# GLYCOLYSIS.

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Q. Describe the breakdown of sugar in anaerobic respiration ? OR,
Describe degradation of carbohydrates up to pyruvic acid ?

Anaerobic respiration is the breakdown of complex carbon containing substances into simple substance with the release of energy in living cells in absence of $O_2$. Here organic compounds are broken down incompletely and it takes place in only a few micro-organism and if in higher plants it is for short duration.

In one of the most families type of anaerobic respiration, Ethyl alcohol and $O_2$ are produced. The most obvious differences from aerobic respiration are as follows -

1. It is of rare occurence.
2. It occurs for a temporary phase of life.
3. Energy is liberated in lesser quantity.
4. It is toxic to plants.
5. It occurs in absence of $O_2$.
6. Organic food are incompletely oxidised.
7. In anaerobic respiration the end product are ethyl alcohol & $CO_2$, lactic acid or acetic acid.

## MECHANISM OF ANAEROBIC BREAK DOWN OF SUGAR

The breakdown of sugar in ~~of~~ anaerobic

condition consists of the following stage.

1. Glycolysis.
2. Fermentation.

1. Glycolysis → Glycolysis is common to both aerobic and anaerobic modes of respiration. After this stage the fate of final products depends on presence of or absence of oxygen.

The process of glycolysis was worked out by 3 German scientists Embden, Mayerhoff & Paranas. Therefore it is named after them as Embden, Mayerhoff, Paranas or EMP pathway.

EMP pathway takes place in cytoplasm and it does not require atmospheric $O_2$. Here a molecule of hexose sugar, glucose or fructose is oxidised to form two molecules of pyruvic acid with the release of 4 atoms of hydrogen.

$$C_6H_{12}O_6 \longrightarrow 2CH_3COCOOH + 4[H].$$

The above breakdown take place in several steps. The steps are as follows :-

1. Phosphorylation of sugar.
2. Formation of GAP.
3. Oxidation of GAP.
4. Formation of Pyruvic acid.

① Phosphorylation of Sugar → In this step sugar are phosphorylated. Starch if present

is also phosphorylated. The reaction is mediated by phosphorylase ~~enz~~ enzymes. The products thus formed is glucose 1 phosphate. It is then converted in to glucose 6- phosphate.

STARCH + i.p $\xrightarrow{\text{phosphorylase}}$ Glucose + phosphate

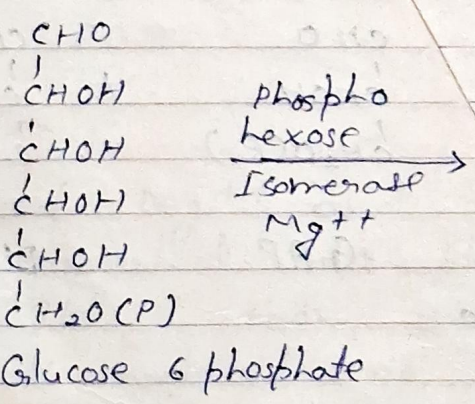
GLUCOSE + i.p $\xrightarrow{\text{phosphoglucomutase}}$ Glucose 6 phosphate

GLUCOSE + ATP $\xrightarrow[Mg^{++}]{\text{Hexokinase}}$ Glucose 6 phosphate + ADP.

Glucose 6 phosphate is then converted in to fructose 6 phosphate in presence of phosphohexose isomerase and $Mg^{++}$ Fructose if available is also converted into fructose 6 phosphate.

glucose 6 phosphate $\underset{\text{Isomerase}}{\overset{\text{Phospho hexose}}{\rightleftharpoons}}$ Fructose 6 phosphate

Fructose + ATP $\xrightarrow[Mg^{++}]{\text{Hexokinase}}$ Fructose 6 phosphate




Fructose 6 phosphate accepts another phosphate radical from ATP at carbon atom 1. This yields fructose 1, 6 diphosphate.