

# **Pentose Phosphate Pathway**

# Introduction

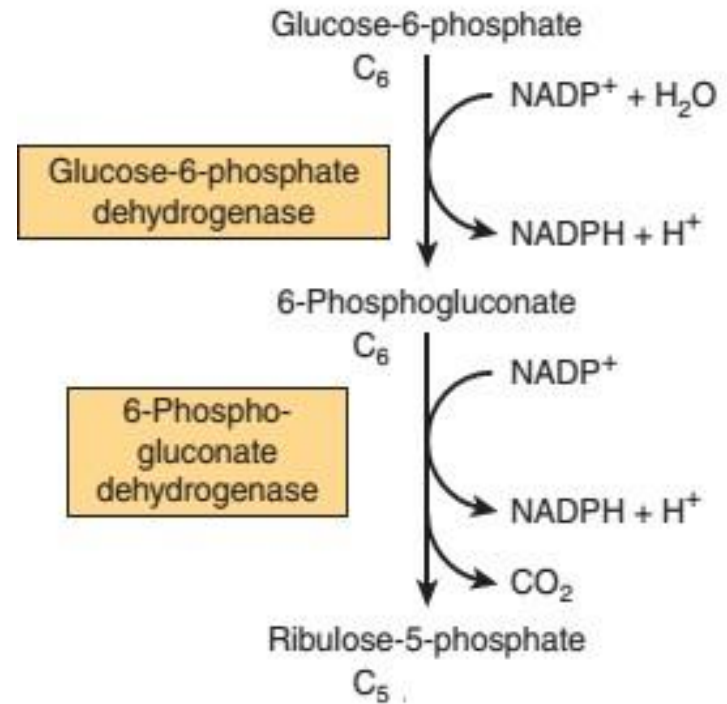
- Alternative route for the metabolism of glucose
- Also known as **Hexose Monophosphate (HMP) shunt**
- It is more complex than glycolysis
- It helps in
  - **formation of NADPH** for synthesis of fatty acids, steroids,
  - **maintaining reduced glutathione** for antioxidant activity
  - **synthesis of ribose** for nucleotide and nucleic acid formation
  - **Integrity of RBC** membrane

# Pentose Phosphate Pathway

- Like glycolysis it occurs in **cytosol**
- Oxidation is achieved by dehydrogenation using  $\text{NADP}^+$ , not  $\text{NAD}^+$
- Its carried out in 2step:
  - **Irreversible oxidative phase**: 3 molecules of **glucose-6-phosphate** give rise to 3 molecules of  $\text{CO}_2$  and 3 5-carbon sugars.
  - **Reversible nonoxidative phase**: Rearranged to regenerate 2 molecules of **glucose-6 phosphate** and 1 molecule of the **glyceraldehyde-3 phosphate**

# Oxidative phase

- Dehydrogenation of **glucose-6-phosphate** to **6-phosphogluconate** catalyzed by **glucose 6-phosphate dehydrogenase**
- Followed by hydrolysis of **6-phosphogluconolactone** to **Ribulose-5-phosphate** catalyzed by **6-phosphogluconate dehydrogenase**
- Both this step requires  $\text{NADP}^+$  as hydrogen acceptor

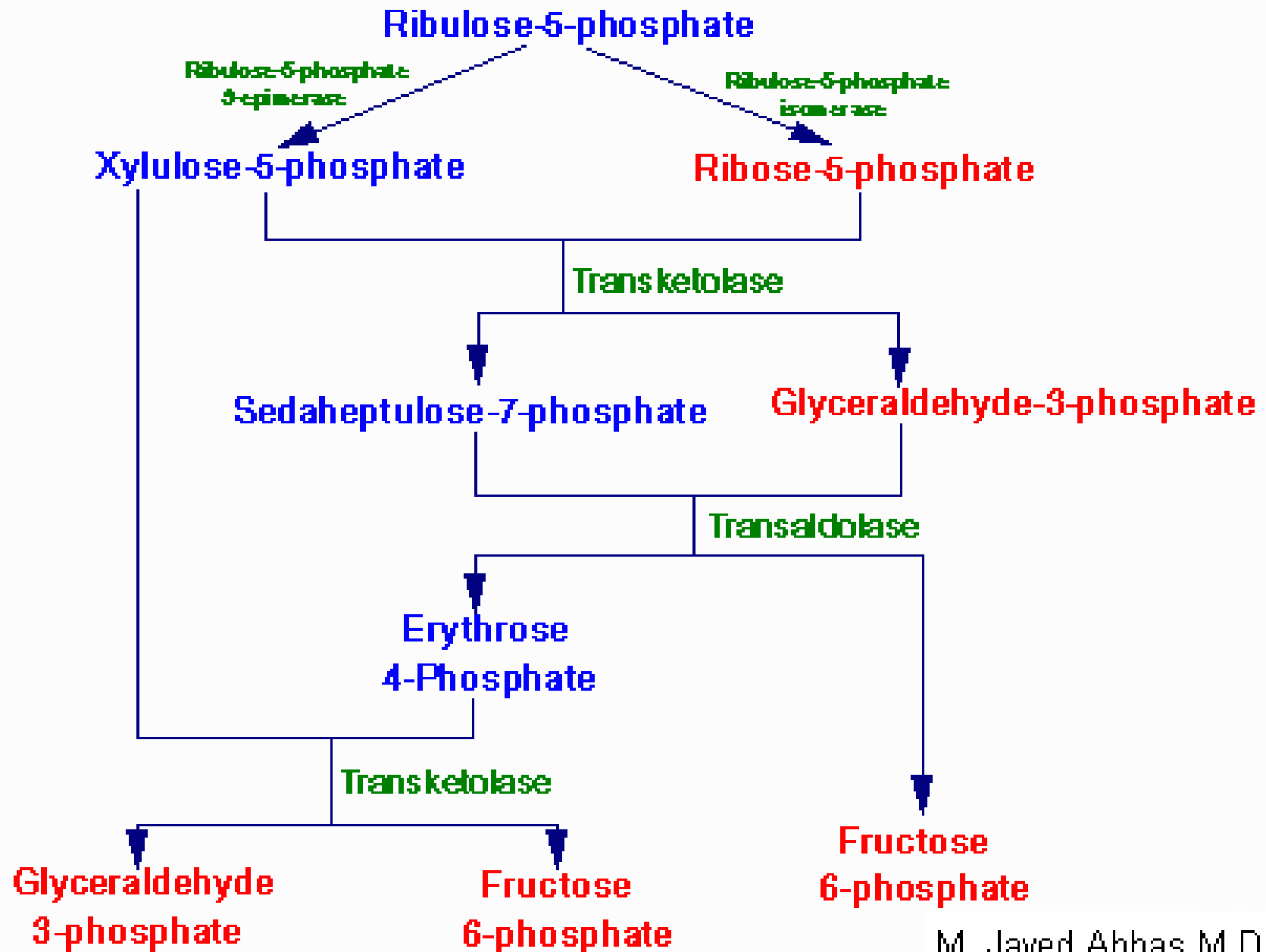


# Non-oxidative Phase

It starts with:

- Ribulose-5-phosphate which is the substrate for two enzymes:
  - Ribose-5-phosphate isomerase: ribulose 5-phosphate to the corresponding ribose-5-phosphate - used for nucleotide and nucleic acid synthesis
  - Ribulose-5-phosphate 3-epimerase: alters the configuration about carbon giving xylulose 5-phosphate

# Non-Oxidative Stage of Pentose Phosphate Pathway



# Pentose Phosphate Pathway Beginning

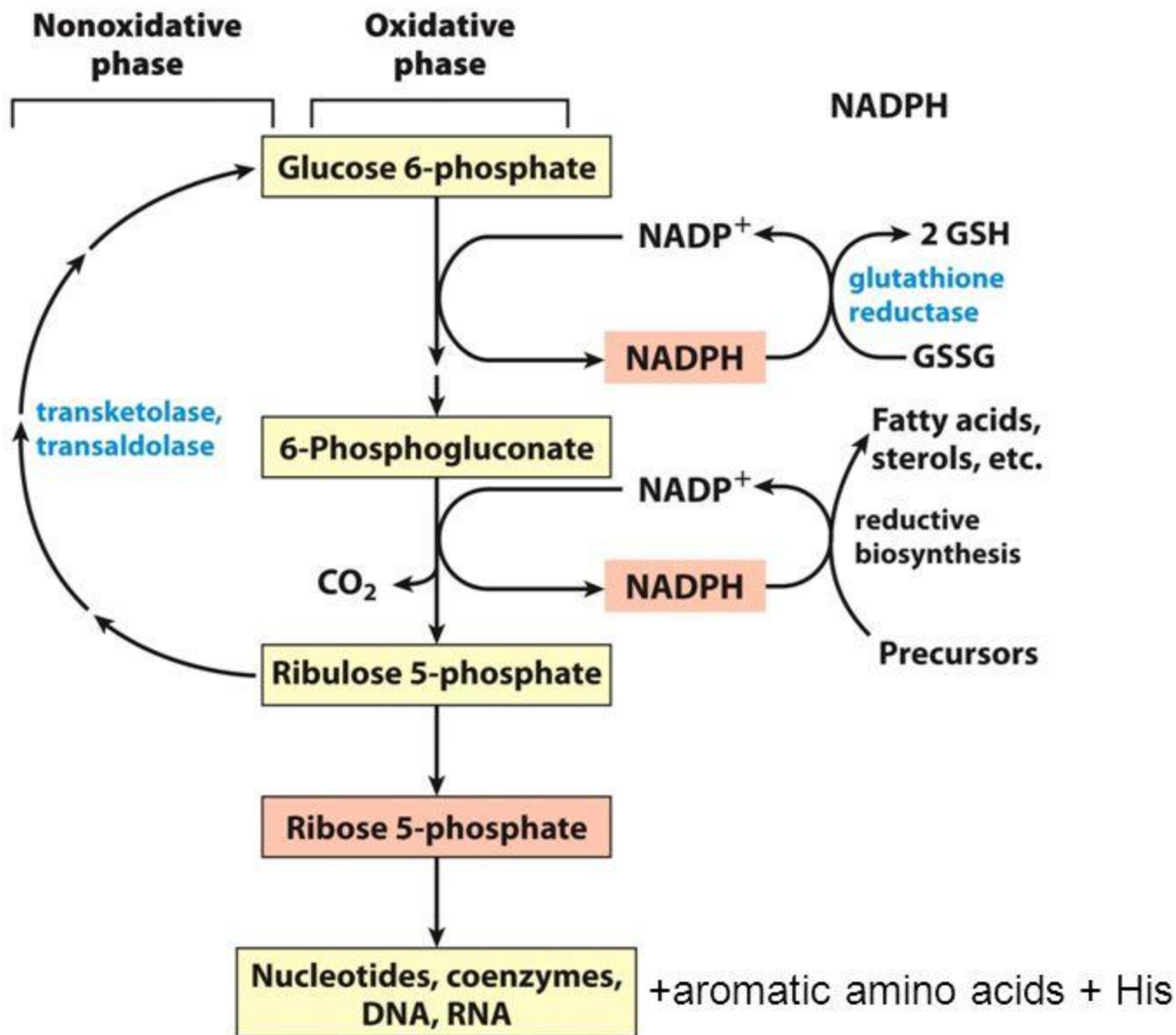


Figure 14-21

Lehninger Principles of Biochemistry, Sixth Edition

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