

PDH Complex (Pyruvate dehydrogenase complex):

1. It's a complex that contains three enzymatic activities, which are Pyruvate decarboxylase, Dihydrolipoyl transacetylase and Dihydrolipoyl dehydrogenase.
2. It has five different coenzymes, thiamine pyrophosphate (TPP), lipoic acid, CoA, flavin adenine dinucleotide (FAD) and nicotinamide adenine dinucleotide (NAD⁺)
3. What comes in and what comes out? Pyruvate comes in to the intermediate in the mitochondria from the cytoplasm and acetyl CoA comes out to the matrix of the mitochondria.
4. Pyruvate, 3 carbons alpha-keto acid reacts with pyruvate decarboxylase and thiamine and in doing so is decarboxylated, it results in the formation of CO₂, the acetyl group get transfer to coenzyme A which that's going to feed into the TCA cycle, and the electrons that came from hydroxyethyl are transfer to FAD, FADH₂ and FADH₂ release them to NAD⁺ to NADH.
5. NAD⁺ comes from the mitochondria.

Regulation of PDH complex

1. The PDH Complex is the gateway from the cytosol to the mitochondria.
2. When you make too much ATP you got to turn it off and the way to do this is that there is an enzyme called PDH kinase will catalyzed phosphorylation of the PDH Complex and it will turn off.
3. Substances don't regulate the PDH Complex, they do regulate the PDH kinase and then the Kinase will regulate the Complex.
4. What activates the PDH Kinase? Generally the products of the pathway when you have plenty of this product.
5. What are those products that activate the PDH Kinase? Lots of NADH and Acetyl CoA and ATP
6. What does inactivate PDH Kinase? Lots of Pyruvate.
7. What do Phosphatases hydrolyzes off? the phosphate.
8. What activates the PDH Complex again? PDH Phosphatase
9. What activates the PDH Phosphatase? By Calcium released during contraction in skeletal muscle.

Formation of α -ketoglutarate from acetyl coenzyme A (CoA) and oxaloacetate

1. We need to know the reaction and this means that there is a substrate and a product and then what kind for reaction is it and what it's the enzyme that catalyze the reaction.
2. Citrate synthase is the enzyme that catalyzes the condensation of acetyl CoA and oxaloacetate and water hydrolyzes off the CoA.
3. What is created from the condensation of Acetyl CoA and oxaloacetate? A tricarboxylic acid that have 6 carbons, which is Citrate.

4. Citrate is isomerized to isocitrate by which enzyme? Aconitase
5. What is Aconitase? An Fe-S protein.
6. What does Isocitrate dehydrogenase catalyzes? the irreversible oxidative decarboxylation of Isocitrate
7. What does Isocitrate dehydrogenase yields when catalyzes Isocitrate? 3 NADH and the first release of CO₂.
8. What does the catalysis of Isocitrate generates? α -ketoglutarate.
9. Alpha-ketoglutarate is a 5 carbon alpha-keto dicarboxylic acid.
10. The enzyme Isocitrate dehydrogenase is activated by what? ADP (a low-energy signal) and Calcium.
11. What regulates or inhibits the enzyme Isocitrate dehydrogenase? Elevated levels of ATP and NADH.

Alpha-Ketoglutarate Dehydrogenase (NADH, CO₂) into Succinate Thiokinase (GTP)

1. What catalyzes the conversion of alpha-ketoglutarate to succinyl CoA? Alpha-ketoglutarate dehydrogenase complex.
2. The mechanism to convert alpha-ketoglutarate to succinyl CoA is an oxidative decarboxylation.
3. What does Alpha-ketoglutarate dehydrogenase complex yields? A second CO₂ and a second NADH for the cycle.
4. What will regulate α -ketoglutarate dehydrogenase complex? Its products which are too much NADH and succinyl CoA
5. What will activate α -ketoglutarate dehydrogenase complex? Calcium.
6. What cleaves the high-energy thioester bond of succinyl CoA? Succinate thiokinase .
7. The generation of GTP by succinate thiokinase is another example of substrate-level phosphorylation.
8. Succinate is oxidized to fumarate by which enzyme? succinate dehydrogenase
9. What's a 4 carbon alpha-keto dicarboxylic acid? Succinate
10. FAD (its coenzyme) is reduced to what when succinate dehydrogenase oxidizes succinate and makes a double bond? FADH₂.
11. Succinate dehydrogenase is the only enzyme of the TCA cycle that is embedded where? in the inner mitochondrial membrane.
12. Fumarate is hydrated so adds the water to L-malate in a freely reversible reaction catalyzed by which enzyme? fumarase
13. L-Malate is oxidized to oxaloacetate by which enzyme? malate dehydrogenase.
14. Which reaction produces the third and final NADH of the cycle? L-Malate being oxidized by malate dehydrogenase to oxaloacetate.

Regulation of the Cycle

1. the most important of the regulated enzymes in the TCA cycle are those that catalyze reactions with highly negative ΔG^0 and they are? citrate synthase, iso-citrate dehydrogenase, and α -ketoglutarate dehydrogenase complex.
2. Reducing equivalents needed for oxidative phosphorylation are generated by what? the PDH complex and the TCA cycle
3. both processes of PDH Complex and TCA cycle are up-regulated in response to a decrease in the ratio of ATP to ADP.