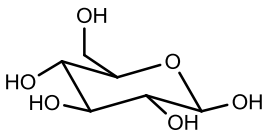
PENTOSE PHOSPHATE SHUNT

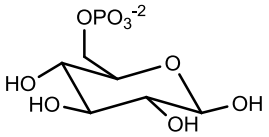
OXIDATIVE Phase



Glucose

ATP

ADP



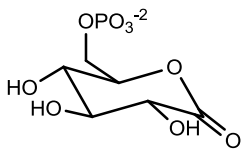
glucose-6-phosphate

1. glucose-6-P dehydrogenase

$NADP^+$

NADPH

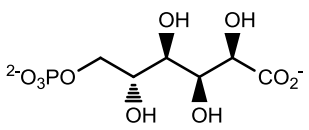
⇩ **NADPH, Fatty acyl-CoA**



6-P-gluconolactone

2. 6-phospho-gluconolactonase

H_2O



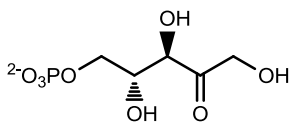
6-P-gluconate

3. 6-phospho-gluconate dehydrogenase

$NADP^+$

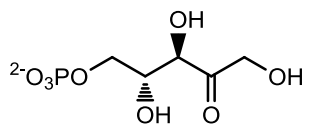
NADPH

CO_2



ribulose-5-phosphate

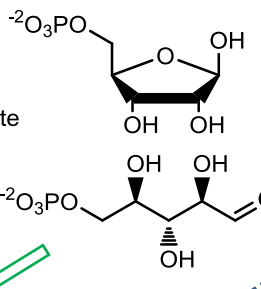
NONOXIDATIVE BRANCH



ribulose-5-phosphate C5

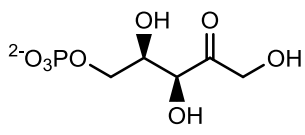
ribulose 5-phosphate Isomerase

ribulose 5-phosphate 3-epimerase



ribose-5-phosphate

C5



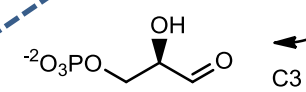
C5

xylulose 5-phosphate

(straight chain)

to nucleic acid synthesis

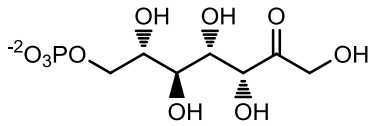
transketolase



C3

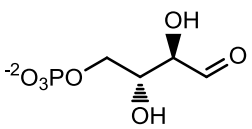
glyceraldehyde 3-phosphate (G3P)

C7



Sedoheptulose 7-phosphate

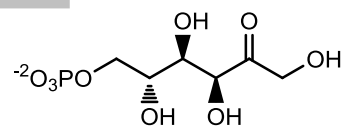
transaldolase



C4

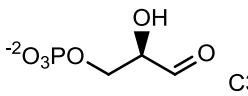
erythrose-4-phosphate

C6



fructose-6-P (F6P)

to aromatic amino acid synthesis

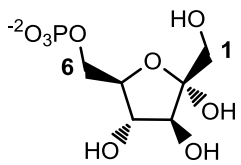


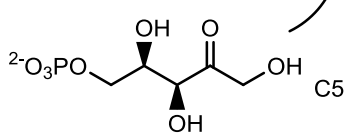
C3

glyceraldehyde 3-phosphate

to glycolysis
TAG synthesis

transketolase

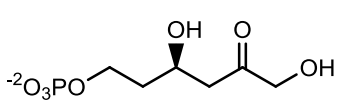




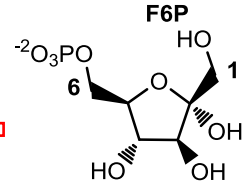
C5

xylulose 5-phosphate

C6



fructose-6-P
F6P



to glycolysis

If more NADPH is required than ribose (for nucleic acid synthesis, this path is dominant

$C_5 + C_5 \leftrightarrow C_3 + C_7$
$C_3 + C_7 \leftrightarrow C_6 + C_4$
$C_4 + C_5 \leftrightarrow C_6 + C_3$
NET
$3C_5 \leftrightarrow 2C_6 + C_3$

3 riboses ↔ 2F6P + 1Glycerald-3P

In this case, overall
Oxidative:
$6G6P + 12NADP^+ + 6H_2O \rightarrow 6R5P + 12\ NADPH + 12H^+ + 6CO_2$
Nonoxidative:
$6R5P \rightarrow 4F6P + 2G3P$
Gluconeo: $4F6P + 2G3P + H_2O \rightarrow 5\ G6P + Pi$

Net: $G6P + 12NADP^+ + 7H_2O \rightarrow 6CO_2 + 12\ NADPH + 12H^+ + Pi$
Complete oxdiation of Glc without TCA to get NADPH