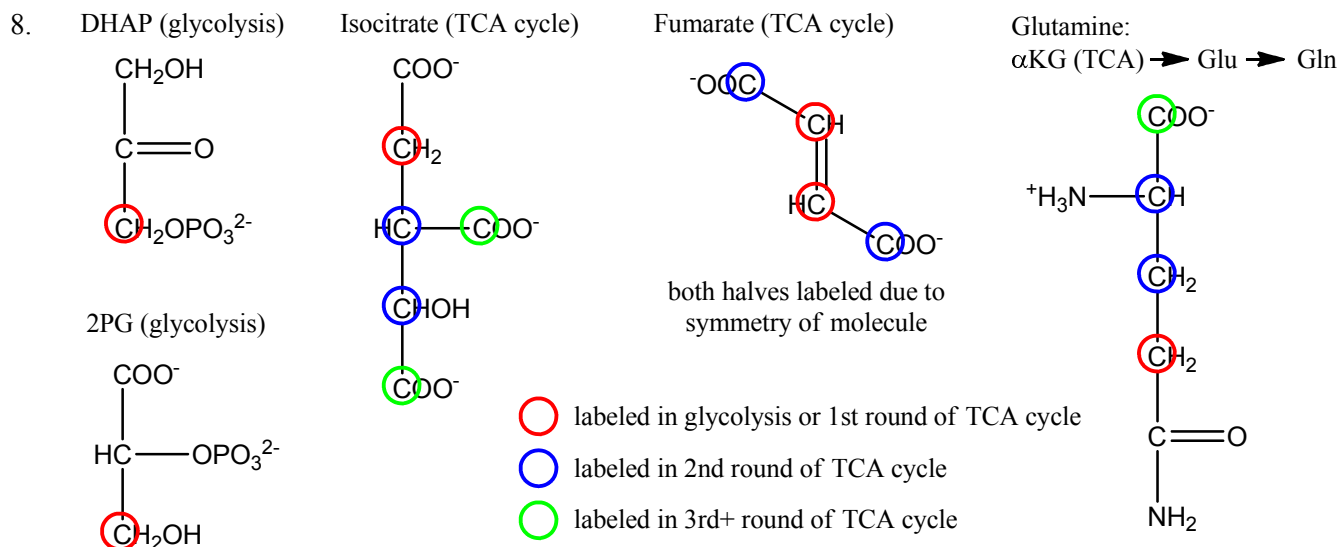
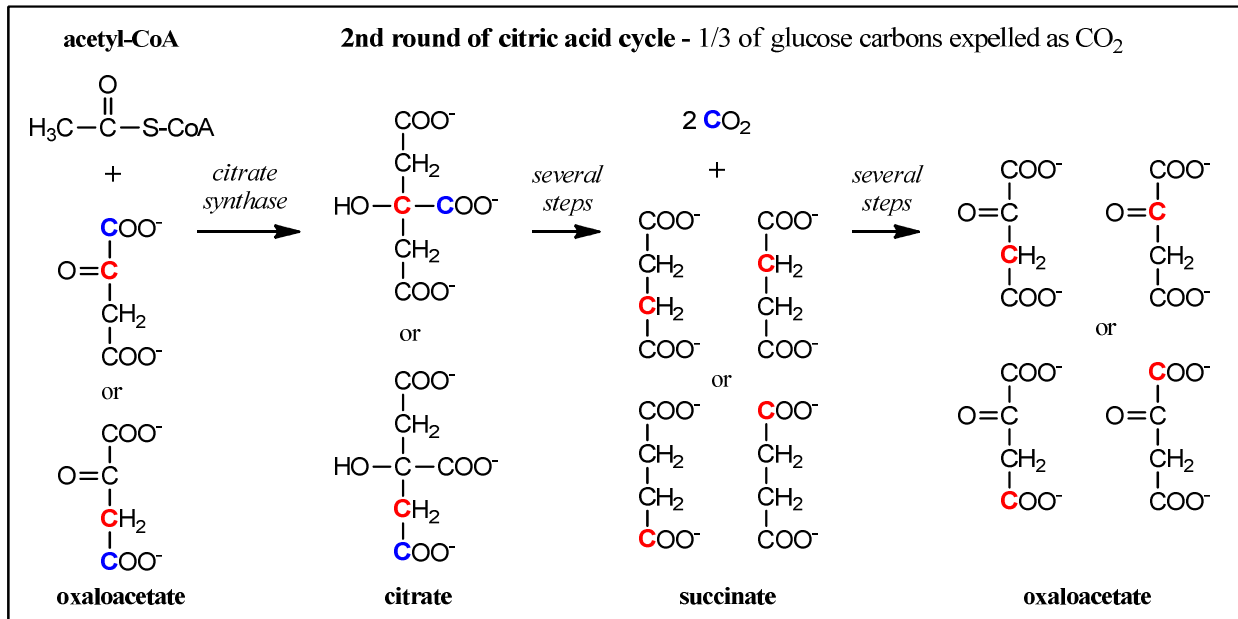
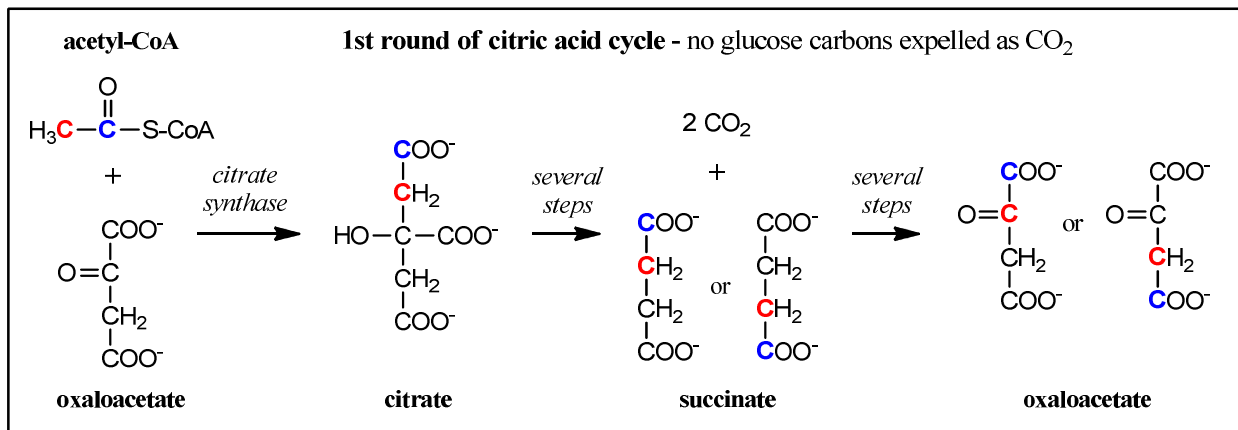
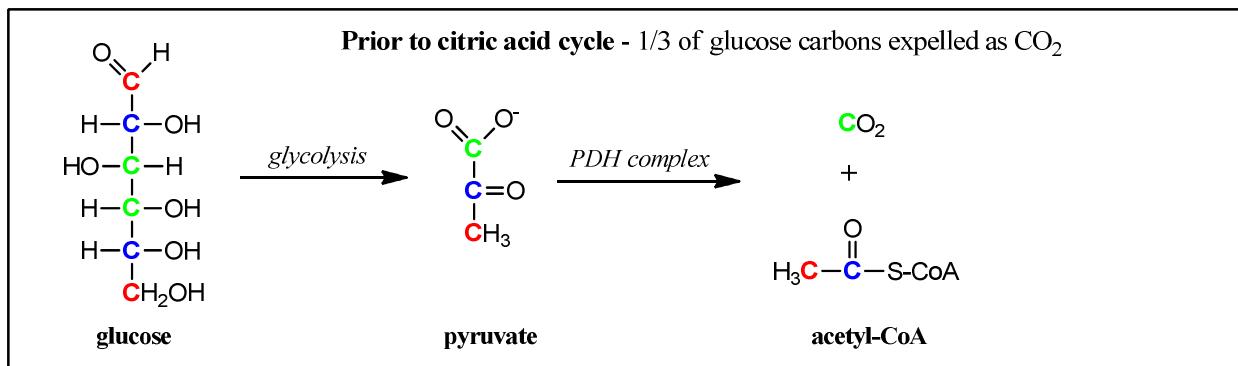
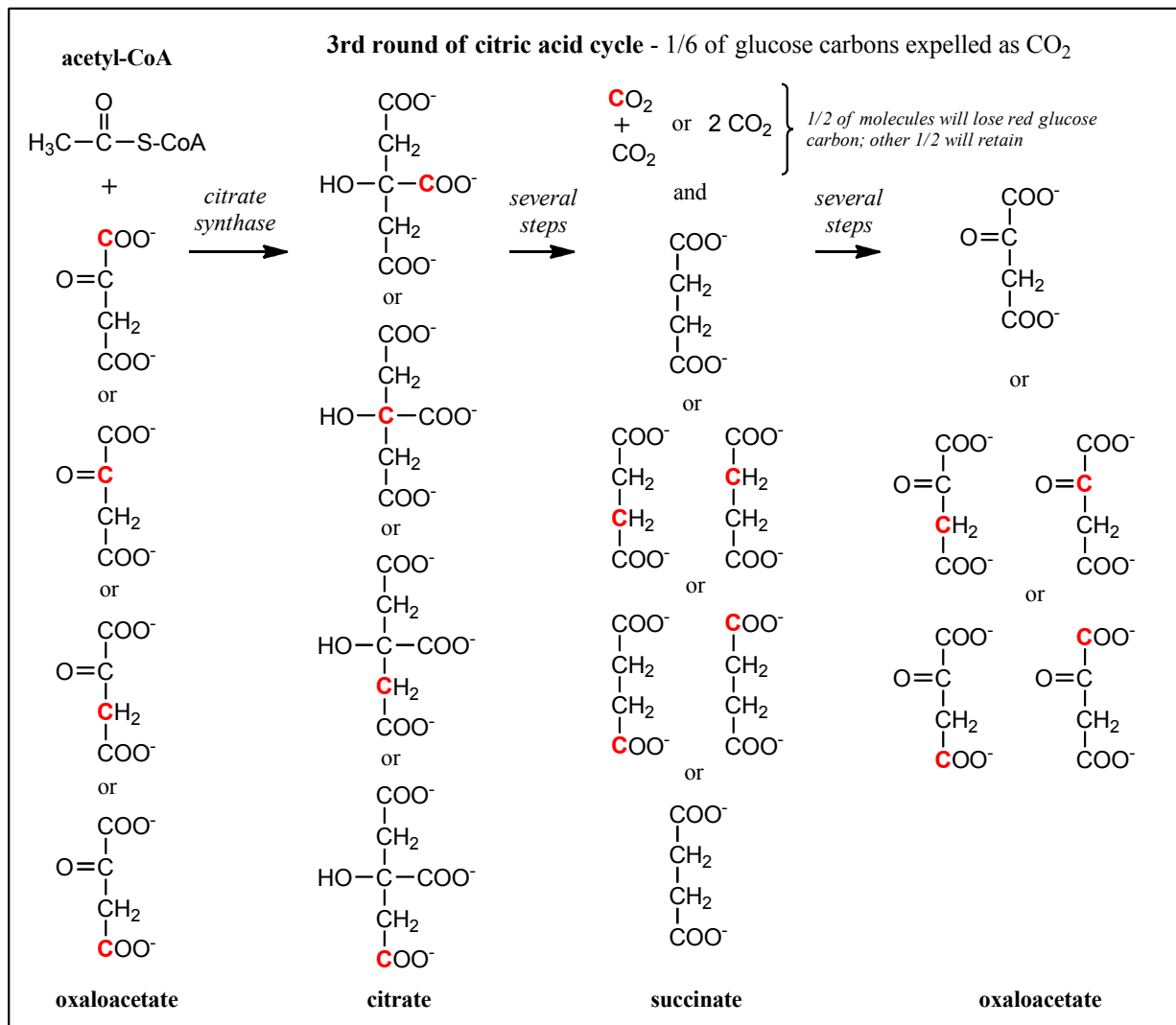


- No. It catalyzes a reversible reaction.
 - (NA)
 - Yes. It catalyzes an irreversible reaction and the first committed step of this pathway.
 - Positive effectors could include A, H, B. Negative effectors could include D, E, F, G, and possibly C (although C would be more likely to act as a competitive inhibitor of B).
 - Enzymes 5, 6, 7, and 8 are also probably regulated.
- a, b, e
- The reactants 1,3-BPG and ADP are at relatively low concentration, and the product ATP is at relatively high concentration. ([1,3-BPG] is low because the previous reaction, catalyzed by GAPDH, is endergonic under standard conditions.)
- Coupling to thioester hydrolysis.
Coupling to an oxidation-reduction reaction.
Preceding or following the reaction with a highly spontaneous reaction (which alters the concentration of a substrate or product.)
- The first reaction favors a large excess of B; high concentrations of B push forward the conversion of B to C.
- Homolactic fermentation; lactic acid (lactate + protons)
 - Aerobic metabolism would be carried out instead, which would prevent production of protons (and sour taste). (Also, it inhibits growth of aerobic microbes that could be toxic or cause the cabbage to spoil.)
- a, d



- In the direction of malate \rightarrow oxaloacetate, NAD^+ is the oxidant. (In the reverse direction, oxaloacetate is the oxidant.)
- (Structural logic shown below)
 Before round 1: C3 & 4 leave (pyruvate \rightarrow acetyl-CoA) \Rightarrow 1/3 of C's
 TCA round 1: no additional carbons released
 TCA round 2: C2 & 5 leave (isocitrate \rightarrow α -KG \rightarrow succinyl-CoA) \Rightarrow 1/3 of C's
 TCA round 3: 1/2 of C1 & 6 leave (same steps as round 2) \Rightarrow 1/2 of 1/3 = 1/6 of C's
1/3 of carbons are expelled by the end of the 1st round
1/3 + 1/3 = 2/3 of carbons are expelled by the end of the 2nd round
2/3 + 1/6 = 5/6 of carbons are expelled by the end of the 3rd round





11. The pyruvate carboxylase reaction uses ATP, so it shouldn't be carried out unless oxaloacetate is needed. (The presence of acetyl-CoA indicates that the energy status of the cell is OK, and that flux through the TCA cycle should be increased by increasing the concentration of oxaloacetate.)
12.
 - a. False; this description applies to the term 'amphibolic.' 'Anaplerotic' refers to processes that generate particular intermediates.
 - b. False; the bond between succinate and CoA is cut by the addition of a phosphate, termed *phosphorolysis*.
 - c. False; fumarate has no tetrahedral carbons and cannot be prochiral
13. An antiporter is an enzyme that couples the transport of two different compounds in opposite directions across the membrane. Antiporters are unlikely to be found in the outer mitochondrial membrane because they usually transport small metabolites, and the outer membrane has large pores that allow the free diffusion of small metabolites across the membrane.
14.
 - a. Lipoic acid is covalently bound to lysine in E₂; without lysine there is no lipoamide and no catalysis.
 - b. Growth won't differ, because PDH complex isn't used in anaerobic metabolism
 - c. Growth is reduced, because PDH complex is essential for aerobic metabolism (of glucose).
 - d. You mutated E₂ of α-ketoglutarate DH complex (also essential for aerobic metabolism), not of PDH complex.
 - e. α-ketoglutarate