

RAMSADAY COLLEGE, AMTA



AVIRUP CHAKROBORTY

HEXOSE MONOPHOSPHATE SHUNT

OR

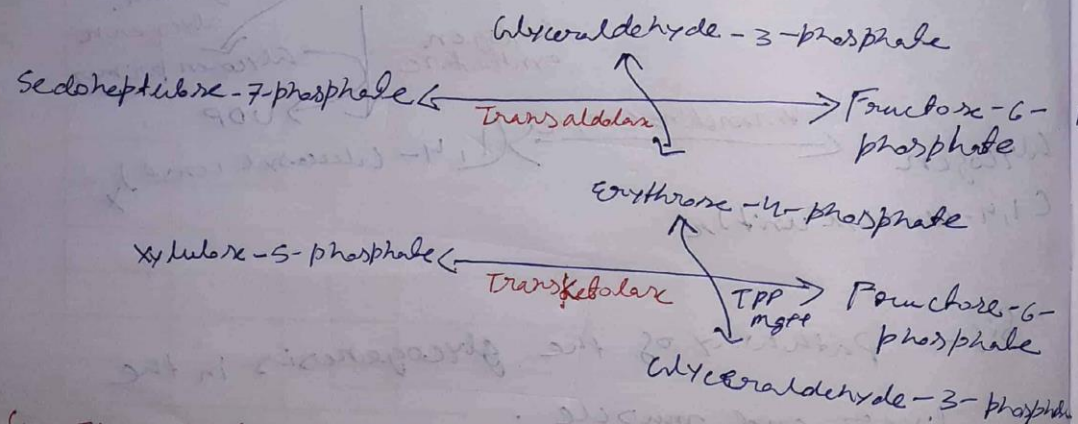
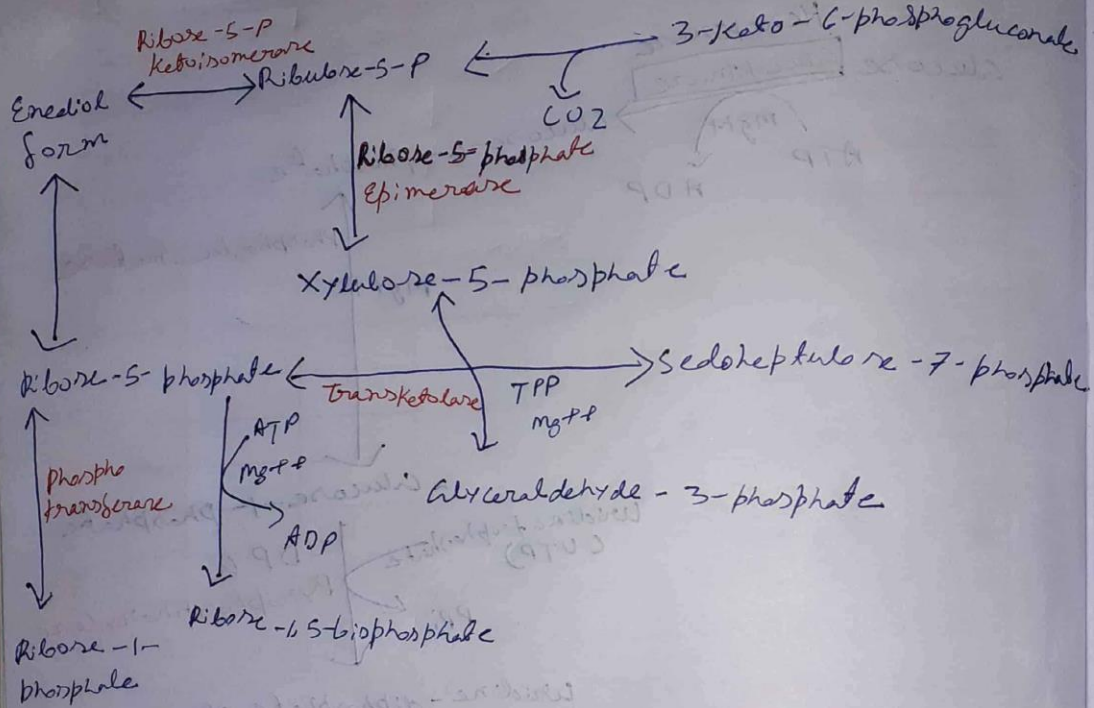
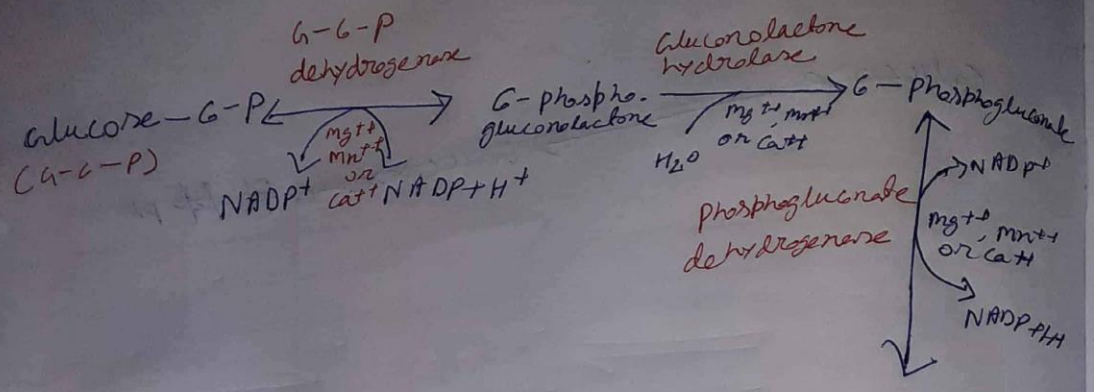
PENTOSE PHOSPHATE PATHWAY

This is an alternate aerobic pathway for the oxidation of glucose in the liver, lactating mammary gland and adipose tissue in addition to the EMBDEN-MEYERHOF pathway for glycolysis.

The enzymes of this pathway are present in the extramitochondrial portion of the cell.

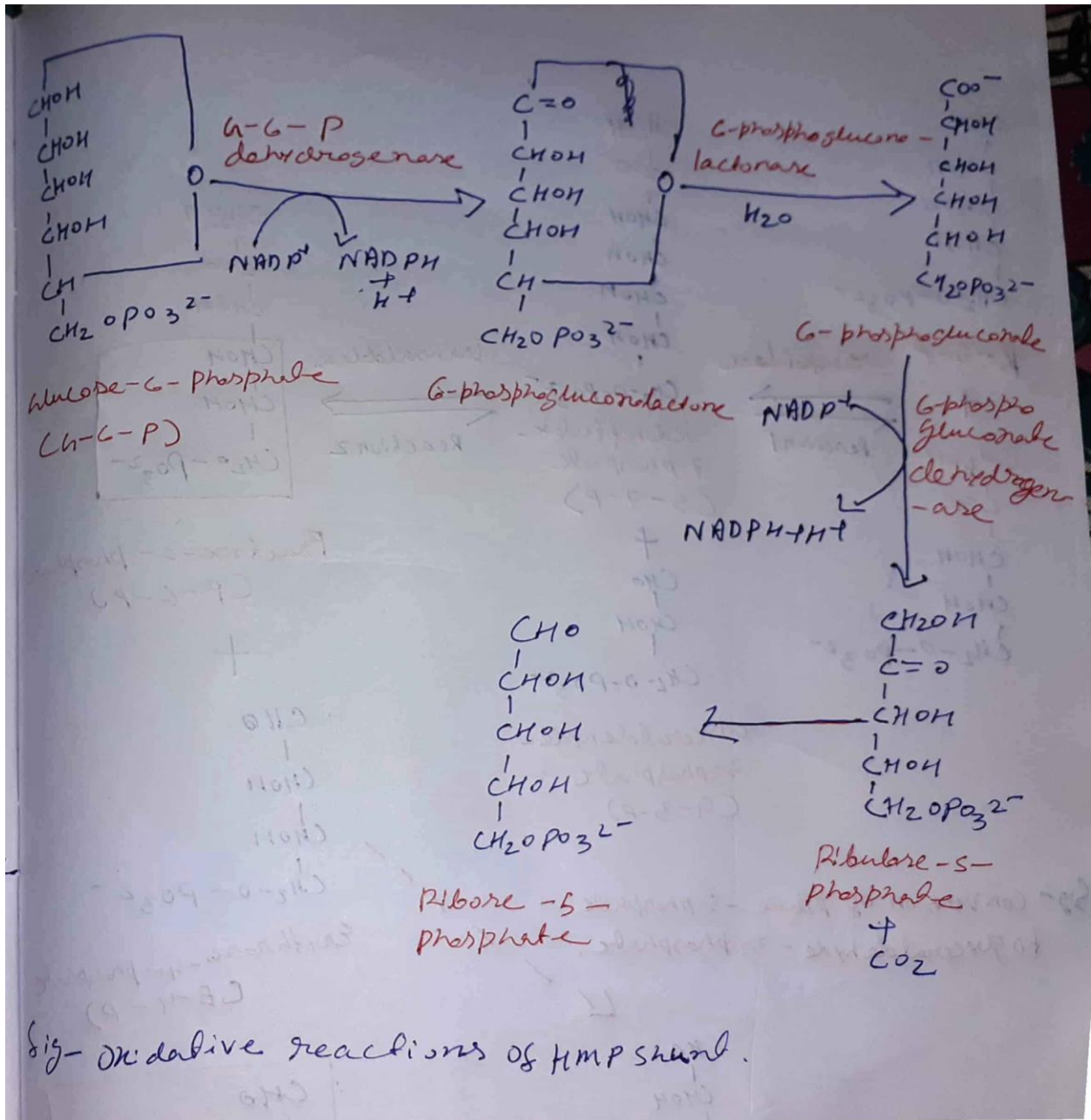
In this pathway 3 molecules of Glucose -6-phosphate yield 3 molecules of CO_2 and 3 molecules of pentose sugars. The latter are converted ultimately to 2 molecules of glucose-6-phosphate and one molecule of glyceraldehydes-3-phosphate.

Metabolic reactions



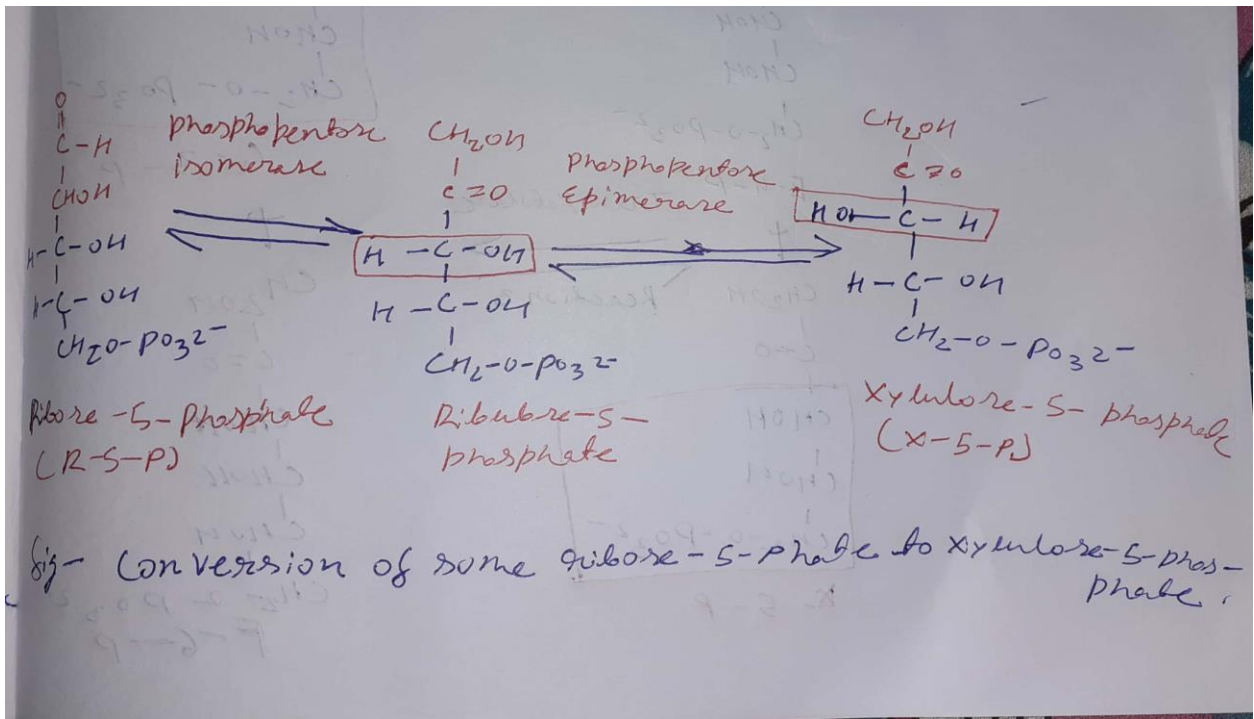
Sig-Flow chart of the HMP Shunt, -
 From AC Deb, Fundamentals of Bio Chemistry

In the first part, glucose-6-phosphate by dehydrogenation and decarboxylation gives rise to ribulose-5-phosphate.

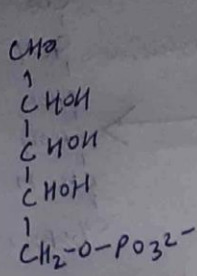


Oxidative section produces equal amounts of ribose-5-phosphate and NADPH. The rate-limiting step is the first reaction, that of oxidation of glucose-6-phosphate to 6-phosphogluconolactone. The rate of this reaction is tightly coupled to the level of NADP^+ .

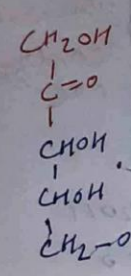
In the second part, ribose-5-phosphate is converted to glyceraldehyde -3-phosphate. Glyceraldehyde -3-phosphate is converted to glucose-6-phosphate by gluconeogenesis reaction.



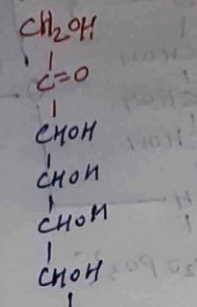
Avirup Chakraborty



R-5-P Transketolase



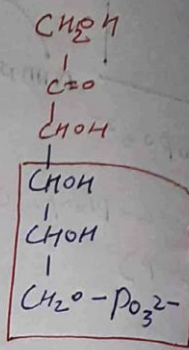
Reaction 1



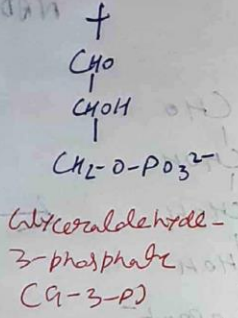
Sedoheptulose-7-phosphate (S-7-P)

Transaldolase

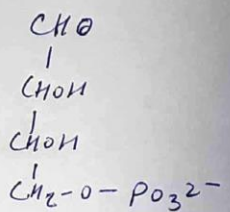
Reaction 2



Fructose-6-phosphate (F-6-P)

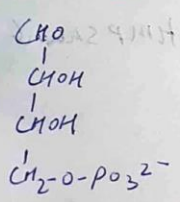


Glyceraldehyde-3-phosphate (G-3-P)



Erythrose-4-phosphate (E-4-P)

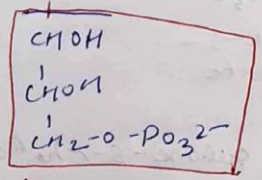
Step - Conversion of Ribose-5-phosphate to glyceraldehyde-3-phosphate.



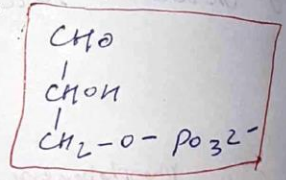
E-4-P

Transketolase

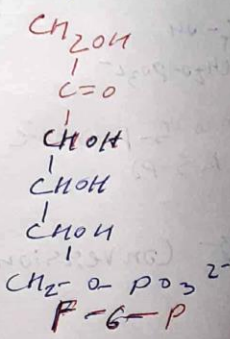
Reaction 3



X-5-P



G-3-P



F-6-P

Significance

1. It supplies ribose-5-phosphate (a pentose sugar) for nucleotide and nucleic acid synthesis. Ribose is also a component of coenzymes NAD and FAD.
2. It supplies NADPH for fat and other reductive syntheses.
3. It provides a route for excess pentose sugars in the diet to be brought into the mainstream of glucose metabolism.
4. CO_2 is the characteristic product in this pathway . this product is utilized for synthesis of fatty acids and purine bases etc.

Reference

1. Fundamentals of Biochemistry; A.C.Deb
2. Biochemistry and Molecular Biology; William H.Elliott & Daphne C. Elliott

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