Texas A&M University (TAMU) CHEM107 General Chemistry for Engineering Students Exam 2 Practice (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

1. **In terms of kinetic energy, what can we conclude about gas molecules at higher temperatures?**
   - A. Their average kinetic energy decreases
   - B. Their average kinetic energy is constant
   - C. Their average kinetic energy increases
   - D. Their average kinetic energy fluctuates

2. **What is the purpose of a phase diagram?**
   - A. To show temperature changes during a reaction
   - B. A graphical representation showing the phase behavior of a substance at different temperatures and pressures
   - C. To indicate the rate of a chemical reaction
   - D. To visualize the order of reactants

3. **What is the wavelength of green light?**
   - A. 390 nm
   - B. 450 nm
   - C. 680 nm
   - D. 700 nm

4. **What does VSEPR theory predict?**
   - A. The melting points of various compounds
   - B. The three-dimensional arrangement of atoms in a molecule based on electron pair repulsion
   - C. The reaction rates of chemical interactions
   - D. The types of intermolecular forces present in a substance

5. **Entropy is defined as:**
   - A. A measure of the order or structure in a system
   - B. A measure of the disorder or randomness in a system
   - C. The total energy content of a system
   - D. A constant rate of reaction

6. What does the principal quantum number (n) indicate?

- **A. The number of protons in an atom**
- **B. The energy level of an electron**
- **C. The type of orbital**
- **D. The angular momentum of an electron**

7. How is oxidation defined in a chemical reaction?

- **A. The loss of mass in a reaction**
- **B. Gaining electrons or decreasing oxidation state**
- **C. The process of losing electrons or an increase in oxidation state**
- **D. The combination of two reactants to form one product**

8. What is an equilibrium constant (K)?

- **A. A number that expresses the relationship between the concentrations of products and reactants at equilibrium**
- **B. A measure of the total heat content of a system**
- **C. The speed at which reactants are converted to products**
- **D. A graphical representation of phase behavior of a substance**

9. Which of the following properties is characteristic of ideal gases?

- **A. Attractive forces between molecules**
- **B. Volume of gas molecules is significant**
- **C. Collisions are elastic**
- **D. Particles are in fixed positions**

10. A large negative electron affinity value indicates what tendency in an element?

- **A. More likely to form cations**
- **B. More likely to form anions**
- **C. Less likely to gain electrons**
- **D. Equal likelihood of forming cations or anions**

Answers

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

Explanations

1. **In terms of kinetic energy, what can we conclude about gas molecules at higher temperatures?**

   A. Their average kinetic energy decreases

   B. Their average kinetic energy is constant

   C. Their average kinetic energy increases

   D. Their average kinetic energy fluctuates

At higher temperatures, the average kinetic energy of gas molecules increases. This relationship is a direct consequence of temperature being a measure of the average kinetic energy of the particles in a substance. According to kinetic molecular theory, as the temperature of a gas rises, the energy of its molecules also rises, leading to more vigorous motion. This increased kinetic energy results in higher speeds for the molecules, which translates to greater energy within the system. The average kinetic energy is defined mathematically as proportional to the temperature measured in Kelvin. This means that as one measures the temperature increase, one also expects to see an increase in the average kinetic energy of the gas molecules. Thus, at higher temperatures, gas particles collide with more force and frequency, leading to an overall rise in their energy. In contrast, other options suggest scenarios that do not align with this fundamental principle. An average kinetic energy decrease or constancy at elevated temperatures contradicts the laws of thermodynamics, specifically that energy transfers and states change in correspondence with temperature variations. Lastly, the idea that average kinetic energy fluctuates does not hold for a system at thermal equilibrium, where temperature and corresponding kinetic energy are consistently averaged over time. Thus, the conclusion that average kinetic energy increases with temperature is consistent with established physical principles

2. **What is the purpose of a phase diagram?**

   A. To show temperature changes during a reaction

   B. A graphical representation showing the phase behavior of a substance at different temperatures and pressures

   C. To indicate the rate of a chemical reaction

   D. To visualize the order of reactants

A phase diagram serves as a graphical representation that illustrates how a substance behaves in different phases—solid, liquid, and gas—under varying temperature and pressure conditions. This diagram provides crucial insights into the conditions required for each phase to exist and indicates the boundaries between phases, known as phase transitions. For example, it can show when a substance will melt, boil, or undergo sublimation, thus revealing the relationship between temperature and pressure for a given substance. Understanding phase diagrams is essential not only in chemistry but also in fields such as material science and engineering, as it helps predict how materials will behave under different environmental conditions. This allows engineers and scientists to make informed decisions when selecting materials for specific applications based on their phase behavior.

3. What is the wavelength of green light?

A. 390 nm

B. 450 nm

C. 680 nm

D. 700 nm

The wavelength of green light typically ranges from approximately 495 nm to 570 nm. The answer given as 450 nm corresponds more closely to blue light, which falls on the shorter wavelength side of the visible spectrum. Green light, being situated in the middle range of the visible spectrum, is best represented by values around 520 nm. It is essential to understand the organization of the visible spectrum, where blue light has shorter wavelengths (around 450 nm), and red light has longer wavelengths (up to 700 nm). When identifying the wavelength of green light, one should be aware that it does not correspond to the values provided in the options above. Instead, the designated range for green would likely be around 520 nm, which is not listed in the given options. Therefore, the most accurate representation of green light would not be among the choices provided, indicating a possible misalignment in the understanding of the wavelength ranges for colors in the visible spectrum.

4. What does VSEPR theory predict?

A. The melting points of various compounds

B. The three-dimensional arrangement of atoms in a molecule based on electron pair repulsion

C. The reaction rates of chemical interactions

D. The types of intermolecular forces present in a substance

VSEPR theory, or Valence Shell Electron Pair Repulsion theory, predicts the three-dimensional arrangement of atoms in a molecule by considering how the electron pairs surrounding a central atom repel each other. According to this theory, electron pairs, whether they are bonding pairs or lone pairs, will position themselves in ways that minimize repulsion, thereby creating specific geometrical shapes around the central atom. For example, if a central atom has four pairs of electrons (including both bonding and lone pairs), VSEPR theory predicts that these pairs will adopt a tetrahedral arrangement to maximize the distance between them. This allows chemists to infer the molecular shape, which is important for understanding the chemical behavior and properties of substances. The correct answer focuses on the molecular geometry aspect predicted by VSEPR, which is crucial for predicting various physical and chemical properties of molecules, whereas the other options refer to unrelated concepts, such as melting points, reaction rates, and intermolecular forces.

5. Entropy is defined as:

A. A measure of the order or structure in a system

B. A measure of the disorder or randomness in a system

C. The total energy content of a system

D. A constant rate of reaction

Entropy is fundamentally a concept that quantifies the degree of disorder or randomness in a system. It reflects the dispersal of energy within that system and indicates how much energy is unavailable to do work. As systems evolve and energy transformations occur, they naturally progress toward states with greater entropy, which corresponds to a more disordered arrangement of particles or energy states.   In thermodynamics, higher entropy signifies a larger number of possible microstates; that is, a greater variety of ways in which components of the system can be arranged while still resulting in the same macrostate. This tendency toward increasing disorder is encapsulated in the second law of thermodynamics, which states that the total entropy of an isolated system can never decrease over time. In contrast, the other choices either misrepresent the concept of entropy or relate to different principles in chemistry. The idea of order or structure as mentioned in the first option does not accurately capture the essence of entropy, which is inherently linked to disorder. The total energy content of a system as indicated in the third choice is more closely associated with enthalpy or internal energy rather than entropy. The last option, suggesting a constant rate of reaction, pertains to kinetics rather than thermodynamic properties.

6. What does the principal quantum number (n) indicate?

A. The number of protons in an atom

B. The energy level of an electron

C. The type of orbital

D. The angular momentum of an electron

The principal quantum number, represented by the symbol \(n \), indicates the energy level of an electron in an atom. This quantum number serves as a key descriptor for the size and energy of the electron's orbitals. Specifically, \(n \) can take on positive integer values (1, 2, 3, etc.), with each value corresponding to a different energy level or shell surrounding the nucleus of an atom. As \(n \) increases, the energy level of the electron also increases, and the electron is generally found further from the nucleus. This foundational concept is crucial in understanding an atom's electronic structure and helps explain many properties of elements, including their reactivity and where they fall in the periodic table. Higher energy levels (larger \(n \) values) also indicate that there can be more energy states available for electrons to occupy, leading to more complex interactions and bonding characteristics in larger atoms.

7. How is oxidation defined in a chemical reaction?

- A. The loss of mass in a reaction
- B. Gaining electrons or decreasing oxidation state
- C. The process of losing electrons or an increase in oxidation state
- D. The combination of two reactants to form one product

Oxidation in a chemical reaction is defined as the process of losing electrons or an increase in oxidation state. This definition aligns with the fundamental principles of redox (reduction-oxidation) reactions. In a redox reaction, one substance undergoes oxidation while another undergoes reduction. When a substance loses electrons, its oxidation state increases, which effectively indicates that it has been oxidized. For example, consider the oxidation of iron: \[\text{Fe} \rightarrow \text{Fe}^{2+} + 2\text{e}^- \] In this reaction, iron (Fe) loses two electrons, resulting in an increase in its oxidation state from 0 to +2. Hence, this is a clear demonstration of oxidation. In contrast to this, reduction is characterized by the gain of electrons or a decrease in oxidation state. Understanding these processes is critical for grasping the behavior of elements during chemical reactions and is foundational in areas such as electrochemistry and thermodynamics.

8. What is an equilibrium constant (K)?

- A. A number that expresses the relationship between the concentrations of products and reactants at equilibrium
- B. A measure of the total heat content of a system
- C. The speed at which reactants are converted to products
- D. A graphical representation of phase behavior of a substance

An equilibrium constant, often denoted as K, quantifies the ratio of the concentrations of products to reactants in a chemical reaction that has reached equilibrium. At this point, the rate of the forward reaction (where reactants form products) equals the rate of the reverse reaction (where products revert to reactants). This ratio is specific to a given reaction at a certain temperature and is determined using the formula: \[K = \frac{[Products]}{[Reactants]} \] where the concentrations are raised to the power of their respective stoichiometric coefficients from the balanced chemical equation. In understanding the other choices, options that refer to measures of heat content or the speed of reaction velocity do not align with the definition of an equilibrium constant. Heat content is described by enthalpy, and reaction speed pertains to kinetics, which concerns how fast equilibrium is achieved rather than the state of equilibrium itself. Graphical representations of phase behavior are more related to phase diagrams and do not pertain to equilibrium constants.

9. Which of the following properties is characteristic of ideal gases?

A. Attractive forces between molecules

B. Volume of gas molecules is significant

C. Collisions are elastic

D. Particles are in fixed positions

In the context of ideal gases, one of the defining properties is that collisions between gas particles are perfectly elastic. This means that when gas molecules collide with each other or with the walls of their container, there is no loss of kinetic energy in the collision process. Instead, energy is conserved; the total kinetic energy of the colliding particles remains the same before and after the collision. This characteristic is a key assumption in the kinetic molecular theory of gases, which describes the behavior of an ideal gas. In contrast, ideal gases are considered to have no appreciable intermolecular forces (which negates attractive forces between molecules) and the volume occupied by the gas molecules themselves (the actual substance) is negligible compared to the volume of the container. This means that the ideal gas model simplifies calculations by treating gas particles as point masses without volume. Additionally, in an ideal gas, the particles are free to move around and are not in fixed positions, further emphasizing the fluid and dynamic nature of gases rather than being confined to fixed locations as solids or liquids are.

10. A large negative electron affinity value indicates what tendency in an element?

A. More likely to form cations

B. More likely to form anions

C. Less likely to gain electrons

D. Equal likelihood of forming cations or anions

A large negative electron affinity value indicates that an element has a strong tendency to gain electrons. This value reflects the energy change that occurs when an electron is added to a neutral atom in the gas phase. When the electron affinity is large and negative, it means that the process of adding an electron releases a significant amount of energy, which is thermodynamically favorable. Elements with a strong electron affinity are typically nonmetals, especially those in the upper right portion of the periodic table, like the halogens. These elements tend to gain electrons during chemical reactions, resulting in the formation of negatively charged ions (anions). The greater the negative value of the electron affinity, the more likely the element will attract and hold onto an additional electron. Other options consider behaviors that are not aligned with the properties associated with large negative electron affinities. For instance, an element that forms cations typically has a lower tendency to gain electrons, as it tends to lose them instead.

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://tamu-chem107exam2.examzify.com

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