

The Citric Acid Cycle Practice Test (Sample)

Study Guide



Everything you need from our exam experts!

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Introduction

Preparing for a certification exam can feel overwhelming, but with the right tools, it becomes an opportunity to build confidence, sharpen your skills, and move one step closer to your goals. At Examzify, we believe that effective exam preparation isn't just about memorization, it's about understanding the material, identifying knowledge gaps, and building the test-taking strategies that lead to success.

This guide was designed to help you do exactly that.

Whether you're preparing for a licensing exam, professional certification, or entry-level qualification, this book offers structured practice to reinforce key concepts. You'll find a wide range of multiple-choice questions, each followed by clear explanations to help you understand not just the right answer, but why it's correct.

The content in this guide is based on real-world exam objectives and aligned with the types of questions and topics commonly found on official tests. It's ideal for learners who want to:

- Practice answering questions under realistic conditions,
- Improve accuracy and speed,
- Review explanations to strengthen weak areas, and
- Approach the exam with greater confidence.

We recommend using this book not as a stand-alone study tool, but alongside other resources like flashcards, textbooks, or hands-on training. For best results, we recommend working through each question, reflecting on the explanation provided, and revisiting the topics that challenge you most.

Remember: successful test preparation isn't about getting every question right the first time, it's about learning from your mistakes and improving over time. Stay focused, trust the process, and know that every page you turn brings you closer to success.

Let's begin.

How to Use This Guide

This guide is designed to help you study more effectively and approach your exam with confidence. Whether you're reviewing for the first time or doing a final refresh, here's how to get the most out of your Examzify study guide:

1. Start with a Diagnostic Review

Skim through the questions to get a sense of what you know and what you need to focus on. Your goal is to identify knowledge gaps early.

2. Study in Short, Focused Sessions

Break your study time into manageable blocks (e.g. 30 - 45 minutes). Review a handful of questions, reflect on the explanations.

3. Learn from the Explanations

After answering a question, always read the explanation, even if you got it right. It reinforces key points, corrects misunderstandings, and teaches subtle distinctions between similar answers.

4. Track Your Progress

Use bookmarks or notes (if reading digitally) to mark difficult questions. Revisit these regularly and track improvements over time.

5. Simulate the Real Exam

Once you're comfortable, try taking a full set of questions without pausing. Set a timer and simulate test-day conditions to build confidence and time management skills.

6. Repeat and Review

Don't just study once, repetition builds retention. Re-attempt questions after a few days and revisit explanations to reinforce learning. Pair this guide with other Examzify tools like flashcards, and digital practice tests to strengthen your preparation across formats.

There's no single right way to study, but consistent, thoughtful effort always wins. Use this guide flexibly, adapt the tips above to fit your pace and learning style. You've got this!

Questions

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- 1. During which process is GTP converted into ATP?**
 - A. Substrate-level phosphorylation**
 - B. Oxidative phosphorylation**
 - C. Glycolysis**
 - D. Cycling of the TCA cycle**

- 2. During the citric acid cycle, which molecule is primarily responsible for transporting electrons?**
 - A. NAD⁺**
 - B. FADH₂**
 - C. ATP**
 - D. Citrate**

- 3. What type of reaction occurs when succinate is converted to fumarate in the Citric Acid Cycle?**
 - A. A hydration reaction**
 - B. A dehydrogenation reaction**
 - C. A condensation reaction**
 - D. An oxidation reaction**

- 4. What is the significance of acetyl-CoA in cellular respiration?**
 - A. It acts as an electron carrier**
 - B. It is a byproduct of glycolysis**
 - C. It enters the Citric Acid Cycle as a metabolite**
 - D. It is used for fatty acid synthesis only**

- 5. What type of reaction involves the conversion of isocitrate to alpha-ketoglutarate?**
 - A. Hydration reaction**
 - B. Decarboxylation reaction**
 - C. Oxidation reaction**
 - D. Dehydrogenation reaction**

- 6. Which intermediate can lead to the production of amino acids through transamination?**
- A. Citrate**
 - B. Malate**
 - C. Oxaloacetate**
 - D. Succinyl-CoA**
- 7. Which compounds are required for the synthesis of citrate?**
- A. Acetyl-CoA and oxaloacetate**
 - B. Malate and fumarate**
 - C. Pyruvate and succinate**
 - D. Isocitrate and alpha-ketoglutarate**
- 8. What provides the energy for substrate-level phosphorylation of GDP in the conversion of succinyl CoA to succinate?**
- A. Breaking the thioester bond**
 - B. Oxidative phosphorylation**
 - C. ATP hydrolysis**
 - D. Release of CO₂**
- 9. What role does CoA play in the Citric Acid Cycle?**
- A. It promotes the production of ATP**
 - B. It is involved in the formation of acetyl-CoA**
 - C. It acts as an electron carrier**
 - D. It assists in glucose phosphorylation**
- 10. What is the source of electrons for the electron transport chain that follows the Citric Acid Cycle?**
- A. GTP produced in the cycle**
 - B. NADH and FADH₂ generated in the cycle**
 - C. ATP produced in glycolysis**
 - D. Acetyl-CoA entering the cycle**

Answers

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1. A
2. A
3. B
4. C
5. B
6. C
7. A
8. A
9. B
10. B

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Explanations

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1. During which process is GTP converted into ATP?

A. Substrate-level phosphorylation

B. Oxidative phosphorylation

C. Glycolysis

D. Cycling of the TCA cycle

The conversion of GTP into ATP occurs during substrate-level phosphorylation. This process involves the direct transfer of a phosphate group to ADP from a high-energy substrate, such as GTP, resulting in the synthesis of ATP. In the context of the Citric Acid Cycle, one of the key steps involves the conversion of succinyl-CoA to succinate, in which a high-energy thioester bond is broken, releasing energy that is used to convert GDP (guanosine diphosphate) into GTP, and subsequently, GTP can be used to generate ATP directly. This mechanism contrasts with oxidative phosphorylation, which relies on the electron transport chain and chemiosmotic coupling to generate ATP, as well as glycolysis, which primarily produces ATP and NADH through substrate-level phosphorylation and does not directly involve the conversion of GTP. The cycling of the TCA cycle refers to the entire sequence of reactions and does not specifically focus on the direct conversion of GTP to ATP, making substrate-level phosphorylation the most accurate choice for this particular process.

2. During the citric acid cycle, which molecule is primarily responsible for transporting electrons?

A. NAD⁺

B. FADH₂

C. ATP

D. Citrate

The correct answer highlights the role of NAD⁺ as a key electron carrier in the citric acid cycle. Throughout this metabolic pathway, NAD⁺ acts as an oxidizing agent, meaning it accepts electrons during various reactions. When NAD⁺ picks up electrons, it is reduced to NADH, which then carries these high-energy electrons to the electron transport chain. There, NADH plays a crucial role in oxidative phosphorylation, ultimately contributing to ATP production. In contrast, while FADH₂ also serves as an electron carrier in the cycle, it is usually generated from specific reactions involving succinate and is not primarily responsible for electron transport overall in the cycle. ATP, although vital for energy transfer within the cell, does not function in electron transport. Citrate, on the other hand, is an important intermediate of the cycle but does not participate in electron transfer. Understanding these roles clarifies why NAD⁺ is recognized as the primary electron transporting molecule within the citric acid cycle.

3. What type of reaction occurs when succinate is converted to fumarate in the Citric Acid Cycle?

A. A hydration reaction

B. A dehydrogenation reaction

C. A condensation reaction

D. An oxidation reaction

The conversion of succinate to fumarate in the Citric Acid Cycle is classified as a dehydrogenation reaction. This type of reaction involves the removal of hydrogen atoms from a molecule, which in this context results in the conversion of the saturated four-carbon compound succinate into the unsaturated four-carbon compound fumarate. During this transformation, succinate loses two hydrogen atoms, which are transferred to a molecule of FAD (flavin adenine dinucleotide), reducing it to FADH₂. This step is crucial because the electron carriers are integral to the pathway, facilitating the subsequent steps in the Citric Acid Cycle by contributing to the electron transport chain where ATP is ultimately produced. Thus, identifying this reaction as a dehydrogenation emphasizes the role of electron transfer and oxidation-reduction processes in the cycle.

4. What is the significance of acetyl-CoA in cellular respiration?

A. It acts as an electron carrier

B. It is a byproduct of glycolysis

C. It enters the Citric Acid Cycle as a metabolite

D. It is used for fatty acid synthesis only

Acetyl-CoA plays a crucial role in cellular respiration, primarily as it enters the Citric Acid Cycle (also known as the Krebs Cycle or TCA Cycle) as a metabolite. This entry marks a vital step in energy metabolism, as acetyl-CoA is derived from the breakdown of carbohydrates, fats, and proteins. Once formed, acetyl-CoA combines with oxaloacetate to produce citrate, initiating a series of reactions in the cycle that ultimately leads to the production of electron carriers such as NADH and FADH₂, which are pivotal for ATP generation through oxidative phosphorylation. In the context of cellular respiration, acetyl-CoA serves as a key link between various metabolic pathways and the Citric Acid Cycle, underscoring its centrality in energy production and biosynthetic reactions.

5. What type of reaction involves the conversion of isocitrate to alpha-ketoglutarate?

- A. Hydration reaction**
- B. Decarboxylation reaction**
- C. Oxidation reaction**
- D. Dehydrogenation reaction**

The conversion of isocitrate to alpha-ketoglutarate is a decarboxylation reaction. In this step of the citric acid cycle, isocitrate undergoes a structural transformation where a carboxyl group is removed and released as carbon dioxide (CO₂). This process reduces the carbon skeleton of the molecule, resulting in the formation of alpha-ketoglutarate. Additionally, this reaction is also coupled with the reduction of NAD⁺ to NADH, indicating that it involves both decarboxylation and oxidation processes, but the defining feature of this transformation is the release of the carboxyl group, which characterizes it as a decarboxylation reaction. The removal of CO₂ is crucial, as it transforms the six-carbon isocitrate into a five-carbon alpha-ketoglutarate. Understanding this reaction is fundamental because it links the citric acid cycle to the broader metabolic pathways of cellular respiration.

6. Which intermediate can lead to the production of amino acids through transamination?

- A. Citrate**
- B. Malate**
- C. Oxaloacetate**
- D. Succinyl-CoA**

Oxaloacetate is a key intermediate in the citric acid cycle that plays a crucial role in amino acid synthesis through a process known as transamination. During transamination, an amino group is transferred to a keto acid, which allows for the formation of an amino acid. Specifically, oxaloacetate can react with an amino group from glutamate to form aspartate, an important amino acid. This interaction underscores oxaloacetate's significance as a precursor in the biosynthesis of several amino acids, thereby linking the citric acid cycle to nitrogen metabolism. The other intermediates mentioned do not directly participate in the transamination reactions necessary for amino acid production. Citrate, while important in the cycle, primarily functions in energy production and fatty acid synthesis. Malate is involved in the cycle primarily as an intermediate, without a direct role in amino acid transamination. Succinyl-CoA is also integral to energy production and the synthesis of heme but does not directly contribute to amino acid formation through transamination. Thus, oxaloacetate stands out for its role in facilitating the synthesis of amino acids.

7. Which compounds are required for the synthesis of citrate?

- A. Acetyl-CoA and oxaloacetate**
- B. Malate and fumarate**
- C. Pyruvate and succinate**
- D. Isocitrate and alpha-ketoglutarate**

The synthesis of citrate in the citric acid cycle begins with the condensation of acetyl-CoA and oxaloacetate. Acetyl-CoA, a two-carbon molecule derived from carbohydrates, fats, and proteins, readily combines with the four-carbon molecule oxaloacetate to form citrate, a six-carbon compound. This reaction is catalyzed by the enzyme citrate synthase. This process marks the initial step of the citric acid cycle, where the energy from the high-energy thioester bond of acetyl-CoA is utilized to drive the reaction forward, allowing for the continuation of the metabolic pathway. The formation of citrate is a crucial step that leads to the subsequent series of reactions, ultimately resulting in the generation of energy carriers such as NADH and FADH₂, which are vital for cellular respiration. The other options do not involve the correct substrates that are necessary for the formation of citrate. Malate and fumarate, pyruvate and succinate, as well as isocitrate and alpha-ketoglutarate, correspond to different reactions or intermediate stages within the cycle, but they do not participate directly in the initial synthesis of citrate from acetyl-CoA and oxaloacetate.

8. What provides the energy for substrate-level phosphorylation of GDP in the conversion of succinyl CoA to succinate?

- A. Breaking the thioester bond**
- B. Oxidative phosphorylation**
- C. ATP hydrolysis**
- D. Release of CO₂**

The correct answer is based on the biochemical process of converting succinyl CoA to succinate within the Citric Acid Cycle. In this reaction, the high-energy thioester bond present in succinyl CoA is broken. This bond is energetically rich, and the energy released during its cleavage is utilized to drive the phosphorylation of GDP to form GTP, a process known as substrate-level phosphorylation. When the thioester bond is broken, it creates a more stable product, succinate, while providing enough energy to facilitate the addition of an inorganic phosphate to GDP, thereby synthesizing GTP. This is a classic example of how the energy contained in certain molecular bonds, specifically thioester bonds in this case, is harnessed to produce a high-energy molecule during metabolic processes. The other options do not apply directly to this specific mechanism. Oxidative phosphorylation, for example, is associated with the electron transport chain and does not take place during this step of the Citric Acid Cycle. ATP hydrolysis can provide energy in other contexts, but it is not the primary driver for the phosphorylation of GDP in this reaction. The release of CO₂ does occur during the conversion of succinyl CoA to succinate, but it

9. What role does CoA play in the Citric Acid Cycle?

- A. It promotes the production of ATP
- B. It is involved in the formation of acetyl-CoA**
- C. It acts as an electron carrier
- D. It assists in glucose phosphorylation

Coenzyme A (CoA) plays a crucial role in the Citric Acid Cycle by facilitating the formation of acetyl-CoA. This step is fundamental because acetyl-CoA is the molecule that enters the Citric Acid Cycle after being generated from the breakdown of carbohydrates, fats, and proteins. When pyruvate, for example, is oxidatively decarboxylated in the presence of CoA, it is transformed into acetyl-CoA, releasing carbon dioxide in the process. This conversion enables the subsequent entry of acetyl-CoA into the cycle, where it combines with oxaloacetate to form citrate, allowing the cycle to continue and ultimately contribute to energy production. The other roles listed in the options do not directly relate to CoA's primary function in this context. While ATP production is a key outcome of the Citric Acid Cycle, CoA itself does not promote ATP production directly. Similarly, CoA does not act as an electron carrier; that role is primarily fulfilled by other molecules like NADH and FADH₂, which are produced during the cycle. Lastly, glucose phosphorylation pertains to earlier metabolic processes, such as glycolysis, rather than the role of CoA within the Citric Acid Cycle.

10. What is the source of electrons for the electron transport chain that follows the Citric Acid Cycle?

- A. GTP produced in the cycle
- B. NADH and FADH₂ generated in the cycle**
- C. ATP produced in glycolysis
- D. Acetyl-CoA entering the cycle

The source of electrons for the electron transport chain following the Citric Acid Cycle is primarily the NADH and FADH₂ that are generated during the cycle. As the citric acid cycle proceeds, various reactions occur that facilitate the oxidation of acetyl-CoA, leading to the reduction of NAD⁺ to NADH and FAD to FADH₂. These reduced cofactors—NADH and FADH₂—carry high-energy electrons that are crucial for the electron transport chain. Once inside the mitochondria, NADH and FADH₂ donate their electrons to the electron transport chain, initiating a series of redox reactions that ultimately result in the production of ATP through oxidative phosphorylation. This process not only utilizes the high-energy electrons but also contributes to the proton gradient across the mitochondrial membrane, which is essential for ATP synthesis by ATP synthase. In contrast, GTP produced in the cycle serves as an energy currency but does not directly contribute electrons for the electron transport chain. ATP produced in glycolysis, while important for energy transfer within the cell, is not a direct source of electrons for the chain. Acetyl-CoA, although vital for entering the citric acid cycle, is not involved in electron transport as it gets converted

Next Steps

Congratulations on reaching the final section of this guide. You've taken a meaningful step toward passing your certification exam and advancing your career.

As you continue preparing, remember that consistent practice, review, and self-reflection are key to success. Make time to revisit difficult topics, simulate exam conditions, and track your progress along the way.

If you need help, have suggestions, or want to share feedback, we'd love to hear from you. Reach out to our team at hello@examzify.com.

Or visit your dedicated course page for more study tools and resources:

<https://thecitricacidcycle.examzify.com>

We wish you the very best on your exam journey. You've got this!

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