Pentose Phosphate Pathway

The Oxidative phase (All reactions are irreversible)

Step	Enzyme	Substrate	Product	Notes
Step 1	G6P dehydrogenase	G6P	6-phoshpglucolactone	Produce 1st NADPH
Step 2	Glucolactonase (Hydrolyzation reaction)	6-phoshpglucolactone	6-phosphogluconate	
Step 3	6-phosphogluconate dehydrogenase (Oxidative decarboxylation)	6-phosphogluconate	Ribulose-5-phosphate	Produce 2nd NADPH & CO_2

$3\ G6P + 6\ NADP^+ + 3\ H_2O \rightarrow 3$ pentose-5-phosphate $+ 6\ H^+ + 6\ NADPH + 3\ CO_2$

The Non-oxidative phase (All reactions are reversible)

Step	Enzyme	Substrates	Products
Step 1	1. Phosphopentose isomerase → 2. Phosphopentose-3-epimerase →	Ribulose-5-phosphate	→ Ribose-5-phosphate → Xylulose-5-phosphate
Step 2	Transketolase (transfers a two-carbon fragment) (Require TPP as coenzyme)	1. Ribose-5-phosphate 2. Xylulose-5-phosphate	1. Sedoheptulose-7-phosphate 2. Glyceraldehyde-3-phosphate
Step 3	Transaldolase (transfer of dihydroxyacetone fragment)	1. Sedoheptulose-7-phosphate (7C) 2. Glyceraldehyde-3-phosphate (3C)	1. Erythrose-4-phospahte 2. Fructose-6-phoshate
Step 4	Transketolase (transfers a two-carbon fragment)	1. Erythrose-4-phospahte 2. Xylulose-5-phosphate	1. Glyceraldehyde-3-phosphate 2. Fructose-6-phoshate

2 xylulose-5-phosphate + 1 ribose-5-phosphate → 2 fructose-6-phosphate + 1 glyceraldehyde-3-phosphate