

NATIONAL COUNCIL OF EXAMINERS FOR ENGINEERING AND SURVEYING (NCEES) FUNDAMENTALS OF ENGINEERING (FE) CHEMICAL PRACTICE EXAM (SAMPLE)

STUDY GUIDE



SAMPLE STUDY GUIDE WITH LIMITED QUESTIONS

VISIT US ONLINE FOR
THE FULL VERSION STUDY GUIDE

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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. What is the kinetic energy (KE) formula?

- A. $KE = mv^2$
- B. $KE = 1/2m^2v$
- C. $KE = 1/2mv^2$
- D. $KE = mv$

2. What is the primary focus of the ethical hierarchy in engineering?

- A. Maximizing profit for the engineer's firm
- B. Ensuring compliance with the law
- C. Prioritizing the welfare of the clients above all
- D. Promoting the welfare of society and the public

3. In psychrometrics, what does the term "RH" stand for?

- A. Relative Humidity
- B. Real Heat
- C. Resource Heat
- D. Relative Heat

4. What is the formula for calculating total force on a plane surface underwater?

- A. $F = \text{mass} \times \text{gravity}$
- B. $F = (\text{density})(\text{gravitational constant})(\text{height of centroid})(\text{area of plane})$
- C. $F = \text{pressure} \times \text{area}$
- D. $F = \text{density} \times \text{volume} \times \text{height}$

5. Which of the following is the correct formula for the phosphate ion?

- A. $PO_4 +3$
- B. $PO_4 -3$
- C. $PO_3 -3$
- D. $PO_4 0$

6. How do you determine if an element is oxidized or reduced in a redox reaction?
- A. By observing the reactants only
 - B. By analyzing the mass of the products
 - C. By checking the oxidation state of each element
 - D. By measuring the temperature change
7. What is the formula to calculate book value in economics?
- A. Initial cost - total depreciation
 - B. Initial cost + total depreciation
 - C. Total cost - cumulative expenses
 - D. Initial cost - sum of each year's depreciation
8. What is an important aspect of calculating the relationship between distance, velocity, and acceleration?
- A. Velocity is always equal to distance
 - B. Acceleration is the derivative of distance with respect to time
 - C. Distance and acceleration are inversely related
 - D. Velocity is not related to distance
9. A molecular compound typically consists of which types of elements?
- A. A metal and a nonmetal
 - B. Two nonmetals or a compound with hydrogen
 - C. An alkali metal and a noble gas
 - D. An acid and a base
10. How is the magnitude of a vector calculated?
- A. $|V| = V_x + V_y + V_z$
 - B. $|V| = \sqrt{V_x^2 + V_y^2}$
 - C. $|V| = \sqrt{V_x^2 + V_y^2 + V_z^2}$
 - D. $|V| = V_x * V_y * V_z$

Answers

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

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Explanations

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1. What is the kinetic energy (KE) formula?

- A. $KE = mv^2$
- B. $KE = 1/2mv^2v$
- C. $KE = 1/2mv^2$**
- D. $KE = mv$

The formula for kinetic energy is based on the relationship between mass and velocity, which quantifies the energy that an object possesses due to its motion. In the correct formula, kinetic energy is calculated as half the product of the mass of the object and the square of its velocity, represented as $KE = 1/2mv^2$. This formula illustrates that kinetic energy increases with the square of the velocity, meaning that even a small increase in speed results in a significant increase in kinetic energy. Also, it highlights the direct proportionality to mass; as mass increases, so does kinetic energy, provided the velocity remains constant. In contrast, the other formulas do not accurately represent kinetic energy. For example, using the mass squared or just linear velocity does not align with the principles of motion and energy conservation. The mathematical relationship in the correct formula is crucial for accurate calculations in physics and engineering, making this choice the right one for expressing kinetic energy.

2. What is the primary focus of the ethical hierarchy in engineering?

- A. Maximizing profit for the engineer's firm
- B. Ensuring compliance with the law
- C. Prioritizing the welfare of the clients above all
- D. Promoting the welfare of society and the public**

The primary focus of the ethical hierarchy in engineering centers on promoting the welfare of society and the public. This approach emphasizes that engineers have a responsibility not only to their clients and employers but also to the broader community and environment in which they operate. It establishes that the safety, health, and well-being of the public should take precedence in decision-making processes. When engineers adhere to this ethical framework, they ensure that their work contributes positively to society while minimizing harm. This obligation reflects a fundamental principle of engineering ethics, which requires professionals to consider the implications of their designs, projects, and recommendations for the community at large, ultimately leading to sustainable practices and outcomes. While maximizing profit for an engineering firm and ensuring compliance with the law are important considerations, they do not supersede the responsibility engineers have toward public welfare. Similarly, although prioritizing the welfare of clients is crucial, it is vital that client interests do not undermine societal well-being. The ethical hierarchy specifically places societal concerns above individual or organizational interests, making it the cornerstone of responsible engineering practice.

3. In psychrometrics, what does the term "RH" stand for?

- A. Relative Humidity**
- B. Real Heat
- C. Resource Heat
- D. Relative Heat

The term "RH" in psychrometrics stands for Relative Humidity. Relative humidity is a key metric that describes the amount of moisture in the air relative to the maximum amount of moisture that air can hold at a given temperature. It is expressed as a percentage, with 100% indicating that the air is fully saturated with water vapor and cannot hold any more moisture, while 0% would indicate entirely dry air. Understanding relative humidity is essential in fields such as chemical engineering, HVAC design, and meteorology, as it affects comfort levels, material properties, and chemical processes that are sensitive to moisture content. The concept is crucial for analyzing psychrometric charts and understanding the behavior of air and water vapor mixtures in various engineering applications.

4. What is the formula for calculating total force on a plane surface underwater?

- A. $F = \text{mass} \times \text{gravity}$
- B. $F = (\text{density})(\text{gravitational constant})(\text{height of centroid})(\text{area of plane})$**
- C. $F = \text{pressure} \times \text{area}$
- D. $F = \text{density} \times \text{volume} \times \text{height}$

The formula for calculating the total force on a plane surface underwater is derived from the principles of fluid mechanics, specifically hydrostatic pressure. The correct answer establishes that the total force on a submerged plane surface can be calculated using the product of the fluid density, gravitational acceleration, the height of the centroid from the free surface, and the area of the plane. The hydrostatic pressure increases with depth, which is represented in the formula by the term $(\text{density})(\text{gravitational constant})(\text{height of centroid})$. This is important because the pressure exerted by a fluid at rest is proportional to the depth of the fluid above the point of measurement. To break down the components of the formula: - The density represents the mass per unit volume of the fluid. - The gravitational constant accounts for the acceleration due to gravity. - The height of the centroid helps in understanding how deep the center of the surface is submerged. - The area of the plane covers the total surface that the fluid is acting upon. Thus, multiplying these components gives an accurate measure of the total force experienced by the underwater surface, which is essential in engineering applications such as designing dams, underwater structures, or any systems interacting with the fluid environment. Other options provided do not comprehensively represent the calculation needed for

5. Which of the following is the correct formula for the phosphate ion?

- A. PO_4^{+3}
- B. PO_4^{-3}**
- C. PO_3^{-3}
- D. PO_4^0

The phosphate ion is correctly represented by the formula PO_4^{-3} . This indicates that the phosphate ion consists of one phosphorus atom (P) and four oxygen atoms (O), carrying a total negative charge of three. In this formulation, phosphorus is in the center, covalently bonded to four oxygen atoms. The -3 charge signifies that the ion has three more electrons than protons, resulting in its anionic nature. This charge distribution affects the ion's reactivity and interactions with other ions and compounds, which is an important aspect to understand in chemical reactions, especially in biological and environmental contexts. Recognizing the correct charge of the phosphate ion is crucial for understanding how it participates in various compounds, such as in biology where it plays a key role in energy transfer as part of ATP, and in environmental chemistry where it is a significant nutrient contributing to the growth of aquatic plants. The other options present different arrangements or charges that do not accurately represent the phosphate ion. For instance, PO_4^{+3} suggests a positively charged species, which is not typical for phosphate, while PO_3^{-3} indicates a different ion known as phosphite, not phosphate. The formula PO_4^0 implies a neutral charge, which does not correspond to the established identity of

6. How do you determine if an element is oxidized or reduced in a redox reaction?

- A. By observing the reactants only
- B. By analyzing the mass of the products
- C. By checking the oxidation state of each element**
- D. By measuring the temperature change

In a redox reaction, identifying whether an element is oxidized or reduced hinges on the changes in oxidation states of the elements involved. Oxidation refers to the loss of electrons, resulting in an increase in the oxidation state, while reduction involves the gain of electrons, leading to a decrease in the oxidation state. To determine these changes, one must assign oxidation states to each element before and after the reaction. If the oxidation state of an element increases, this indicates that it has been oxidized; conversely, if the oxidation state decreases, that element has been reduced. This systematic approach allows chemists to track electron transfer effectively, which is the fundamental aspect of redox processes. Other methods mentioned, such as observing the reactants or analyzing product mass, do not directly provide insight into the electron transfer or the changes in oxidation states, making them insufficient for determining oxidation and reduction in a redox reaction. Measuring temperature change may indicate energy changes in the reaction but does not correlate to the redox status of the elements involved. Hence, the most reliable method is checking the oxidation state of each element.

7. What is the formula to calculate book value in economics?

- A. Initial cost - total depreciation
- B. Initial cost + total depreciation
- C. Total cost - cumulative expenses
- D. Initial cost - sum of each year's depreciation**

The correct approach to calculate book value in economics is derived from the principles of asset depreciation. When assessing the book value of an asset, one typically starts with the initial cost of the asset and adjusts for the total depreciation that has occurred over time. Option D expresses this by stating that the book value is determined by the initial cost minus the sum of each year's depreciation. This method correctly accounts for the annual depreciation that reflects the asset's reduction in value over its useful life. To elaborate, depreciation is a systematic allocation of the cost of a tangible asset over its useful life. As each year passes and depreciation is recorded, the book value of the asset is adjusted downwards, thereby giving a more accurate reflection of its current worth on the books of the company. Other choices do not accurately represent the calculation for book value. For example, adding total depreciation (as suggested in one of the options) does not appropriately reflect the decrease in an asset's value, hence it would not yield the correct book value.

8. What is an important aspect of calculating the relationship between distance, velocity, and acceleration?

- A. Velocity is always equal to distance
- B. Acceleration is the derivative of distance with respect to time**
- C. Distance and acceleration are inversely related
- D. Velocity is not related to distance

The correct answer centers on the definition and mathematical relationship between distance, velocity, and acceleration in kinematics. Acceleration, which describes how the velocity of an object changes over time, is indeed the derivative of velocity; in a more foundational sense, it can be expressed as the second derivative of distance with respect to time. This reflects how a change in the distance traveled over a period of time produces a change in velocity, which itself can be an indicator of acceleration. Understanding this relationship is crucial, particularly in various applications across physics and engineering, where calculating motion parameters can inform everything from machinery design to transportation systems. By differentiating the distance function over time, one obtains velocity, and differentiating velocity again gives acceleration. This fundamental concept governs many principles of motion analysis and allows engineers to apply mathematical models to predict behavior under various conditions. In contrast, the other statements do not accurately convey the correct relationships or definitions within this context, thereby reinforcing the significance of option B in the study of motion.

9. A molecular compound typically consists of which types of elements?

- A. A metal and a nonmetal
- B. Two nonmetals or a compound with hydrogen**
- C. An alkali metal and a noble gas
- D. An acid and a base

A molecular compound is primarily formed by the sharing of electrons between two nonmetals. This concept stems from the nature of chemical bonding; nonmetals tend to have similar electronegativities, allowing them to form covalent bonds rather than transferring electrons as seen in ionic compounds. In many cases, compounds that include hydrogen are also considered molecular, particularly when hydrogen bonds with nonmetals like oxygen or nitrogen to form molecules like water (H_2O) or ammonia (NH_3). This bonding through the shared electrons defines the molecular nature of these compounds, which usually consist of discrete molecules with specific arrangements of atoms. Hence, the defining characteristic of molecular compounds is the presence of two nonmetals or hydrogen bonded to a nonmetal, making this option the most accurate description of the types of elements that typically comprise a molecular compound.

10. How is the magnitude of a vector calculated?

- A. $|V| = V_x + V_y + V_z$
- B. $|V| = \sqrt{V_x^2 + V_y^2}$
- C. $|V| = \sqrt{V_x^2 + V_y^2 + V_z^2}$
- D. $|V| = V_x * V_y * V_z$

The magnitude of a vector is determined by using the formula that accounts for all components of the vector in each dimensional space. In a three-dimensional Cartesian coordinate system, a vector V is often expressed in terms of its components along the x , y , and z axes, denoted as V_x , V_y , and V_z . To find the magnitude $|V|$ of the vector, the appropriate formula is given by the square root of the sum of the squares of its components. This accounts for the contributions of each direction to the overall length of the vector. Specifically, the calculation involves squaring each component (V_x , V_y , and V_z), summing these squared values, and then taking the square root of the resulting sum: $|V| = \sqrt{V_x^2 + V_y^2 + V_z^2}$. This formulation is derived from the Pythagorean theorem and ensures that the distance represented by the vector is accurately portrayed in space. If we were only considering two-dimensional vectors, the formula would reduce to the case with V_z set to zero, but in three dimensions, all three components must be included to obtain the true magnitude. Thus, the correct choice reflects this comprehensive approach to calculating a vector's magnitude in three-dimensional

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:

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

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