

API 571 Certification (Corrosion & Materials) 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. Which alloy type is enhanced for resistance to dealloying?**
 - A. Phosphorus-inhibited alloys**
 - B. Chromium nickel alloys**
 - C. Ceramic alloys**
 - D. Silicon-containing alloys**

- 2. Which alloy type is often recommended for marine applications due to its corrosion resistance?**
 - A. Copper alloys**
 - B. Duplex stainless steel**
 - C. Carbon steel**
 - D. Aluminum alloys**

- 3. What process can prevent dealuminification in aluminum bronze?**
 - A. Surface coating**
 - B. Heat treating**
 - C. Cold working**
 - D. Galvanization**

- 4. What type of steel shows better resistance in low pressure oxygen environments?**
 - A. Carbon Steel**
 - B. Low Alloy Steel**
 - C. Stainless Steel**
 - D. Nodular Cast Iron**

- 5. What does the term "corrosion rate" refer to?**
 - A. The amount of material lost per year**
 - B. The thickness of material over time**
 - C. The speed at which a material deteriorates due to corrosion**
 - D. The type of corrosion occurring in a specific environment**

6. Which factor mainly affects older carbon steels with large grain sizes?

- A. Strain hardening**
- B. Strain aging**
- C. Temper embrittlement**
- D. Creep rupture**

7. Which materials are preferred when the O₂ concentration is below 20ppb?

- A. 400 series stainless and Alloy C-276**
- B. CS and LAS**
- C. 300 series stainless and Alloy 20**
- D. 316L SS and Alloy 825**

8. Which materials are known to be affected by liquid metal embrittlement, except as noted?

- A. High-strength steels**
- B. Copper and aluminum alloys**
- C. Titanium alloys**
- D. All of the above**

9. What are localized attacks in corrosion?

- A. Uniform corrosion across a surface**
- B. Corrosion occurring at widely distributed areas**
- C. Localized degradation often due to electrochemical reactions**
- D. Corrosion that only affects non-metallic substances**

10. One of the key reasons to understand materials' corrosion is to:

- A. Maximize profit only**
- B. Extend the lifecycle and safety of infrastructures**
- C. Limit advancements in material science**
- D. Reduce the weight of materials for better performance**

Answers

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

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Explanations

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1. Which alloy type is enhanced for resistance to dealloying?

- A. Phosphorus-inhibited alloys**
- B. Chromium nickel alloys**
- C. Ceramic alloys**
- D. Silicon-containing alloys**

Phosphorus-inhibited alloys are specifically designed to improve their resistance to dealloying, a form of corrosion where one metal is leached from the alloy, potentially leading to structural weakening. The addition of phosphorus modifies the microstructure and enhances the corrosion resistance of the alloy, particularly in environments where dealloying might occur, such as in certain chloride-rich environments. In comparison, while chromium nickel alloys can offer good corrosion resistance, they are not specifically tailored for dealloying resistance as phosphorus-inhibited alloys are. Ceramic alloys primarily focus on different properties, such as high heat stability and hardness, rather than dealloying resistance. Silicon-containing alloys can have some desirable properties, but they are also not primarily developed for dealloying resistance. Thus, phosphorus-inhibited alloys are the most effective choice for enhancing resistance to this particular type of corrosion.

2. Which alloy type is often recommended for marine applications due to its corrosion resistance?

- A. Copper alloys**
- B. Duplex stainless steel**
- C. Carbon steel**
- D. Aluminum alloys**

Duplex stainless steel is specifically designed to provide excellent corrosion resistance, making it a popular choice for marine applications. The combination of both austenitic and ferritic microstructures in duplex stainless steel offers superior strength and resistance to various forms of corrosion, including pitting and crevice corrosion, which are particularly concerning in marine environments where exposure to saltwater is common. This alloy type typically contains a higher concentration of chromium and molybdenum compared to standard stainless steels, which enhances its ability to withstand aggressive corrosive media. The dual-phase structure gives duplex stainless steels a high resistance to stress corrosion cracking, an important factor in marine settings where tensile stresses and corrosive environments can co-exist. In contrast, while copper alloys and aluminum alloys do have certain corrosion-resistant properties, they may not provide the same level of protection and strength as duplex stainless steel under severe marine conditions. Carbon steel, on the other hand, is prone to rust and corrosion unless it is specially treated or coated, making it ill-suited for marine applications.

3. What process can prevent dealuminification in aluminum bronze?

- A. Surface coating**
- B. Heat treating**
- C. Cold working**
- D. Galvanization**

Preventing dealuminification in aluminum bronze involves addressing the susceptibility of the alloy to this form of corrosion, particularly in environments that contain chlorides, which can lead to the preferential leaching of aluminum from the alloy. Heat treating is an effective method for reducing the likelihood of dealuminification. The process typically involves heating the aluminum bronze alloy to a specific temperature and then cooling it at a controlled rate. This treatment alters the microstructure of the alloy, improving its resistance to corrosion and enhancing its mechanical properties. By homogenizing the alloy and minimizing the segregation of elements, heat treating can significantly reduce the areas in which preferential corrosion can occur, thus mitigating the risk of dealuminification. While surface coating, cold working, and galvanization can also have roles in corrosion prevention strategies, they do not specifically target the dealuminification mechanism in aluminum bronze as effectively as heat treating does. Surface coatings might provide protective barriers but do not change the alloy's inherent susceptibility. Cold working may inadvertently lead to increased stress concentrations, promoting corrosion in some cases. Galvanization, which involves applying a zinc coating, is primarily a strategy for ferrous materials and does not pertain directly to aluminum bronze. Hence, heat treating emerges as the most suitable option for preventing dealuminification.

4. What type of steel shows better resistance in low pressure oxygen environments?

- A. Carbon Steel**
- B. Low Alloy Steel**
- C. Stainless Steel**
- D. Nodular Cast Iron**

Stainless steel is known for its excellent resistance to corrosion, particularly in environments where oxygen is present, including low-pressure oxygen atmospheres. The inherent properties of stainless steel, such as its chromium content, lead to the formation of a passive oxide layer that protects the underlying metal from oxidation and other forms of corrosion. This makes stainless steel particularly suitable for applications involving oxygen exposure. Moreover, stainless steel's ability to resist localized corrosion, such as pitting and crevice corrosion, enhances its performance in situations where oxygen is present, compared to other types of steel. This characteristic is especially valuable in processes involving oxygen-rich conditions, as the integrity of components is crucial for safety and operational reliability. While other materials like carbon steel, low alloy steel, and nodular cast iron can be susceptible to oxidation and corrosion in oxygen environments, they do not possess the same level of protective properties as stainless steel. This distinction makes stainless steel the preferred choice for low-pressure oxygen applications.

5. What does the term "corrosion rate" refer to?

- A. The amount of material lost per year
- B. The thickness of material over time
- C. The speed at which a material deteriorates due to corrosion**
- D. The type of corrosion occurring in a specific environment

The term "corrosion rate" refers to the speed at which a material deteriorates due to corrosion. It is typically expressed in units such as millimeters per year (mm/year) or inches per year (in/year). This measure is crucial for understanding how quickly a material, like metal, is losing integrity due to corrosive processes, allowing engineers and maintenance personnel to predict the lifespan of structural components and plan for replacements or repairs. By monitoring the corrosion rate, facilities can implement appropriate corrosion control measures to prolong the service life of equipment and ensure safety. While the amount of material lost per year is related to the corrosion rate, it does not fully encapsulate the concept of speed in the context of deterioration. Similarly, thickness over time reflects changes but doesn't directly define the rate. The type of corrosion occurring, while important for understanding the mechanisms involved, does not speak to the speed of material loss. Therefore, understanding the corrosion rate is essential for effective material selection and maintenance planning in various environments.

6. Which factor mainly affects older carbon steels with large grain sizes?

- A. Strain hardening
- B. Strain aging**
- C. Temper embrittlement
- D. Creep rupture

Strain aging is the correct choice because it specifically pertains to the effects that occur in older carbon steels, particularly those with large grain sizes. This phenomenon arises when dislocations in the metal's crystal structure interact with impurities or solute atoms, resulting in a further increase in strength and hardness, but at the cost of ductility. In older carbon steels, which may have undergone processes that lead to larger grain sizes, the performance under stress can be significantly impacted by strain aging. As these steels age, they can exhibit increased brittleness due to the redistribution of alloying elements during this process, which ultimately can lead to failures in structural integrity. This explanation places importance on the specific relationship between microstructural features like grain size and the susceptibility to strain aging, which is highly relevant for understanding the behavior of older carbon steels in applications where strength and ductility are paramount.

7. Which materials are preferred when the O₂ concentration is below 20ppb?

- A. 400 series stainless and Alloy C-276**
- B. CS and LAS**
- C. 300 series stainless and Alloy 20**
- D. 316L SS and Alloy 825**

In environments where the oxygen concentration is below 20 parts per billion (ppb), carbon steel (CS) and low-alloy steel (LAS) become preferred materials due to their specific corrosion resistance characteristics and cost-effectiveness. At such low oxygen levels, these materials can generally handle the corrosive environment effectively without significant risk of pitting or crevice corrosion, which can be issues in environments with higher levels of oxygen or chlorides. Low oxygen concentrations reduce the likelihood of oxidizing conditions that may cause corrosion in more reactive materials. Carbon steel is particularly useful in a variety of applications because it offers good strength and ductility. Low-alloy steel can also provide enhanced strength and toughness while maintaining good corrosion resistance, making these alloys suitable for environments where minimal corrosive activity is present. In contrast, higher-grade stainless steels and nickel-based alloys might be unnecessarily expensive and could introduce other issues, such as sensitization or intergranular corrosion in certain conditions. Therefore, the choice of carbon steel and low-alloy steel aligns best with the requirement for durability and practicality in low oxygen scenarios.

8. Which materials are known to be affected by liquid metal embrittlement, except as noted?

- A. High-strength steels**
- B. Copper and aluminum alloys**
- C. Titanium alloys**
- D. All of the above**

Liquid metal embrittlement is a phenomenon where certain metals become brittle and lose their ductility when they come into contact with liquid metals, particularly at elevated temperatures. High-strength steels, copper and aluminum alloys, and titanium alloys are all known to be susceptible to this form of embrittlement under certain conditions. High-strength steels are particularly vulnerable because the presence of liquid metals can lead to the diffusion of liquid into the grain boundaries, which enhances the likelihood of brittle fracture under tensile stress. This is critical in applications where the mechanical integrity of steel components is essential. Copper and aluminum alloys can also suffer from the effects of liquid metal embrittlement, especially when exposed to molten zinc or lead. The alloying elements and the solid solution can be disrupted, leading to deterioration in mechanical properties. Titanium alloys can experience liquid metal embrittlement due to their high reactivity and the narrow temperature range in which they are susceptible. Specifically, interactions with elements like mercury can significantly affect the microstructure and integrity of titanium alloys. The option stating "all of the above" accurately encompasses these materials, highlighting the broad impact of liquid metal embrittlement across various high-performance alloys in different applications. Therefore, recognizing the susceptibility of these materials is crucial for engineers and material scientists.

9. What are localized attacks in corrosion?

- A. Uniform corrosion across a surface
- B. Corrosion occurring at widely distributed areas
- C. Localized degradation often due to electrochemical reactions**
- D. Corrosion that only affects non-metallic substances

Localized attacks in corrosion refer to specific areas on a material that experience significant degradation, often due to localized electrochemical reactions. This type of corrosion occurs when there are variations in the environmental conditions or material properties at certain points on the surface, leading to the formation of corrosion cells. Factors such as differences in moisture, temperature, or the presence of aggressive ions can cause these cells to develop, resulting in pitting, crevice corrosion, or other forms of attack that are concentrated in a limited area rather than spread uniformly across the material. For instance, in the case of pitting corrosion, small pits can form on the surface, and even a few pits can lead to catastrophic failure of the material over time if not addressed. Understanding localized corrosion is crucial because it can lead to severe damage that may not be immediately evident, making it important for maintenance strategies and material selection in various environments.

10. One of the key reasons to understand materials' corrosion is to:

- A. Maximize profit only
- B. Extend the lifecycle and safety of infrastructures**
- C. Limit advancements in material science
- D. Reduce the weight of materials for better performance

Understanding materials' corrosion is crucial for extending the lifecycle and safety of infrastructures. Corrosion can lead to significant degradation of materials over time, resulting in structural failures, costly repairs, and potential safety hazards. By gaining insights into how different materials react to their environments—such as moisture, chemicals, and temperature variations—engineers and materials scientists can make informed decisions about material selection, protective coatings, and maintenance strategies. This proactive approach not only extends the lifespan of infrastructure but also ensures that safety standards are upheld, preventing accidents and ensuring reliability in critical systems. Focusing on maximizing profit or limiting advancements in material science does not address the fundamental need to maintain safety and functionality in infrastructure. Similarly, while reducing the weight of materials can enhance performance in certain applications, the primary concern with corrosion is its impact on longevity and safety.

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://api-571.examzify.com>

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

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