Reaction Id	Reaction	Enzyme	Energy Consumption	Pathway	Description
R-1	Glucose + ATP -> Glucose 6-phosphate + ADP	Hexokinase	1 ATP (ATP -> ADP)	Glycolysis (preparatory phase)	Phosphorylation of Glucose on carbon 6
R-2	Glucose 6-phosphate <-> Fructose 6-phosphate	Phosphohexose isomerase		Glycolysis (preparatory phase)	Isomerization moves the carbonyl-group to C-2
R-3	Fructose 6-phosphate + ATP -> Fructose 1,6-bisphosphate + ADP	Phosphofructokinase-1	1 ATP (ATP -> ADP)	Glycolysis (preparatory phase)	Phosphorylation of Fructose 6-phosphate on C-1
R-4	Fructose 6-phosphate <-> Glyseraldehhyde 3-phosphate + Dehydroxyacetone phosphate	Aldolase		Glycolysis (preparatory phase)	Cleavage of 6-carbon phosphate sugar to two 3-carbon phosphate carbon
R-5	Phosphoenolpiruvate + H2O <-> 2-Phosphoglycerate	Enolase		Gluconeogenesis	Hydration
R-6	2-Phosphoglycerate <-> 3-Phosphoglycerate	Phosphoglycerate mutase		Gluconeogenesis	
R-7	3-Phosphoglycerate + ATP <-> 1,3-Phosphoglycerate + ADP	Phosphoglycerate kinase	1 ATP	Gluconeogenesis	
R-8	1,3-Phosphoglycerate + NADH + H^+ <-> Glyseraldehhyde 3-phosphate + Pi	Glyceraldehyde 3-phosphate dehydrognase	1 NADH	Gluconeogenesis	
R-9	Glyseraldehhyde 3-phosphate <-> Dehydroxyacetone phosphate	Triose phosphate isomerase		Gluconeogenesis	
R-10	Xylulose 5-phosphate -> Glyceraldehyde 3-phosphate	Transketolase		Pentose phosphate	
R-11	Glyceraldehyde 3-phosphate -> Erythrose 4-phosphate	Transaldolase		Pentose phosphate	
R-12	Erythrose 4-phosphate + Phosphoenolpiruvate + H2O -> 2-keto-3-deohy-D-arabinoheptulosonate 7-phosphate + Pi	2-keto-3-deohy-D-arabinoheptulosonate 7-phosphate synthase		Shikimate	
R-13	2-keto-3-deohy-D-arabinoheptulosonate 7-phosphate NADH + H^+ -> 3-Dehydroquinate + Pi + NAD^+	Dehydroquinate synthase	NADH	Shikimate	
R-14	3-Dehydroquinate -> 3-Dehxdroshikimate + H2O	3-dehydroquinate dehydratase		Shikimate	
R-15	3-Dehxdroshikimate + NAHPH + H^+ -> Shikimate + $NADP^+$	Shikomate dehydrogenase	NADPH	Shikimate	
R-16	Shikimate + ATP -> Shikimate 3-phosphate + ADP	Shikimate kinase	ATP	Shikimate	
R-17	Shikimate 3-phosphate + Phosphoenolpiruvate -> 5-Enolpyruvylshikomate 3-phosphate + Pi	5-Enolpyruvylshikomate 3-phosphate synthase		Shikimate	
R-18	5-Enolpyruvylshikomate 3-phosphate -> Chorismate + Pi	Chorismate synthase		Shikimate	
R-19	Chorismate -> Prephenate	chorismate mutase		Shikimate	
R-20	Prephenate -> Phenylpyruvate	prephenate dehydratase		Shikimate	
R-21	Phenylpyruvate + CO2 + H2O -> L-Phenylalanine	Aromatic aminotransferase		Shikimate	
R-22	L-phenylalanine -> trans-cinnamic acid + NH3	L-phenylalanine ammonia-lyase			
R-23	trans-cinnamic acid + NADPH + H^+ + ATP -> Cinnamaldehyde + AMP + $NADP^+$	carboxylic acid reductase (CAR), PPTase	2 ATP (ATP -> AMP) & 1 NADPH		