## Minor metabolic pathways →
- HMP shunt pathway
- fructose metabolism
- Galactose metabolism

## (1) HMP shunt pathway:

- also known as pentose phosphate pathway.
- occurs in cytoplasm.
- Starting substrate is g-6-P.
- generate NADPH & Riboses but NO ATP.

# Glucose-6-phosphate dehydrogenase.

produce NADPH.

G-6-P $\xrightarrow{\text{G-6-PD}}$ G-P

Also called as. ✓

- pentose phosphate pathway or.
- phosphogluconate pathway or.
- Dickens - Horecker pathway.

(1) metabolic pathway parallel to glycolysis.

(2) for most organisms, this pathway take place in cytosol.

- Two distinct phase → oxidative.
  → Non-oxidative.

Result of oxidative phase.

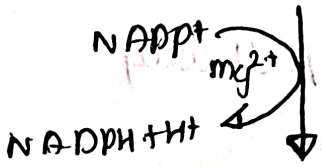
- production of 2 molecules of NADPH,
  1 molecule of pentose phosphate.
  1 molecule $CO_2$.

- In Non-oxidative: pentose phosphate is converted to Intermediate of glycolysis.

HMP shunt pathway

Oxidative phase.

Glucose-6-phosphate

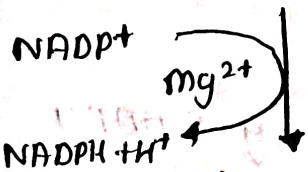



G6P dehydrogenase.

6-phosphogluconolactone

Gluconolactone hydrolase.

6 phosphogluconate




phosphogluconate dehydrogenase.

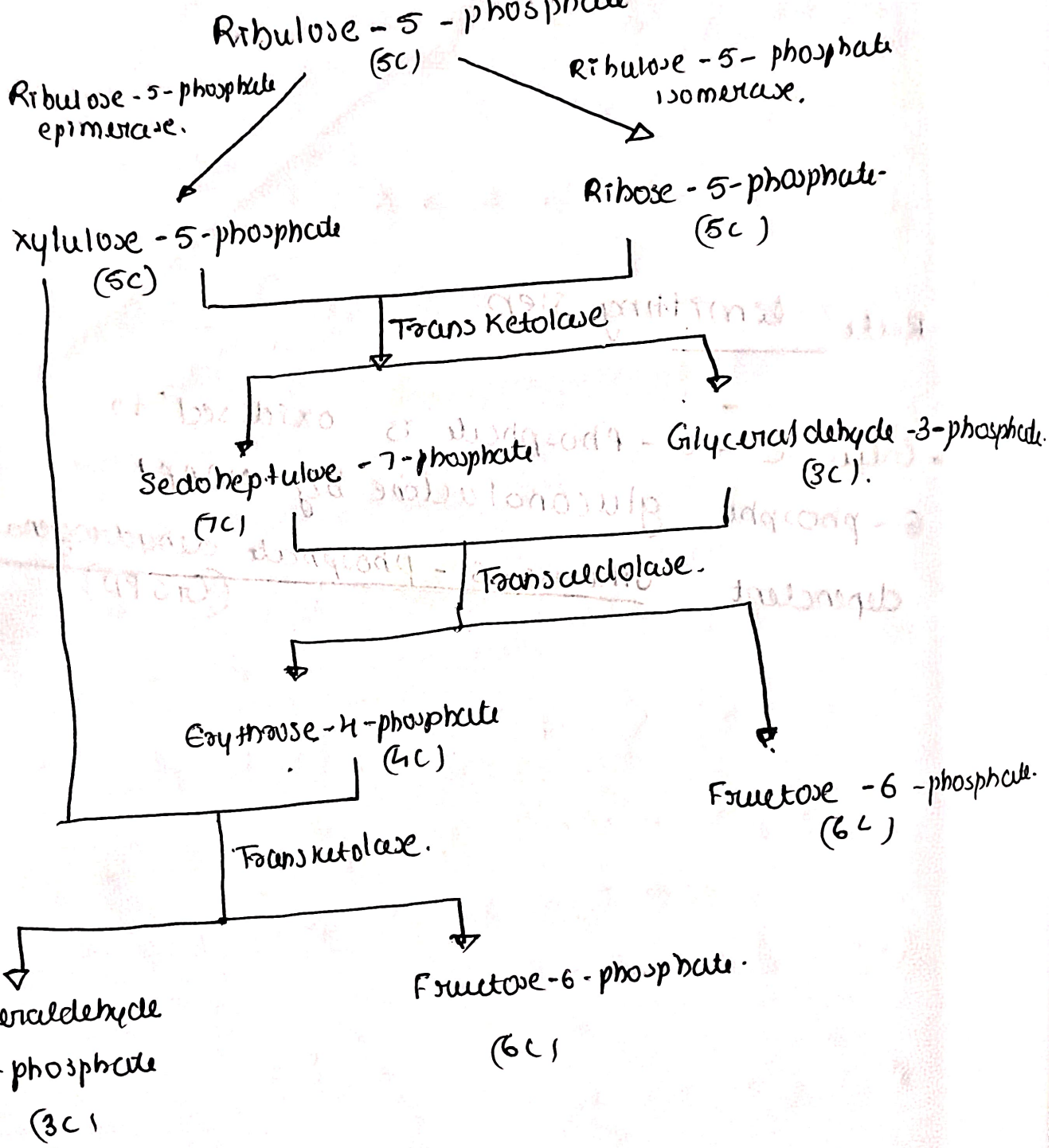
Ribulose-5-phosphate.

• NADPH producing steps (imp).

Rate limitting step.

• Glucose - 6 - phosphate is oxidised to 6 - phospho gluconolactone by NADP+ dependent Glucose-6-phosphate dehydrogenase (G6PD).

# NON- OXIDATIVE PHASE.



Transketolase: TPP dependent Enzyme.

Imp.

- Earliest biochemical manifestation of Thiamine deficiency: reduced transketolase activity in RBC.

## SIGNIFICANCE OF HMP SHUNT PATHWAY

### Physiological significance

1) Generation of reducing equivalents, in the form of NADPH.

NADPH is used in,

- reductive biosynthesis of fatty acid synthesis, cholesterol & steroids
- free radical scavenging through the action of antioxidant enzymes (eg: GR, SOD, peroxidase) glutathione reductase. superoxide dismutase.
- preserve RBC membrane integrity by maintaining glutathione in reduced state.
- prevention of met-hemoglobinemia.
- detoxification of drugs by cytochrome P450 enzyme.

- preserving the transparency of lens of eye.
- production of reactive oxygen species to kill bacteria.

II) Production of Ribose-5-phosphate, used in synthesis of nucleotides and nucleic acids (DNA & RNA).

CLINICAL SIGNIFICANCE:

- G6PD deficiency.
- also known as favism.
- transmitted as X-linked recessive trait.
- leads to drug induced hemolytic anemia.
- manifested when exposed to certain drugs like primaquine (antimalarial drug), sulpha drugs etc.
- This drug stimulate peroxide formation inside RBC.

. In G6PD deficiency, the level of NADPH is low, so production of peroxide will lead to hemolysis.

Regulation.

. G6PD is the rate limiting enzyme of this pathway.

. It is allosterically stimulated by NADP+ and strongly inhibited by NADPH.

. Insulin will induce G6PD.