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QNo (1):- Define Dickens and Horecker's Pathway also explain irreversible phase of HMP pathway. Enlist the enzymes used in non-Oxidative phase of HMP Pathway.?

(ANS):-

Dickens and Honecker's Pathway

Dickens shunt - a secondary pathway for the oxidation of d-glucose (not occurring in skeletal muscle), generating reducing power in the cytoplasm outside the mitochondria and synthesizing pentoses and a few other sugars. Synonym(s): pentose phosphate pathway; Warburg-Lipmann-Dickens-Honecker shunt.

Pathway explain irreversible phase of HMP pathway.

The hexose monophosphate shunt, also known as the pentose phosphate pathway, is a unique pathway used to create products essential in the body for many reasons. The HMP shunt is an alternative pathway to glycolysis and is used to produce ribose-5-phosphate and nicotinamide adenine dinucleotide phosphate (NADPH). This pathway occurs in the oxidative and non-oxidative phases, each comprising a series of reactions. The HMP shunt also has significance in the medical world, as enzyme or co-factor deficiencies can have potentially fatal implications on the affected patients.

Function

The HMP shunt is parallel to the glycolysis pathway and takes place in the cytoplasm. A 6-carbon sugar, glucose, may enter the glycolytic pathway or enter the alternative HMP shunt depending on the cell's individual needs at the time. Once the glucose enters the HMP shunt, it undergoes a series of reactions, broken down into the oxidative(irreversible) and non-oxidative phases (reversible).

Enlist the enzymes used in non-Oxidative phase of HMP Pathway

The non-oxidative phase of the HMP shunt involves the conversion of ribulose-5-phosphate to ribose-5-phosphate (R-5-P) through a series of independent reactions. It is important to note that no NADPH molecules get created in this part of the HMP shunt. R-5-P in this reaction can be returned to the glycolytic pathway as fructose-6-phosphate. This step requires the transketolase enzyme with the presence of the thiamine co-factor. Thiamine also participates in a plethora of other metabolic reactions throughout the body. It is used by enzyme alpha-ketoglutarate in the Krebs cycle, for the enzyme pyruvate dehydrogenase as well as branch-chained ketoacid dehydrogenase.

Q2: What are the steps and enzymes involved in Glycolysis ?

(ANS):-.

Glycolysis (Embden Meyerhof Pathway):

Glycolysis takes place in the cytosol of the cells.

Glucose enters the Glycolysis pathway by conversion into glucose-6-phosphate.

Step 1: Hexokinase Enzyme:

Glucose + ATP Glucose-6-phosphate + ADP

Mg++ interacts with negatively charged phosphate oxygen atoms, providing charge compensation and promoting a favorable conformation of ATP at active site of the Hexokinase enzyme.

The reaction catalyzed by hexokinase is highly spontaneous.

Step 2: Phosphoglucose Isomerase Enzyme:

Glucose-6-phosphate Fructose-6-phosphate

Step 3: Phosphofructokinase Enzyme:

Fructose-6-phosphate + ATP Fructose-1,6-biphosphate +ADP

Step 4: Aldolase Enzyme:

Fructose-1,6-biphosphate Dihydroxyacetone-P+Glyceraldehyde-3-P

The reaction is an aldol cleavage, the reverse of an aldol condensation.

Step 5: Triose Phosphate Isomerase Enzyme:
Dihydroxyacetone-Phosphate Glyceraldehyde-3-Phosphate
Step 6:Glyceraldehyde-3-Phosphate Dehydrogenase Enzyme:
Glyceraldehyde-3-P+NAD+Pi 1,3 biphosphoglycerate+NADH+H
Step 7: Phosphoglycerate kinase enzyme :
1,3 biphosphoglycerate+ADP 3-Phosphoglycerate+ATP
Step 8:Phosphoglycerate Mutase:
3-Phosphoglycerate 2-Phosphoglycerate
Step 9: Enolase enzyme:
2-phosphoglycerate phosphoenolpyruvate+H2O This dehydration reaction is mg++ dependent.
Step 10: Pyruvate Kinase enzyme:
Phosphoenolpyruvate + ADP Pyruvate +ATP
Removal of Pi from PEP yields an unstable enol,which spontaneously converts to the keto form of pyruvate.

QNO(3):-Discuss digestion and absorption of Carbohydrates.?
(ANS):-
Absorption and Digestion of carbohydrates:
CHO taken in diet are polysaccharides, disaccharides and monosaccharides
These are supplied from external sources, hence called exogenous CHO
These may be digestible or indigestible
Digestion of CHO takes place in; mouth, stomach and intestine, and absorption form small intestine
Mouth:
At slightly acidic pH amyalse (ptyalin) acts on starch , which is converted into maltose and isomaltose
The enzyme get inactivated in stomach
2(C6H13O3)n + nH2O nC12H22O11 starch maltose and isomaltose
Stomach:
• HCl can cause hydrolysis of starch into maltose and isomaltose and that of maltose to glucose but the reaction is of little significance inside stomach
Small intestine:
In small intestine pancreatic amylase converts 87% starch to maltose and isomaltose and 13 % glucose
(C6H12O6)n + nH2O nC6H12O6

QNo(4):- Explain step by step the Tricarboxylic acid cycle.?
(ANS):-
Krebs Cycle:
The citric acid cycle is also known as the Tricarboxylic acid cycle (TAC) or krebs cycle.The krebs cycle 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 adenosine triphosphate(ATP) and carbon dioxide.In addition.the cycle provides precursors of certain amino acids,as well as the reducing agent NADH, that are used in numerous other reactions.Its central important to many biochemical pathways suggests that it was one of the earliest established components of cellular metabolism and may have originated abiogenically.
In eukaryotic cells, the citric acid cycle occurs in the matrix of the mitochondrion.
Step of the Krebs Cycle:
Step 1: First the Acetyl CoA (a 2 carbon molecule) joins with oxaloacetate(4
carbon molecule) to form citrate (6 carbon molecules).
Step 2:The citrate is the converted to isocitrate (isomer of citrate).
Step 3: Isocitrate is then oxidized to alpha-ketoglutarate(a 5 carbon molecules)which results in the release of carbon dioxide.One NADH molecule is also formed in this step.The enzyme responsible for catalyzing this step is isocitrate dehydrogenase.
Step 4: Here alpha-ketoglutarate is oxidized to form a 4 carbon molecule which pick up coenzyme A forming succinyl CoA.This conversion also forms a NADH molecule.

Step 5: Succinyl CoA is then converted to succinate (4 carbon molecules) and one GTP molecule is produced.
Step 6: Succinate is converted into fumarate(4 carbon molecule) and a molecule of FADH2 is produced.
Step 7: fumarate is converted to malate (another 4 carbon molecules).
Step 8: Malate is converted into oxaloacetate and NADH is also produced her

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QNo(5):- Differentiate between fat and oil also explain “solid fat is beneficial for health or oil”.?
(ANS):-
The differences between fats and oils are as follows.

Fats:
Fats are solid at room temperature.
Fats are usually derived from animals.
The melting point of fats is higher.
Fats contain more proportional of saturated Fathy acid .

Oils:
Oils are liquid at room temperature.
Oils are derived from plants.
Oils contain more proportion of unsaturated fathy acids.
The melting point of oil is lower than fats.

Benefit of solid fats for health:
Fat are an essential part of our diet and is important for good health. There are different types of fats, with some fats being healthier than others. To help make sure you stay healthy, it is important to eat unsaturated fats in small amounts as part of a balanced diet.
Saturated fats
Eating greater amounts of saturated fat is linked with an increased risk of heart disease and high blood cholesterol levels. These fats are usually solid at room temperature and are found in:
Animal-based products:
Dairy foods – such as butter, cream, full fat milk and cheese
Meat – such as fatty cuts of beef, pork and lamb and chicken (especially chicken skin), processed meats like salami, Some plant-derived products:
Palm oil
Coconut
Coconut milk and cream
Cooking margarine

Unsaturated fats
Unsaturated fats are an important part of a healthy diet. These fats help reduce the risk of heart disease and lower cholesterol levels (among other health benefits) when they replace saturated fats in the diet.
There are two main types of unsaturated fats:
Polyunsaturated fats:
omega-3 fats which are found in fish, especially oily fish
omega-6 fats which are found in some oils such as safflower and soybean oil, along with some nuts, including brazil nuts.
Monounsaturated fats:
found in olive and canola oil, avocados and some nuts, such as cashews and almonds.

Trans fats
Trans fats are unsaturated fats that have been processed and as a result, behave like saturated fats. Eating trans fats increases the levels of ‘bad’ cholesterol and decreases the levels of ‘good’ cholesterol in the body which is a major risk factor for heart disease. It is important to lower the

amounts of trans fats you eat to help you stay healthy.
Trans fats are found in many packaged foods and also in butter and some margarines. Use food labels to compare foods and choose those with fewer trans fats.
It is great for health to replace saturated and trans fats with mono and polyunsaturated fats.

Cholesterol
Cholesterol is a type of fat found in food, but also in our blood. Cholesterol has many important functions in the body but having high levels of the wrong type of cholesterol in the blood increases heart disease risk.
It was once thought that eating too many cholesterol-containing foods (such as eggs) was the major dietary cause of high blood cholesterol level. But we now know that eating too many foods containing higher amounts of saturated and trans fats is a bigger problem and has a much greater influence on blood cholesterol levels.

(THE END)