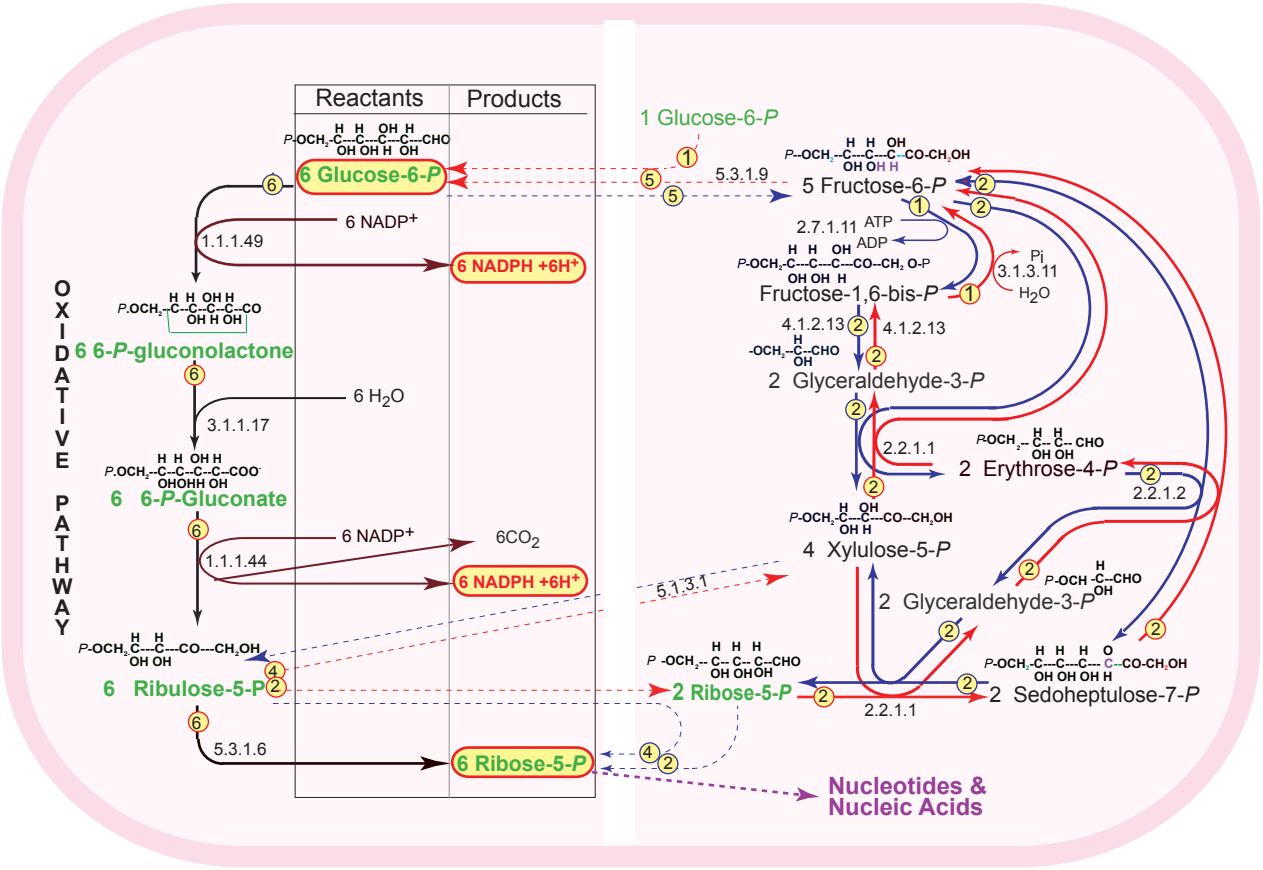
PENTOSE PHOSPHATE PATHWAYS

Major functions: To provide reducing power **(NADPH)** for biosynthesis and/or **RIBOSE** for nucleotides

PATHWAY I



PATHWAY I (OXIDATIVE)

Cell requires BOTH **NADH** and **RIBOSE**

6 Glucose-6-*P*+ 12 $NADP^+$ + $6H_2O$ ⟶
6 Ribose-5-*P* + 12 NADPH + $12H^+$ + $6CO_2$

Glucose-6-*P* + 2 $NADP^+$ + H_2O ⟶
Ribose-5-*P* + 2 NADPH + $2H^+$ + CO_2

PATHWAYS II and III

Inter- and intra -molecular rearrangements between 3, 4, 5, 6, and 7-carbon sugars, result in the conversion of 5 hexoses into 6 pentoses - and *vice versa*
i.e. 5 Glucose-6-*P* ⟷ 6 Ribose-5-*P*
This makes possible the two other Pathways (II and III) in which *either* **NADPH** *or* **Ribose** - *but not both* - are produced.

NADPH requirements include:

Fatty acid synthesis and steroid synthesis in liver cytosol
Regeneration of reduced glutathione to maintain stability of erythrocyte membranes
Reduction of ribonucleotides to deoxyribonucleotides for DNA

ENZYMES

1.1.1.44 Phosphogluconate dehydrogenase (decarboxylating)
1.1.1.49 Glucose-6-phosphate dehydrogenase
2.2.1.1 Glycolaldehydetransferase (Transketolase)
2.2.1.2 Dihydroxyacetonetransferase (Transaldolase)
2.7.1.11 6-Phosphofructokinase
3.1.1.17 Gluconolactonase
3.1.3.11 Fructose-bisphosphatase
4.1.2.13 Fructose-bisphosphate aldolase
5.1.3.1 Ribulosephosphate epimerase
5.3.1.1 Triosephosphate isomerase
5.3.1.6 Ribosephosphate isomerase
5.3.1.9 Glucose-6-phosphate isomerase

(N.B. 2.2.1.1 Transketolase actually transfers an aldol and 2.2.1.2 Transaldolase transfers a ketol)