

Class – 9

Sub. Biology

Chapter – 7

Respiration in plants

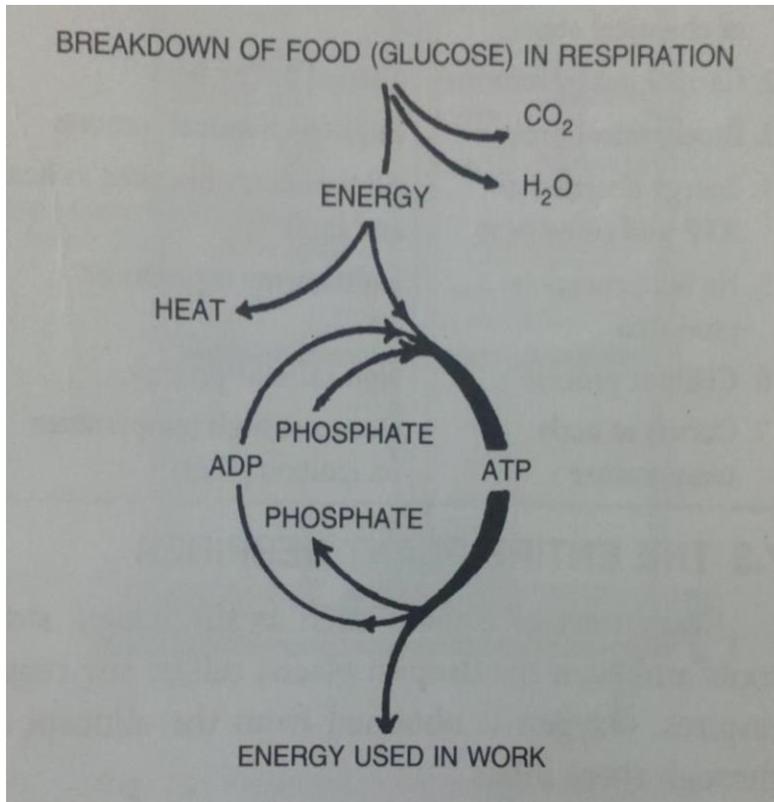
All living things get the energy they need to live from a chemical reaction called *Respiration*. This process needs glucose as a starting point.

Plant cells respire, just as animal cells do.

Plants respire all the time, whether it is dark or light.

Respiration:

The process which helps in releasing of energy from cells of the body is Respiration It is a catabolic process



Glycolysis

Glycolysis is the metabolic process that serves as the foundation for both aerobic and anaerobic cellular respiration. In glycolysis, glucose is converted into pyruvate. Glucose is a six-membered ring molecule found in the blood and is usually a result of the breakdown of carbohydrates into sugars.

Aerobic Respiration (oxybiotic respiration)

The breakdown of glucose in cells in the presence of oxygen is called aerobic respiration.

Here is the word equation for aerobic

respiration. Energy is put in brackets because it

not a substance: glucose + oxygen → carbon

dioxide + water (+ energy)

**Example: $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + ATP$
(energy currency of cell)**

ATP (Adenosine triphosphate) undergoes

hydrolysis to give adenosine diphosphate (ADP),

inorganic phosphorus, and energy.

One mole of glucose yields 38 molecules of ATP on complete oxidation.

Breakdown of glucose occurs in 2 major events which are controlled by enzymes.

Kreb's cycle or Citric acid cycle

It is a series of chemical reactions used by all aerobic organisms to release stored energy through the oxidation of acetyl-CoA derived from carbohydrates, fats and proteins into carbon dioxide and chemical energy in the form of adenosine triphosphate, (ATP.) In addition, the cycle provides precursors of certain amino acids as well as the reducing agent NADH that is used in numerous other

biochemical reactions. pyruvate \rightarrow CO₂ + 6H₂O

+ energy

Anaerobic Respiration (anoxybiotic respiration)

The breakdown of glucose in the absence of oxygen is called anaerobic respiration.

Sometimes, glucose undergoes incomplete oxidation to form ethanol and carbon dioxide and a lesser amount of energy is released. This is anaerobic respiration or fermentation. It may occur temporarily in plants and in our muscle cells when oxygen is not available. Some bacteria and fungi always show anaerobic respiration.

Here is the word equation for anaerobic respiration.

glucose → lactic acid (+ energy released)

Example: $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2 + 2ATP$

The process of anaerobic respiration results in the formation of alcohol (in plants) or lactic acid (in animals) along with the release of carbon dioxide and energy. Water is not released in this process. 2 ATP energy is released during anaerobic respiration.

Organisms that do not require the presence of oxygen for the process of respiration are called anaerobes.

Anaerobic respiration also happens in plant cells and some microorganisms and these organisms are called anaerobes. Anaerobic

respiration in yeast is used during brewing and bread-making:

glucose → ethanol + carbon dioxide



In muscle cells: Pyruvate → lactate + CO₂+H₂O.

Lactic builds up in the muscles may cause cramps and soreness.

Experiments :

Respiration in plants can be investigated by carrying out experiments to show the production of carbon dioxide and heat and consumption of oxygen.

The below-mentioned three experiments show respiration in plants:

Experiment to show Oxygen is used during respiration:

✦ **Put some germinating seeds in a conical flask. With the help of a thread suspend a small tube containing KOH in the flask.**

Through the hole of the cork, pass a glass tube bent twice at right angles. One end of the tube is in the flask while the other end is in the beaker filled with water. Make the apparatus airtight. Note the level of water in the tube.

Keep the apparatus for some time and note the position of water.

It is observed that water rises in the tube. The rise in the level of water is due to a partial vacuum created in the flask because the gas produced during respiration is absorbed by KOH.

This shows that germinating seeds produce CO₂ during aerobic respiration as KOH can absorb CO₂.

This is aerobic respiration as KOH can absorb CO₂ produced by seeds using air available.

Experiment to prove carbon dioxide is released during germination:

Gas produced in flask A turns lime water milky showing carbon dioxide has been produced.

Flask B does not turn lime water milky,

**showing the absence of carbon dioxide,
because of boiled seeds.**

**Experiment to show heat is evolved during
respiration:**

**The live seeds show an increase in the
temperature; boiled seeds do not show any
increase.**

**Living seeds respire and evolve heat while the
boiled seeds do not respire and do not evolve
heat.**