

Aerobic Respiration

Read the passage below, which covers topics from your textbook. Answer the questions that follow.

The Krebs cycle has five main steps. In eukaryotic cells, all five steps occur in the mitochondrial matrix.

Step 1. A two-carbon molecule of acetyl CoA combines with a four-carbon compound, **oxaloacetic acid**, to produce a six-carbon compound, **citric acid**.

Step 2. Citric acid releases a CO₂ molecule and a hydrogen atom to form a five-carbon compound. The electron in the hydrogen atom is transferred to NAD⁺, reducing it to NADH.

Step 3. The five-carbon compound formed in Step 2 also re-releases a CO₂ molecule and a hydrogen atom, forming a four-carbon compound. Again, NAD⁺ is reduced to NADH. In this step, a molecule of ATP is also synthesized from ADP.

Step 4. The four-carbon compound formed in Step 3 releases a hydrogen atom to form another four-carbon compound. This time, the hydrogen atom is used to reduce FAD to FADH₂. **FAD**, or flavin adenine dinucleotide, is a molecule very similar to NAD⁺. Like NAD⁺, FAD accepts electrons during redox reactions.

Step 5. The four-carbon compound formed in Step 4 releases a hydrogen atom to regenerate oxaloacetic acid, which keeps the Krebs cycle operating. The electron in the hydrogen atom reduces NAD⁺ to NADH.

Recall that in glycolysis one glucose molecule produces two pyruvic acid molecules, which can then form two molecules of acetyl CoA. Thus, one glucose molecule is completely broken down in two turns of the Krebs cycle. These two turns produce six NADH, two FADH₂ two ATP, and four CO₂ molecules.

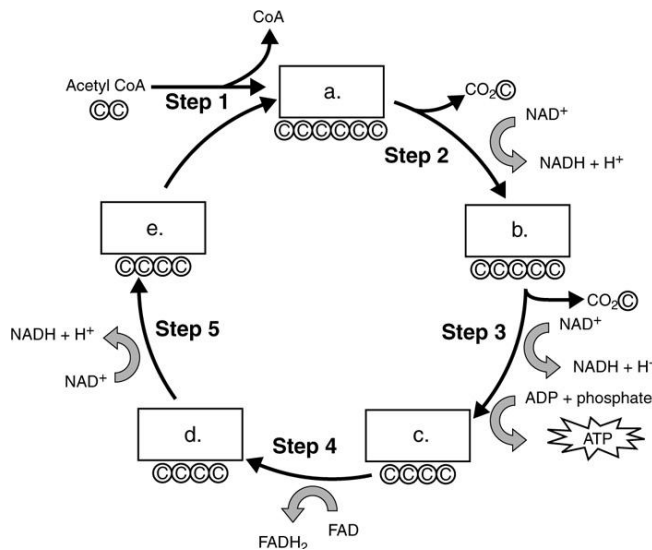
SKILL: Sequencing Information

1. Sequence the events to show the order in which they occur during the Krebs cycle. Write “1” on the line in front of the event that occurs first. Write “2” on the line in front of the event that occurs next, and so on.

- _____ a. Citric acid releases a CO₂ molecule and a hydrogen atom to form a five-carbon compound.
- _____ b. A four-carbon compound is converted into oxaloacetic acid.
- _____ c. A five-carbon compound releases a CO₂ molecule to form a four-carbon compound.
- _____ d. A molecule of acetyl CoA combines with oxaloacetic acid to produce citric acid.
- _____ e. A four-carbon compound releases a hydrogen atom to form another four-carbon compound.

Write your answers in the spaces provided.

2. The figure below shows the Krebs cycle. Using the information contained in the passage, write the name of the compound at each lettered block on the lines below the figure. Use the following labels: “4-carbon compound,” “5-carbon compound,” “Oxaloacetic acid,” and “Citric acid.” You will use a label more than once.



- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

Circle the letter of the phrase that best completes the statement.

3. Two completions of the Krebs cycle produce six NADH, two FADH₂, four CO₂, and
- a. four glucose molecules.
 - b. two ATP molecules.
 - c. four ATP molecules.
 - d. Both (a) and (b)