

BERG/STRYER VI STUDY GUIDE

CHAPTER 17

1. Homework 1, 5-7, 9, 11-12. The **Citric Acid Cycle** (CAC) is strongly oxidative, in contrast to glycolysis which is anaerobic. The CAC takes place in the mitochondrial matrix of eukaryotic cells – whereas glycolysis occurs in the cytoplasm. The immediate products of the CAC are reduced cofactors (NADH and FADH₂) which then feed electrons into oxidative phosphorylation, yielding much ATP. The CAC is connected with glycolysis via the **Pyruvate DH Complex**. Know the 3 enzymes, the cofactors, and the mechanisms as shown in class for the Pyr DH Complex (477ff). Understand how **lipoamide** functions both as a redox cofactor and a delivery system (478-9). Know all structures, enzymes, and cofactors for the CAC (482-490). Include the structure of **cis-Aconitate** (484). Understand that Aconitase acts *asymmetrically* to make and hydrate a double bond among the "old" carbons from Succinate, and away from the "new" carbons from Acetyl CoA ("old" carbons are green in Fig. 17.15). Table 17.2 (489) implies that *only* Citrate Synthase is irreversible. In fact each step where CO₂ is lost is effectively irreversible, including Pyr DH Complex, Isocitrate DH, and α-KGDH Complex.
2. Know the **controls** on the CAC (492-3). Understand why OAA can be in short supply when the CAC isn't running, and that this means we need **anaplerotic reactions** to solve the problem. Know why the symptoms of Thiamine deficiency (beriberi) resemble the symptoms of poisoning with mercury or arsenite (494). Know the **Glyoxylate Cycle**, and why certain plants and bacteria need it (494-5). Remember that for humans, "sugar can make you fat, but fat can't make you sweet!" We can make fatty acids from candy, but we can't make sugar from fatty acids because they break down to Acetyl CoA. Only organisms with the Glyoxylate Cycle can make (net synthesis of) OAA from Acetyl CoA. Fatty seeds (peanuts, soybeans) store lipids through the winter, but have to make lots of cellulose (from lots of glucose) when spring arrives.