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

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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.

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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!

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Questions

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1. 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

2. What is the standard representation of molar flow rate of the gas in packed towers?

A. Gs

B. Q

C. Ws

D. Cs

3. What is the first step in finding an empirical formula?

A. Assume the compound weighs 50g

B. Assume 100g of the compound and find the amount of moles of each element

C. Divide the total mass by the atomic number

D. Use only the number of atoms in the molecule for calculations

4. What is the primary purpose of using specific terms in steam tables?

A. To represent the mass of steam generated

B. To standardize calculations across different systems

C. To allow for easier total value calculations through multiplication by mass

D. To simplify the understanding of steam properties

5. Which of the following is true about the behavior of gases at STP?

A. Gases occupy different volumes depending on their molecular weight

B. All gases occupy the same volume regardless of their identity

C. Gases do not follow ideal gas laws at STP

D. Gases behave non-ideally under increased pressure

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

A. KE = mv^2

B. KE = 1/2m^2v

C. KE = 1/2mv^2

D. KE = mv

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7. What is the role of the prefixes in naming molecular compounds?

A. Only used on the first element

B. Used on both elements, but not mono on the first

C. Only used on the second element

D. Used only when the elements are in a specific ratio

8. What is the first step to solve a material balance involving a recycle and bypass stream?

A. Perform a component balance around the entire system

B. Perform an overall balance around an envelope that includes the recycle/bypass stream

C. Calculate the individual balance for each stream separately

D. Ignore the bypass stream as it does not affect overall balance

9. What does a positive heat of reaction indicate about the reaction process?

A. The reaction is exothermic

B. The reaction is endothermic

C. The reaction is spontaneous

D. The reaction is at equilibrium

10. What type of bonds are present in ceramics?

A. Covalent bonds

B. Metallic bonds

C. Ionic bonds

D. Van der Waals bonds

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Answers

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

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Explanations

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1. 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.

2. What is the standard representation of molar flow rate of the gas in packed towers?

A. Gs

B. Q

C. Ws

D. Cs

The standard representation of the molar flow rate of gas in packed towers is denoted by Gs. This notation is widely used in chemical engineering, particularly when working with mass transfer operations such as gas absorption, distillation, or any process involving contact between gas and liquid phases in a packed column. Molar flow rate describes the quantity of substance that is moving through a system per unit time, often expressed in units such as moles per hour or kilograms per second, depending on the context. In packed towers, where the interactions between gas and liquid are critical for the process efficiency, using a standardized notation helps in maintaining consistency and clarity in calculations and process design. In contrast, other notations represent different parameters: Q typically refers to volumetric flow rate, Ws is often used for the molar flow rate of solids, and Cs usually denotes concentration. These terms, while relevant in the broader context of chemical engineering, do not specifically pertain to the molar flow rate of gases in packed towers, which is why Gs is the correct representation in this scenario.

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3. What is the first step in finding an empirical formula?

A. Assume the compound weighs 50g

B. Assume 100g of the compound and find the amount of moles of each element

C. Divide the total mass by the atomic number

D. Use only the number of atoms in the molecule for calculations

The first step in finding an empirical formula involves assuming a specific amount of the compound, typically 100 grams. This assumption allows for straightforward calculations of the number of moles of each element based on their individual atomic masses. By using 100 grams, the mass percentages of the elements are directly interpreted as grams, simplifying the conversion to moles through division by their respective atomic weights. Once the moles of each element are calculated, the next steps involve determining the simplest whole number ratio of these moles, which ultimately forms the empirical formula. This method is preferred because it standardizes the calculations and avoids complications that might arise from variable sample weights or compositions. Other options either do not facilitate the straightforward calculation needed or employ methods that are not standard practice for deriving empirical formulas. For example, assuming a different mass than 100g or using only the number of atoms without accounting for their respective masses would not provide an accurate empirical formula representation.

4. What is the primary purpose of using specific terms in steam tables?

A. To represent the mass of steam generated

B. To standardize calculations across different systems

C. To allow for easier total value calculations through multiplication by mass

D. To simplify the understanding of steam properties

Using specific terms in steam tables primarily serves to facilitate easier total value calculations through multiplication by mass. This is because specific properties—such as specific enthalpy, specific volume, and specific entropy—are defined per unit mass of the substance, typically expressed in units like kJ/kg. This allows engineers and scientists to calculate the total energy, volume, or entropy for a given mass of steam simply by multiplying the specific property by the total mass. For example, if an engineer knows the specific enthalpy of steam at a certain pressure and temperature, they can easily determine the total enthalpy of a steam mass flow rate by multiplying the specific enthalpy value by the mass flow rate. This relationship is fundamental in thermodynamic calculations and helps streamline processes in various applications, including power generation and heat exchange systems. This use of specific terms aids in minimizing errors in calculations and ensures consistent results across different applications, which is why the efficiency of using specific values is crucial in the field of chemical engineering. Other options might touch on related aspects of steam tables, but the core utility revolves around the simplicity and accuracy it provides when scaling up from unit properties to total system properties.

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5. Which of the following is true about the behavior of gases at STP?

A. Gases occupy different volumes depending on their molecular weight

B. All gases occupy the same volume regardless of their identity

C. Gases do not follow ideal gas laws at STP

D. Gases behave non-ideally under increased pressure

At standard temperature and pressure (STP), which is defined as 0 degrees Celsius (273.15 K) and 1 atm pressure, one mole of any ideal gas occupies a volume of 22.4 liters. This is derived from the ideal gas law, which states that under these specific conditions, the behavior of gases can be approximated as ideal. Therefore, all gases, regardless of their molecular weight or identity, occupy this same volume when evaluated at STP, exemplifying the fundamental principle of gas behavior. The notion that all gases occupy the same volume highlights the essence of the ideal gas law, where the properties of the gas are considered collectively instead of individually. This principle supports the idea that the volume occupied is a function of temperature and pressure, rather than the characteristics of the individual gas itself. The other options touch on significant aspects of gas behavior, but they do not align with the established characteristics of gases at STP. The variation in gas volume based on molecular weight, the notion that gases do not follow ideal gas laws, and the behavior under increased pressure all pertain to conditions that deviate from ideal behavior, but they do not apply specifically to gases at STP. The behavior of gases at STP is a cornerstone

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

A. KE = mv^2

B. KE = 1/2m^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.

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7. What is the role of the prefixes in naming molecular compounds?

A. Only used on the first element

B. Used on both elements, but not mono on the first

C. Only used on the second element

D. Used only when the elements are in a specific ratio

The role of prefixes in naming molecular compounds is essential for indicating the number of atoms of each element present in the compound. When naming these compounds, prefixes are applied to both elements to specify the quantity of each. The prefixes range from mono- for one, di- for two, tri- for three, and so on. The one exception to this rule is the prefix mono-, which is typically omitted when it is used with the first element in the compound name. For instance, in carbon monoxide (CO), the "mono-" prefix is not used for carbon, whereas it is used for the second element, oxygen, to indicate there is one oxygen atom in the compound. Understanding this system allows for clear communication of molecular composition, ensuring that the names accurately reflect the ratios of the constituent atoms. Hence, the correct application of prefixes is integral to representing the structure and composition of molecular compounds.

8. What is the first step to solve a material balance involving a recycle and bypass stream?

A. Perform a component balance around the entire system

B. Perform an overall balance around an envelope that includes the recycle/bypass stream

C. Calculate the individual balance for each stream separately

D. Ignore the bypass stream as it does not affect overall balance

The first step to solve a material balance involving a recycle and bypass stream is to perform an overall balance around an envelope that includes the recycle/bypass stream. This approach is essential because it allows for a comprehensive view of the system, capturing all inputs, outputs, and the interactions between the recycle and bypass streams. Starting with an envelope around the entire system facilitates the identification of the flow rates and quantities entering and leaving the system. By including both the recycle and bypass streams in this initial analysis, you can accurately account for the material that is being recycled back into the system as well as any material that is being diverted or bypassed. This step is crucial for establishing the basis for more detailed component balances that follow. Once the overall balance is established, further detailed calculations can be conducted for individual components, taking into account how the recycle stream affects the concentrations and flow rates of the various substances in the overall process. This method sets a solid foundation for understanding the dynamics of the system and ensures that you do not overlook any critical interactions caused by recycle or bypassing processes.

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9. What does a positive heat of reaction indicate about the reaction process?

A. The reaction is exothermic

B. The reaction is endothermic

C. The reaction is spontaneous

D. The reaction is at equilibrium

A positive heat of reaction indicates that the reaction absorbs heat from its surroundings, characterizing it as an endothermic reaction. In thermodynamic terms, when a reaction has a positive enthalpy change ($\Delta H > 0$), it means that energy is required for the reaction to proceed. As a result, the system takes in heat, leading to a decrease in the temperature of the surroundings if no additional heat is supplied. This is a fundamental principle in thermochemistry and helps in understanding how energy flows during chemical processes. Endothermic reactions are commonly seen in processes such as melting ice or evaporating water, where energy is needed to break intermolecular forces. Thus, recognizing that a positive heat of reaction signifies an endothermic process is pivotal for predicting how reactions will behave under varying conditions of temperature and pressure.

10. What type of bonds are present in ceramics?

A. Covalent bonds

B. Metallic bonds

C. Ionic bonds

D. Van der Waals bonds

Ceramics are primarily characterized by their ionic and covalent bonding. The correct choice highlights the prevalence of ionic bonds in ceramic materials, which are typically composed of metal and non-metal ions. These ionic bonds form between positively and negatively charged ions, leading to a strong electrostatic attraction that imparts desirable properties to ceramics, such as high melting points, hardness, and chemical stability. In many ceramics, the ionic bonds contribute significantly to the material's structural integrity and durability. For example, in common ceramic materials like alumina (Al_2O_3) and zirconia (ZrO_2), ionic bonding plays a crucial role in maintaining their robust structures. While covalent bonds can also be present in certain ceramics, particularly in materials like silicon nitride, it is the ionic bonding that most truly defines the general classification of ceramics. Metallic bonds, found primarily in metals, are less relevant to ceramic bonding characteristics. Additionally, Van der Waals bonds are weak intermolecular forces that do not contribute significantly to the primary bonding in ceramics. Thus, the focus on ionic bonds effectively captures the essential bonding features of ceramics.

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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://ncees-fe-chemical.examzify.com

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

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