

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

STUDY GUIDE



Prepare with structure. Pass with confidence



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Table of Contents

Copyright	1
Table of Contents	2
Introduction	3
How to Use This Guide	4
Questions	5
Answers	8
Explanations	10
Next Steps	16

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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 standard cycle used for steam power plants?
 - A. Brayton cycle
 - B. Otto cycle
 - C. Rankine cycle
 - D. Ideal gas cycle
2. What is the relationship between spring compression and kinetic energy?
 - A. Increased compression means decreased kinetic energy
 - B. Kinetic energy is unaffected by spring compression
 - C. Max spring compression results in max kinetic energy
 - D. Kinetic energy equals potential energy at max compression
3. When naming ionic compounds, what is the correct order of naming?
 - A. Nonmetal first, then metal
 - B. Metal first, then nonmetal, changing nonmetal's ending to "ide"
 - C. Nonmetal with prefixes followed by the metal
 - D. Metal with prefixes followed by the nonmetal
4. What is an annuity?
 - A. A one-time payment
 - B. A uniform series of payments
 - C. A variable series of payments
 - D. A loan that accrues interest
5. What are the safe minimum and maximum levels for oxygen in the workplace?
 - A. 18.5% min, 22.5% max
 - B. 19.0% min, 23.0% max
 - C. 19.5% min, 23.5% max
 - D. 20.0% min, 24.0% max
6. What is the kinetic energy (KE) formula?
 - A. $KE = mv^2$
 - B. $KE = 1/2m^2v$
 - C. $KE = 1/2mv^2$
 - D. $KE = mv$

7. What can you conclude about the kinetic and potential energy in a closed system?
- A. Kinetic energy can be completely converted to potential energy
 - B. The total energy is always increasing
 - C. Kinetic energy is always less than potential energy
 - D. Potential energy can exist without kinetic energy
8. How can the volume of an object that is floating be determined?
- A. By measuring its dimensions directly
 - B. By setting the weight of the object equal to the buoyant force
 - C. By subtracting the weight of the fluid from the weight of the object
 - D. By using the equation $F = mgh$
9. What does the term 'adiabatic' refer to in thermodynamics?
- A. Constant pressure
 - B. Constant Volume
 - C. Constant Temperature
 - D. Constant Enthalpy
10. What is the significance of understanding the conditions under which the compressibility factor is equal to 1?
- A. It indicates a perfect gas behavior
 - B. It applies only to liquids
 - C. It is irrelevant for real gases
 - D. It questions the use of the ideal gas law

Answers

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

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Explanations

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1. What is the standard cycle used for steam power plants?

- A. Brayton cycle
- B. Otto cycle
- C. Rankine cycle**
- D. Ideal gas cycle

The standard cycle used for steam power plants is the Rankine cycle. This cycle is specifically designed for the conversion of heat into mechanical work, typically through the use of steam. In a steam power plant, water is heated in a boiler to produce steam, which then expands through a turbine, performing work as it drives the turbine and generates electricity. The Rankine cycle consists of four key processes: the heating of the working fluid (water) in the boiler, the expansion of the steam through the turbine, the condensation of the steam back into liquid water in a condenser, and the pumping of the condensed water back to the boiler to repeat the cycle. This cycle is advantageous due to its efficiency in converting thermal energy from fuel into electrical energy, which is why it is commonly utilized in thermal power generation. Understanding the Rankine cycle is crucial for engineers working in energy systems, as it forms the foundation for designing and troubleshooting thermal power plants. It offers insights into thermodynamic principles and real-world applications of heat transfer and energy conversion.

2. What is the relationship between spring compression and kinetic energy?

- A. Increased compression means decreased kinetic energy
- B. Kinetic energy is unaffected by spring compression
- C. Max spring compression results in max kinetic energy
- D. Kinetic energy equals potential energy at max compression**

The relationship between spring compression and kinetic energy is grounded in the concepts of potential energy stored in the spring and kinetic energy of a moving object. When a spring is compressed, it stores mechanical energy in the form of potential energy. As the compression of the spring increases, the potential energy correspondingly increases. At the point of maximum compression, the spring has converted all of its kinetic energy into potential energy. This is when the object associated with the spring has come to a stop (assuming no external forces are acting), meaning the kinetic energy of the object is at its minimum – effectively zero at that instant. Therefore, at maximum compression, the stored potential energy in the spring is equal to the maximum kinetic energy the object had before compression began. As the spring decompresses, this stored potential energy is transformed back into kinetic energy, thus illustrating the conservation of energy principle. Consequently, the statement that kinetic energy equals potential energy at maximum spring compression accurately describes this relationship, confirming that energy transitions between forms during the spring's compression and decompression cycle. This principle is critical in understanding energy transformations and dynamics in mechanical systems.

3. When naming ionic compounds, what is the correct order of naming?

- A. Nonmetal first, then metal
- B. Metal first, then nonmetal, changing nonmetal's ending to "ide"**
- C. Nonmetal with prefixes followed by the metal
- D. Metal with prefixes followed by the nonmetal

The correct naming of ionic compounds follows the convention of naming the metal first followed by the nonmetal, with the nonmetal's name modified to end in "ide." This is a standard practice in chemical nomenclature for ionic compounds, which are formed from the electrostatic attraction between positively charged ions (cations) and negatively charged ions (anions). In ionic compounds, the metal, which typically has a positive charge, is named first to reflect its cationic nature. For example, in sodium chloride (NaCl), sodium is the metal and comes first in the name. The nonmetal follows and has its name altered from its elemental form to end with "ide." In the case of chlorine, it changes to "chloride." This method provides clarity in communication about the composition and charge of the ions involved. Other naming conventions, such as using prefixes or placing nonmetals first, do not apply to ionic compounds and are more suited for molecular (covalent) compounds. This distinction helps avoid confusion and ensures accurate identification of the compound's constituents.

4. What is an annuity?

- A. A one-time payment
- B. A uniform series of payments**
- C. A variable series of payments
- D. A loan that accrues interest

An annuity is defined as a uniform series of payments made at regular intervals over a specified period. This financial product involves either receiving or making a series of payments, typically used in contexts such as retirement savings or loan repayments. The term "uniform" indicates that the payments are consistent in amount and are spaced evenly over time, whether it's monthly, quarterly, or annually. When considering other options, a one-time payment does not represent the concept of an annuity since it involves a single transaction rather than a series of transactions. A variable series of payments does not fit the definition of an annuity either, as this would imply that the payment amounts can change over time, which contradicts the premise of uniform payments. Additionally, a loan that accrues interest describes a different financial mechanism; while it may involve repayments over time, it does not specifically relate to the consistent payment structure that characterizes annuities. Thus, the definition of an annuity as a uniform series of payments is accurate and highlights the key features of this financial concept.

5. What are the safe minimum and maximum levels for oxygen in the workplace?

- A. 18.5% min, 22.5% max
- B. 19.0% min, 23.0% max
- C. 19.5% min, 23.5% max**
- D. 20.0% min, 24.0% max

The safe minimum and maximum levels for oxygen in the workplace are typically defined to ensure a safe breathing environment for workers. The correct choice specifies a minimum oxygen level of 19.5% and a maximum of 23.5%. A minimum level of 19.5% is crucial because oxygen concentrations below this threshold can lead to hypoxia, which results in issues such as impaired cognitive function, reduced physical performance, and in more severe cases, loss of consciousness. This level aligns with established safety standards, such as those from the Occupational Safety and Health Administration (OSHA) and other relevant organizations, which emphasize the importance of maintaining adequate oxygen levels for worker safety. On the upper end, a maximum oxygen level of 23.5% reduces the risk of flammability and helps avoid the dangerous effects that can occur with overly rich oxygen environments. High concentrations of oxygen can significantly enhance the flammability of materials, creating hazards that could lead to fire or explosions. This combination ensures that the oxygen level in the workspace remains within a range that supports health and safety while minimizing risks associated with both low and high oxygen concentrations. Thus, the correct answer provides a scientifically supported and regulatory-compliant range for oxygen levels in the workplace.

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

- A. $KE = mv^2$
- B. $KE = 1/2mv^2$
- 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.

7. What can you conclude about the kinetic and potential energy in a closed system?

A. Kinetic energy can be completely converted to potential energy

B. The total energy is always increasing

C. Kinetic energy is always less than potential energy

D. Potential energy can exist without kinetic energy

In a closed system, the principle of conservation of energy asserts that energy cannot be created or destroyed, only transformed from one form to another. This is particularly relevant when discussing kinetic and potential energy. The correct conclusion is that kinetic energy can be completely converted to potential energy. This transformation can be observed in various physical scenarios, such as the way a pendulum swings. As it moves upward, kinetic energy (due to its motion) is converted into potential energy (due to its height). When the pendulum reaches the peak of its swing, its kinetic energy is momentarily zero, while its potential energy is at a maximum. This ability to convert kinetic energy into potential energy, and vice versa, highlights the interdependence of these forms of energy within the confines of a closed system, where the total amount of mechanical energy remains constant (assuming no energy is lost to friction or air resistance). Therefore, understanding this conversion process is critical for analyzing energy states in system dynamics.

8. How can the volume of an object that is floating be determined?

A. By measuring its dimensions directly

B. By setting the weight of the object equal to the buoyant force

C. By subtracting the weight of the fluid from the weight of the object

D. By using the equation $F = mgh$

To determine the volume of an object that is floating, setting the weight of the object equal to the buoyant force provides a clear method that leverages the principles of buoyancy. When an object is floating, the buoyant force acting on it, which is equal to the weight of the fluid displaced by the object, balances out the weight of the object itself. This relationship can be expressed mathematically: - The buoyant force (F_b) can be calculated using Archimedes' principle, which states that this force is equal to the weight of the fluid displaced by the submerged part of the object. - Therefore, if the weight of the object equals the buoyant force, we can express this as: Weight of object (W) = Buoyant force (F_b) - To find the volume (V) of the object, one can rearrange this relationship using the formula for buoyant force: $F_b = \rho_{\text{fluid}} \times V_{\text{displaced}} \times g$, where ρ_{fluid} is the density of the fluid and g is acceleration due to gravity. By knowing the weight of the object and the density of the fluid, one can calculate the volume of the object: $V = W$

9. What does the term 'adiabatic' refer to in thermodynamics?

- A. Constant pressure
- B. Constant Volume
- C. Constant Temperature
- D. Constant Enthalpy**

The term 'adiabatic' in thermodynamics specifically refers to a process in which there is no heat exchange between the system and its surroundings. In an adiabatic process, the internal energy of the system changes as work is done on or by the system without any heat being added or removed. The notion of 'constant enthalpy' is more closely associated with specific types of processes, such as isenthalpic processes, rather than strictly adiabatic processes. However, in the context of adiabatic processes, the focus is often on the relationship between pressure, volume, and temperature rather than strictly adhering to a constant enthalpy condition. To clarify the connections, constant pressure describes an isobaric process, constant volume refers to an isochoric process, and constant temperature is indicative of an isothermal process. Understanding these distinct terms helps clarify why 'adiabatic' does not correlate directly with those properties, reinforcing its unique definition that focuses on the lack of heat transfer rather than maintaining any of those other thermal properties.

10. What is the significance of understanding the conditions under which the compressibility factor is equal to 1?

- A. It indicates a perfect gas behavior**
- B. It applies only to liquids
- C. It is irrelevant for real gases
- D. It questions the use of the ideal gas law

Understanding the conditions under which the compressibility factor equals 1 is significant because it indicates ideal gas behavior. The compressibility factor (Z) is a dimensionless number that describes how much a real gas deviates from ideal gas behavior. When Z equals 1, it implies that the gas behaves as an ideal gas, meaning it follows the ideal gas law ($PV=nRT$) without deviations due to intermolecular forces or the volume occupied by gas molecules. Ideal gas behavior is usually observed under conditions of high temperature and low pressure, where the interactions between gas molecules become negligible, and the volume of the molecules themselves is much smaller than the volume of the gas. This condition simplifies calculations in many engineering applications and allows for a straightforward application of the ideal gas law. Other options, such as those relating to liquids or suggesting irrelevance for real gases, misinterpret the significance of the compressibility factor. The ideal gas law itself is foundational in chemical engineering and thermodynamics, making the understanding of when it holds true essential for accurate modeling and analysis of gas behavior.

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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