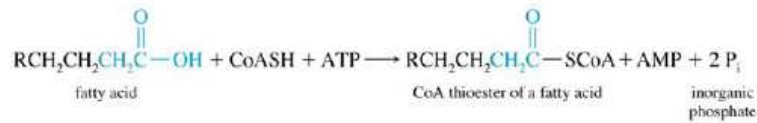
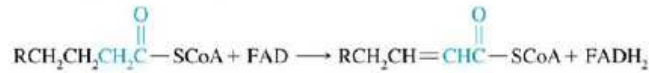


Answer the following questions about beta-oxidation:

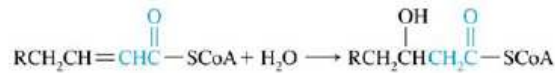
Step 1 Activation (formation of thioester with CoA):



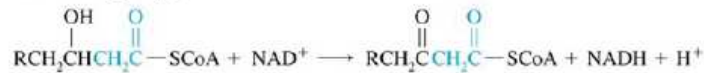
Step 2 Oxidation [dehydrogenation at carbons 2 and 3 (α- and β-carbons)]:



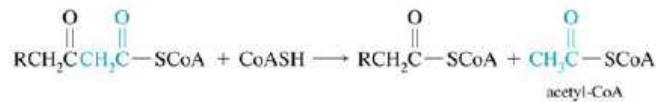
Step 3 Hydration (conversion to a secondary alcohol):



Step 4 Oxidation [dehydrogenation of carbon 3 (β-carbon) to a keto group]:

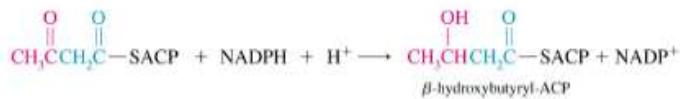


Step 5 Carbon-chain cleavage (reaction with CoA to produce acetyl-CoA and an activated thioester of a fatty acid shortened by two carbons):



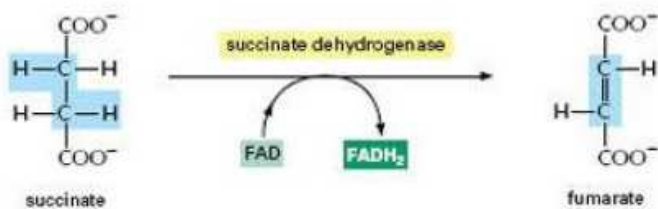
- (a) In which step(s) does the cell gain energy? Explain.
- (b) Is which step(s) does the cell lose energy? Explain.
- (c) How much ATP (or equivalents) are produced per cycle of beta-oxidation?
- (d) If stearic acid (an 18 carbon fatty acid) is completely converted to acetyl-CoA, how much energy would the cell gain (assuming all the molecules are converted to ATP)?

Answer the questions below about the following reaction:



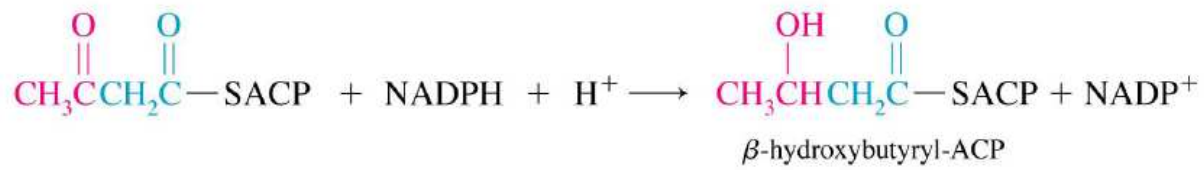
- Describe chemically what is occurring in this step.
- Is this step adding or removing energy from the cell? Explain.
- Indicate with arrow any oxidation/reduction occurring in the reaction.
- Is this step an example of catabolic or anabolic metabolism? Explain.

Answer the questions below about the following reaction:



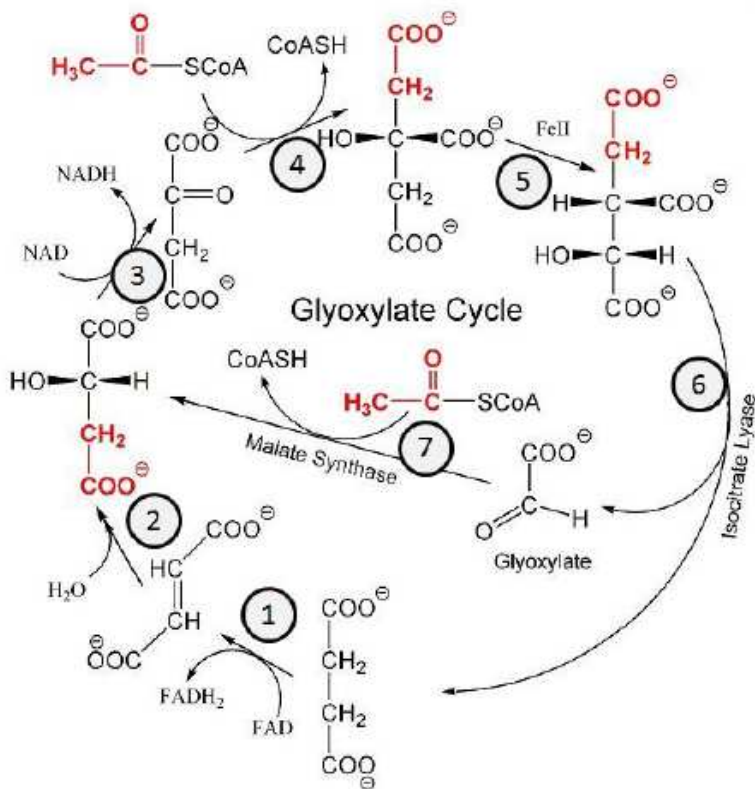
- Describe chemically what is occurring as (Succinic Acid → Fumaric Acid).
- Is this step adding or removing energy from the cell? Explain.
- Indicate with arrow any oxidation/reduction occurring in the reaction.
- Is this step an example of catabolic or anabolic metabolism? Explain.

Answer the questions below about the following reaction:



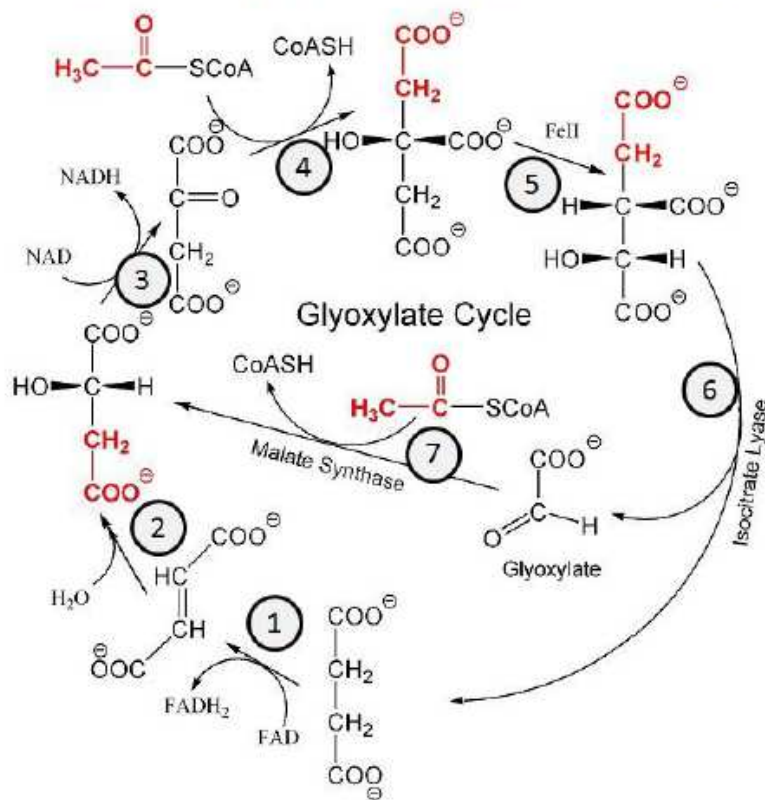
- (a) Describe chemically what is occurring in this step.
- (b) Is this step adding or removing energy from the cell? Explain.
- (c) What is oxidized in this reaction? Explain.
- (d) What is reduced in this reaction? Explain.
- (e) Is this step an example of catabolic or anabolic metabolism? Explain.
- (f) Is this a step from beta-oxidation or lipogenesis. Explain.

Answer the following questions about the Glyoxylate Cycle.



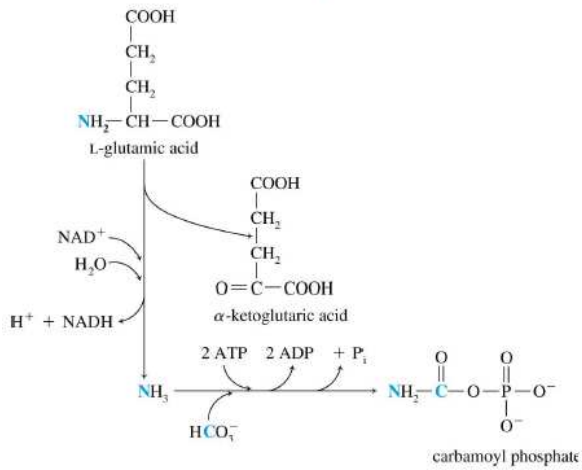
- Describe chemically what is occurring in Step 1.
- Is this step adding or removing energy from the cell? Explain.
- What is oxidized in this reaction? Explain.
- What is reduced in this reaction? Explain.
- Is this step an example of catabolic or anabolic metabolism? Explain.

Answer the following questions about the Glyoxylate Cycle.



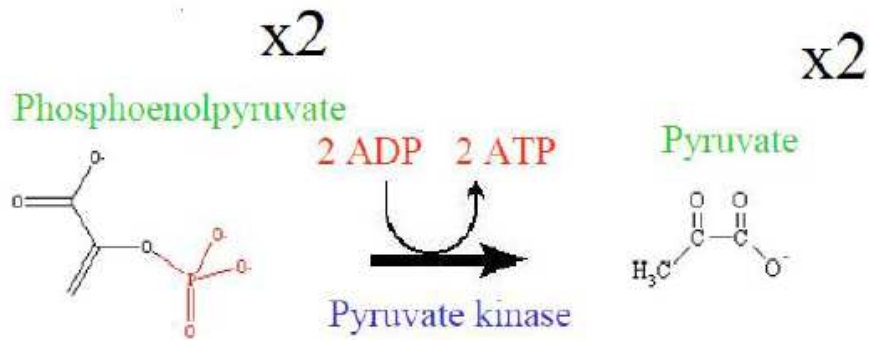
- Describe chemically what is occurring in Step 2.
- Is this step adding or removing energy from the cell? Explain.
- What is oxidized in this reaction? Explain.
- What is reduced in this reaction? Explain.
- Is this step an example of catabolic or anabolic metabolism? Explain.

Answer the following questions about the Urea Cycle.



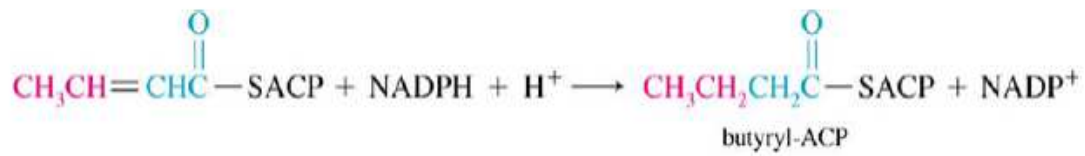
- In the first step of the reaction, does the cell gain or lose energy. Explain.
- Is the first step of the reaction an example of Catabolism or Anabolism? Explain.
- In the second step of the reaction, does the cell gain or lose energy. Explain.
- Is the first step of the reaction an example of Catabolism or Anabolism? Explain.

The following reaction is part of the glycolysis pathway.



- (a) Describe chemically what is occurring in this step.
- (b) Is this step adding or removing energy from the cell? Explain.
- (c) What is oxidized in this reaction? Explain.
- (d) What is reduced in this reaction? Explain.
- (e) Is this step an example of catabolic or anabolic metabolism? Explain.
- (f) What enzyme catalyzes this reaction?

Answer the questions below about the following reaction:



- (a) Describe chemically what is occurring in this step.
- (b) Is this step adding or removing energy from the cell? Explain.
- (c) What is oxidized in this reaction? Explain.
- (d) What is reduced in this reaction? Explain.
- (e) Is this step an example of catabolic or anabolic metabolism? Explain.
- (f) Is this a step from beta-oxidation or lipogenesis. Explain.