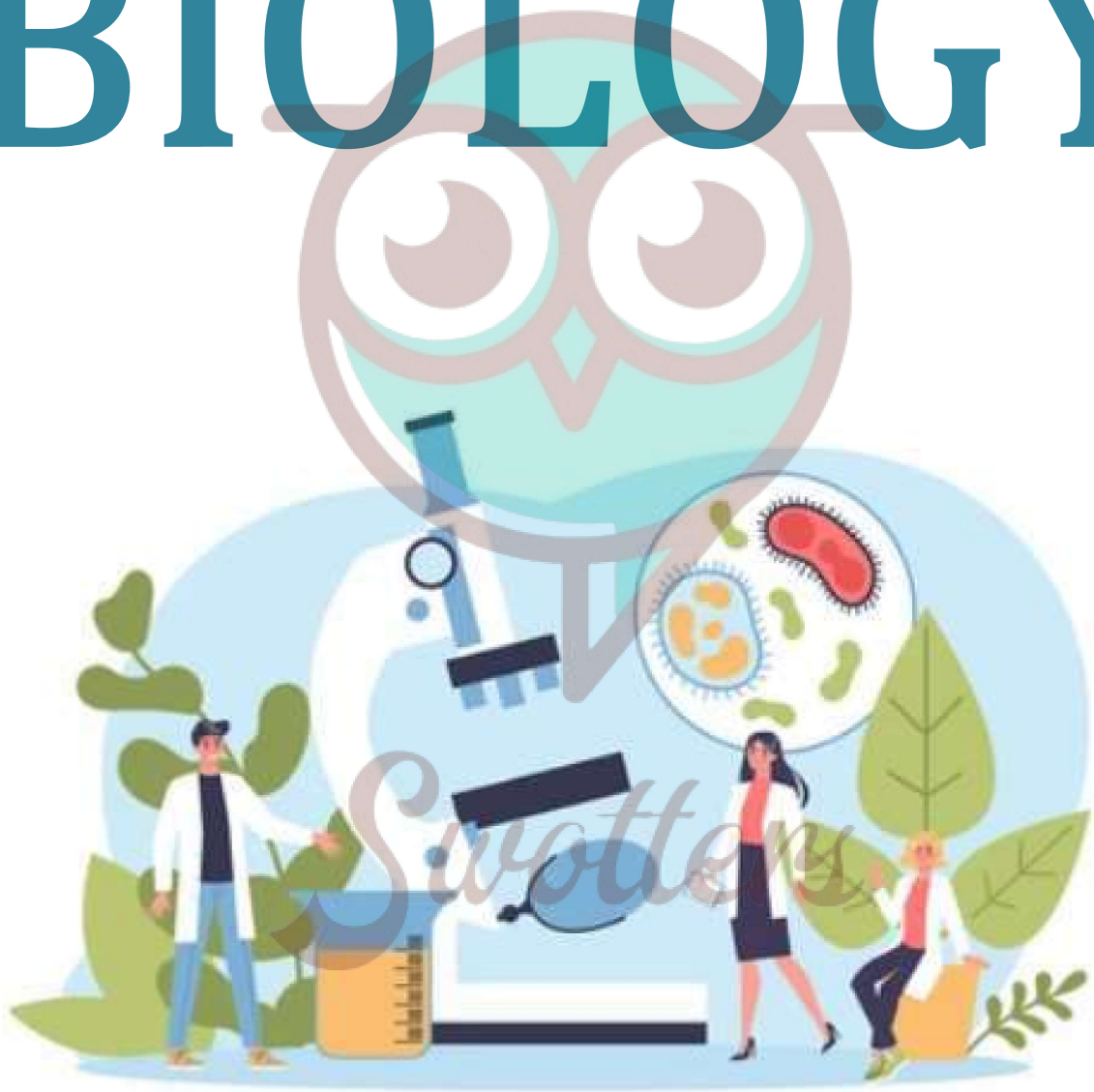


BIOLOGY



Important Questions

➤ Multiple Choice Questions:

Question 1. Major fraction of CO_2 released during cellular respiration is transported in blood through the lungs in the form of

- (a) Free CO_2
- (b) HCO_3
- (c) $\text{H}_2 \text{CO}_3$
- (d) In combination with Hb CO_2

Question 2. Sudden deep inspiration is due to

- (a) Increase in concentration of CO_2
- (b) Increase in concentration of O_2
- (c) Either increase in conc. of CO_2 or decrease in concentration of O_2
- (d) Decrease in concentration of CO_2

Question 3. Fixing of CO_2 and liberation of oxygen in light is done with the help of

- (a) chloroplast
- (b) Mesophyll cells
- (c) Mitochondria
- (d) Chromatophores

Question 4. AH vegetation is only due to

- (a) CO_2
- (b) Water
- (c) Oxygen
- (d) Hydrogen

Question 5. Chloroplast DNA or ct DNA is

- (a) Naked
- (b) Circular
- (c) Single stranded
- (d) All of these

Question 6. During synthesis of a glucose molecule, ATP and NADPH consumed are respectively

- (a) 15 and 12

- (b) 12 and 8
- (c) 30 and 20
- (d) 18 and 12

Question 7. Photorespiration takes place in

- (a) Lvsosomes
- (b) Peroxisomes
- (c) Ribosomes
- (d) Mitochondria

Question 8. Chlorophyll 'a' is found in all

- (a) Oxygen liberation photosynthetic organisms
- (b) Autotrophs
- (c) Higher plants
- (d) Algae

Question 9. The atmosphere contains CO₂ by volume

- (a) 0.1%
- (b) 0.5%
- (c) 0.03%
- (d) 0.3%

Question 10. Green plants convert solar energy into chemical energy of organic matter was proved by

- (a) Van Mayer
- (b) Lavoisier
- (c) Joseph Priestly
- (d) Semebier

Question 11. Wastage of energy is associated with

- (a) Glycolysis
- (b) Photosynthesis
- (c) Krebs cycle
- (d) Photorespiration

Question 12. If a photosynthesising plant releases oxygen containing more amount of ¹⁸O, it is concluded that the plant has been supplied with

- (a) ^{18}O from $^{18}\text{CO}_2$
- (b) ^{18}O from $^{18}\text{CO}_2$
- (c) ^{18}O from H_2^{18}O
- (d) None of these

Question 13. Carbon dioxide acceptor in C_3 plants is:

- (a) RuBP
- (b) RMP
- (c) PGA
- (d) PEP

Question 14. Photosynthetic process is completed in

- (a) Chloroplasts
- (b) Chlorophyll
- (c) Chromatophores
- (d) Mitochondria

Question 15. During synthesis of a glucose molecule, ATP and NADPH consumed are respectively

- (a) 12 and 8
- (b) 30 and 20
- (c) 15 and 12
- (d) 18 and 12

➤ **Fill In the Blanks:**

1. All the energy required for 'life' processes is obtained by oxidation of some macromolecules that we call
2. Green plants trap light energy and convert it into chemical energy that is stored in the bonds of carbohydrates like, and
3. Animals are i.e. they obtain food from plants directly (herbivores) or indirectly (carnivores).
4. The compounds that are oxidised during this process are known as
5., and respire at rates far lower than are characteristic for animals.
6. In stems, the '.....' cells are organised in thin layers in and beneath the bark.

➤ **True or False:**

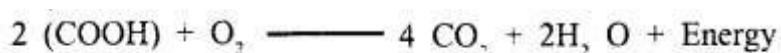
1. Saprophytes like fungi are dependent on green plant.
2. Usually carbohydrates are oxidised to release energy, but proteins, fats and even organic acids can be used as respiratory substances in some plants, under certain conditions.
3. Only during photosynthesis are large volumes of gases exchanged and each leaf is well adapted to take care of its own needs during these periods.
4. In stems, the 'living' cells are organised in thin layers in and beneath the bark. They also have openings called lenticels.
5. The combustion reaction requires carbon.
6. Sucrose is converted into glucose and fructose by the enzyme invertase, and these two monosaccharides can readily enter the glycolytic pathway.

➤ Very Short Question:

1. Whether respiration is a catabolic or anabolic process?
2. Name the cell organelle where cellular respiration takes place.
3. Give the chemical equation for aerobic respiration.
4. Name the substance that is oxidized during respiration.
5. What is fermentation?
6. What is the main source of energy?
7. In what form the energy released by oxidation is stored in the body?
8. Name two respiratory, mediums for living beings.
9. What is cell respiration?
10. What holds the energy in the body?

➤ Short Questions:

1. What is respiration?
2. Define aerobic respiration.
3. Define the process of fermentation showing chemical equation.
4. On what factor the respiratory quotient depends?
5. What is a citric acid cycle?
6. What will be the value of RQ when organic acids are used as respiratory substrate?



$$\text{RQ} = \frac{4 \text{ CO}_2}{1\text{O}_2} = 4$$

7. How many types of respiration occur in plants?
8. Describe the process of glycolysis and where it occurs.

➤ Long Questions:

1. Illustrate the mechanism of the electron transport system.
2. Describe the process and role of the citric acid cycle in living organisms.

Assertion Reason Question-

1. In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

- (a) If both Assertion and Reason are true and Reason is the correct explanation of Assertion.
- (b) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
- (c) If Assertion is true but Reason is false.
- (d) If both Assertion and Reason are false.

Assertion: Stomata are absent in submerged hydrophytes.

Reason: Respiration occurs by means of air chambers in submerged plants. [AIIMS 1997]

2. In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

- (a) If both Assertion and Reason are true and Reason is the correct explanation of Assertion.
- (b) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
- (c) If Assertion is true but Reason is false.
- (d) If both Assertion and Reason are false.

Assertion: Glycolysis is the first step of respiration in which glucose completely breaks into CO_2 and H_2O .

Reason: In this process, there is net gain of twenty four molecules of ATP. [AIIMS 2009]

✓ Answer Key-

➤ Multiple Choice Answers:

1. (c) H_2CO_3
2. (a) Increase in concentration of CO_2
3. (a) Chloroplast
4. (b) Water
5. (d) All of these
6. (d) 18 and 12

7. (b) Peroxisomes
8. (a) Oxygen liberation photosynthetic organisms
9. (c) 0.03 %
10. (a) Van Mayer
11. (d) Photorespiration
12. (c) ^{18}O from $\text{H}_2\ ^{18}\text{O}$
13. (a) RuBP
14. (a) Chloroplasts.
15. (d) 18 and 12

➤ **Fill In the Blanks:**

1. Food
2. glucose, sucrose, starch
3. heterotrophic
4. respiratory substrates
5. Root, stems, leaves
6. living

➤ **True or False:**

1. False
2. True
3. True
4. True
5. False
6. True

➤ **Very Short Answers:**

1. Answer: Catabolic (destructive)
2. Answer: Mitochondria
3. Answer: $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{H}_2\text{O} + 6\text{CO}_2 + 686 \text{ kcal.}$
4. Answer: Glucose
5. Answer: Respiration by microorganisms without the utilization of oxygen is called fermentation.



6. Answer: Carbohydrates, lipids, and proteins.
7. Answer: In the high-energy bonds of ATP molecules.
8. Answer: Air and water.
9. Answer: Enzymatic oxidation of food in body cells is known as cell respiration.
10. Answer: Molecules of food hold energy in their chemical bonds.

➤ Short Answer:

1. Answer: A process of physiochemical change by which environmental oxygen is taken in to oxidize the stored food or release CO₂, water, and energy. The energy released is used for doing various life activities, whereas CO₂ being is used by the plants for their growth and development.
2. Answer: The process of release of energy through intake of molecular oxygen and release of CO₂ is known as Aerobic respiration.
3. Answer: In this process, the carbohydrate is incompletely oxidized into some carbonic compounds such as ethyl alcohol, acetic acid, lactic acid, and CO₂. This process of oxygen being carried out in microbes is known as fermentation.



4. Answer: The ratio of the volume of CO₂ evolved to the volume of O₂ consumed in respiration is called the respiratory quotient

$$RQ = \frac{\text{Volume of CO}_2 \text{ evolved}}{\text{Volume of O}_2 \text{ consumed}}$$

RQ (the respiratory quotient) depends upon the type of respiratory substrate used during respiration. This is different for different substrates.

5. Answer: This is also known as the Tricarboxylic acid cycle. When acetyl CO- A enters into a reaction to form citric acid and how pyruvate is broken down during metabolism is highlighted by the concept of cycles. This series of reactions is known as the citric acid cycle.
6. Answer: Organic acids contain more oxygen than carbohydrates; therefore the RQ is more than one. Less amount of oxygen is required for their oxidation.
7. Answer: Depending upon the availability of oxygen, respiration is of two types.
 - Aerobic respiration
 - Anaerobic respiration.

Aerobic respiration: Complete oxidation of organic substances in presence of oxygen takes place.

Anaerobic respiration: This type of respiration takes place in the complete absence of

oxygen.

8. Answer: Glycolysis is the first stage of breakdown of glucose and common in all organisms. In anaerobic organisms, it is only the process of respiration. In this process, glucose undergoes partial oxidation. This process occurs in the cytoplasm of the cell.

➤ Long Answer:

1. Answer: The glucose molecule is completely oxidized by the end of the citric acid cycle. But the energy is not released unless NADH and FADH are oxidized through the electron transport system. Here oxidation means the removal of electrons from it.

The metabolic pathway through which the electron passes from one carrier to another is called the electron transport system (ETS) and it is operative in the inner mitochondrial membrane. Electrons from NADH produced in the mitochondrial matrix are oxidized by an NADH dehydrogenase (Complex I) and electrons are then transferred to ubiquinone.

The ubiquinone located within the inner membrane also receives reducing equivalents via FADH₂ which is generated during the oxidation of succinate, through the activity of the enzyme, succinate dehydrogenase (complex II). The reduced ubiquinone is then oxidized with the transfer of electrons to the cytochrome complex (Complex III).

Cytochrome is a small protein attached to the outer surface of the inner membrane and acts as a mobile carrier for the transfer of electrons between complex III and complex IV.

(Complex IV) is cytochrome.

When the electrons pass from one carrier to another via complex 1 to IV in the electron transport chain, they are coupled to ATP synthase (Complex V) for the production of ATP from ADP and inorganic phosphate. Oxidation of one molecule of NADH gives rise to 3 molecules of ATP, while that of one molecule of FADH₂, produces 2 molecules of ATP.

The electrons are earned by the cytochromes and recombine with their protons before the final stage when the hydrogen atom is accepted by oxygen to form water. Oxygen acts as the final hydrogen acceptor. The whole process by which oxygen allows the production of ATP by phosphorylation of ADP is called oxidative phosphorylation.

Note: There are two routes by which hydrogen from the substrate molecule passes. In route 1, 3 ATP molecules are formed for every pair of hydrogen atoms. In route 2, only 2 ATP molecules are formed from one pair of hydrogen atoms.

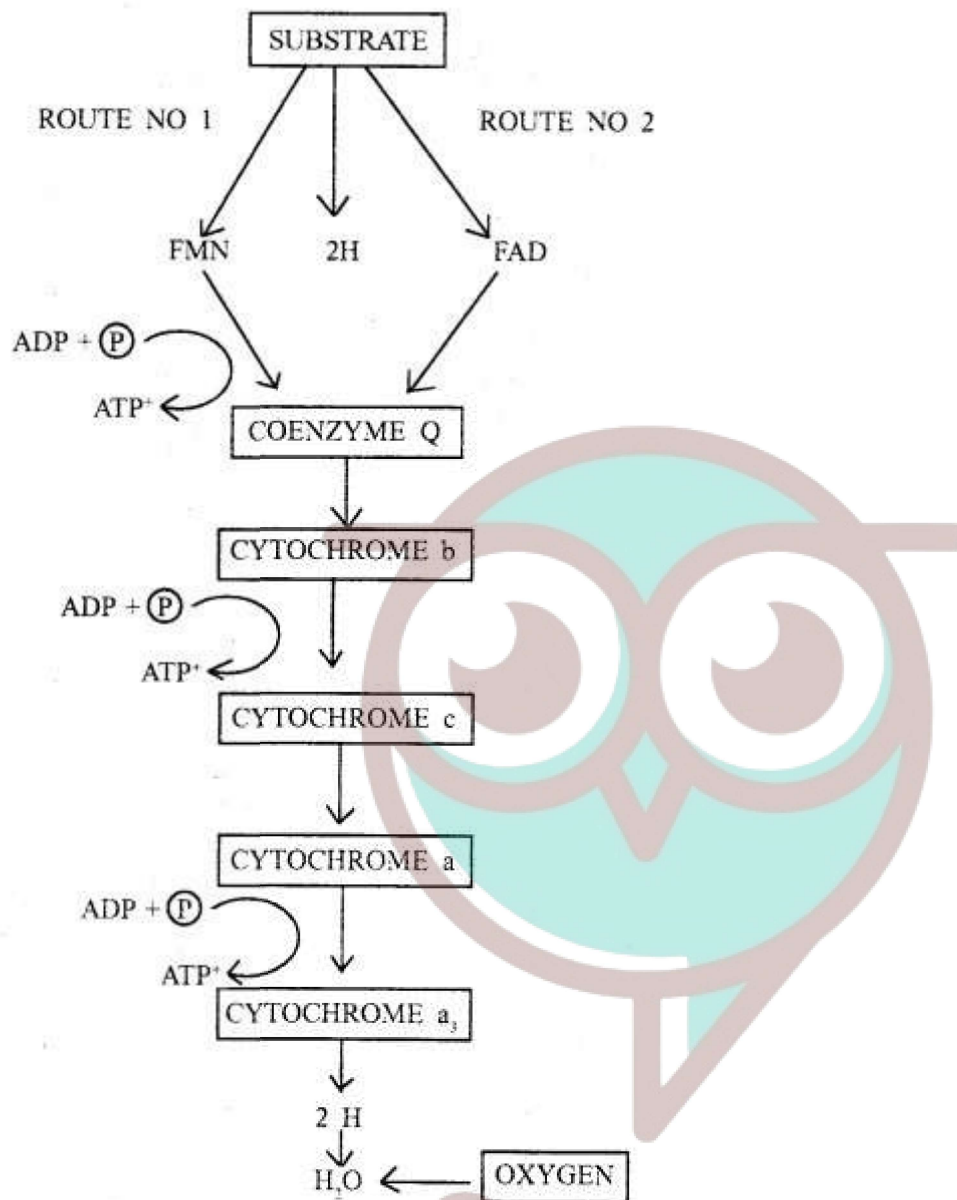
Oxygen acts as the final hydrogen acceptor and forms water.

NAD = nicotinamide adenine dinucleotide.

MN = flavin mononucleotide,

FAD = flavin adenine dinucleotide.

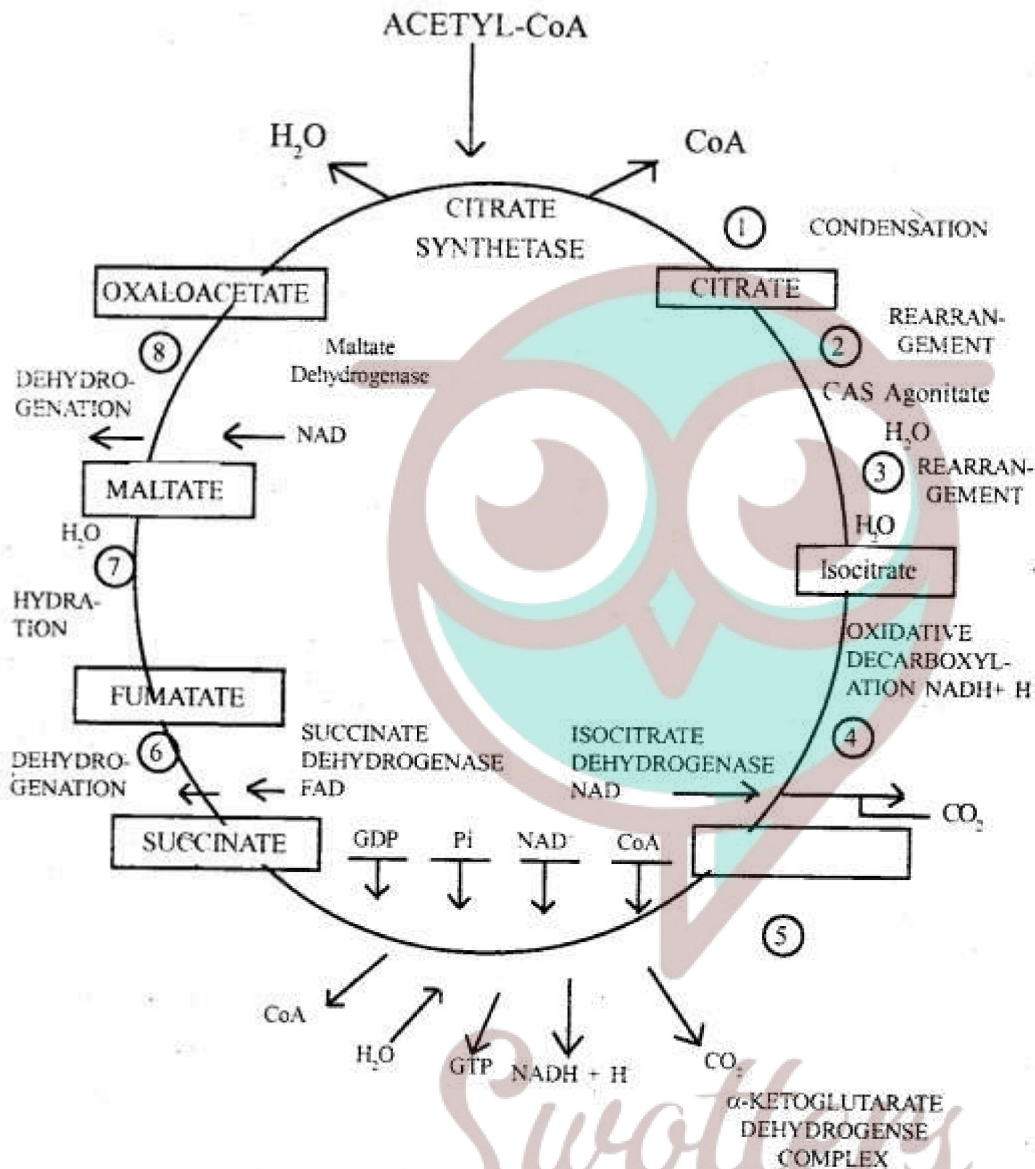
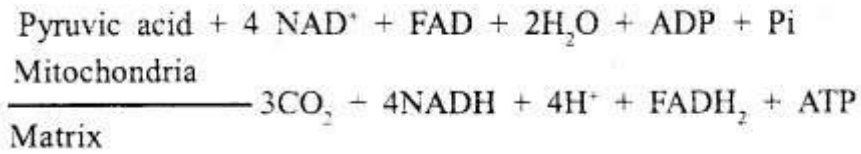
ETC produces 32 ATP molecules per glucose molecule and is the major source of cell energy.



Electron Transport Chain.

2. Answer: In the process of respiration, the carbohydrates are converted into pyruvic acid through series of enzymatic reactions. These reactions are known as glycolysis and take place in the cytosol. The pyruvic acid thus formed enters in mitochondria where O_2 and necessary enzymes are available; the pyruvic acid is finally converted into CO_2 and H_2O . This reaction series is known as Krebs Cycle or Citric acid cycle or Tricarboxylic acid (TCA) cycle.

During this cycle, 3 molecules of NAD and one molecule of FAD (Flavin Adenine Dinucleotide) are reduced to produce NADH and FADH respectively. NADH and FADH, so produced during the citric acid cycle are linked with the electron transport system and produce ATP by oxidative phosphorylation, The summary equation for this phase of respiration may therefore be written as follows:



Kreb's cycle. It follows glycolytic reactions shown in and pyruvate oxidation. It involves two processes

- i. removal of hydrogen and
- ii. the breaking off of carbon dioxide units one by one.

Assertion Reason Answer-

1. (b) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion

Explanation: Stomata are absent since gaseous exchange takes place through diffusion in submerged plants.

2. (d) If both Assertion and Reason are false.

Explanation: Glycolysis is the process of breakdown of glucose or similar hexose sugar into two molecules of pyruvic acid through a series of enzyme mediated reactions, releasing energy (ATP) and reducing power (NADH₂). It is the first step of respiration, which occurs inside the cytoplasm and is independent of O₂. In glycolysis, two molecules of ATP are consumed during double phosphorylation of glucose to form fructose 1, 6 diphosphate. Four molecules of ATP are produced in the conversion of 1, 3-diphosphoglycerate to 3-phosphoglycerate and phosphoenolpyruvate to pyruvate whereas, two molecules of NADH₂ are formed during oxidation of glyceraldehyde 3-phosphate to 1,3-diphosphoglycerate. Since, each NADH is equivalent to 3 ATP, so net gain in glycolysis is 8 ATP.



Swotters