

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-organisms and if in higher plants it is for short duration.

In one of the families type of anaerobic respiration, Ethyl alcohol and CO_2 are produced. The main obvious differences from aerobic respiration are as follows -

1. It is of rare occurrence.
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 oxidized.
7. In anaerobic respiration the end products are ethyl alcohol & CO_2 , lactic acid or acetic acid.

MECHANISM OF ANAEROBIC BREAK DOWN OF SUGAR

The breakdown of sugar in anaerobic respiration is as follows -

condition consists of the following stages

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 or absence of oxygen.

The process of glycolysis was ~~correctly~~ worked out by 3 German scientists Embden, Meyerhoff & Paranas. Therefore it is named after them as Embden, Meyerhoff, 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.

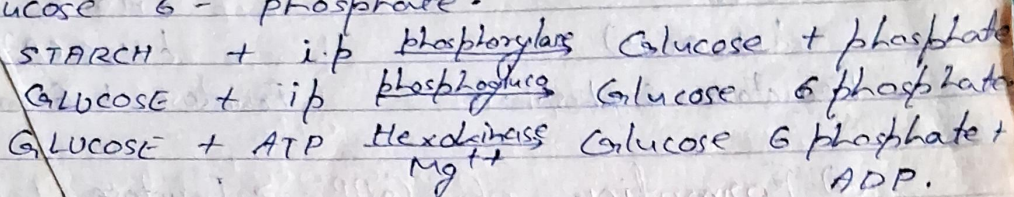
$$C_6H_{12}O_6 \longrightarrow 2CH_3COCOOH + 4[H]$$

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

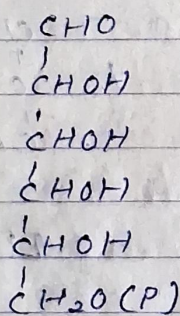
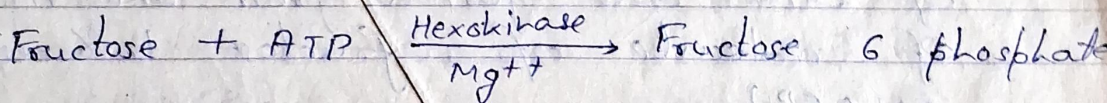
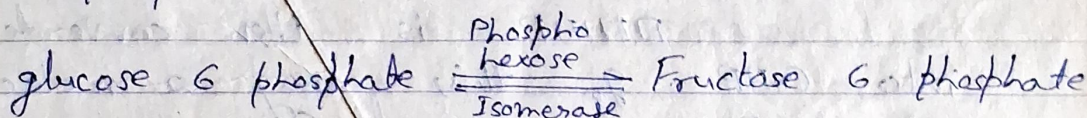
1. Phosphorylation of Sugar.
2. Formation of GAP.
3. Oxidation of GAP.
4. Formation of Pyruvic acid.

① Phosphorylation of Sugar → In this step sugars are phosphorylated. starch if present

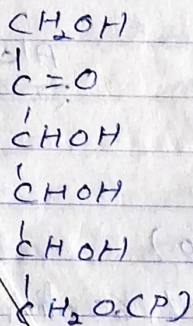
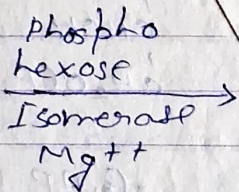
is also phosphorylated. The reaction is mediated by phosphorylase ~~and~~ enzymes. The product thus formed is glucose 1 phosphate. It is then converted into glucose 6-phosphate.



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



Glucose 6-phosphate



Fructose 6-phosphate

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