

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

## Study Guide



**Everything you need from our exam experts!**

**This is a sample study guide. To access the full version with hundreds of 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.

# 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. Don't worry about getting everything right, 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, and take breaks to retain information better.**

## **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.**

## **7. Use Other Tools**

**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

- 1. What type of bond is formed between two nonmetals with a significant difference in electronegativity?**
  - A. Nonpolar covalent bond**
  - B. Polar covalent bond**
  - C. Ionic bond**
  - D. Metallic bond**
  
- 2. What determines the energy levels of electrons within an atom?**
  - A. Quantum Numbers**
  - B. Electron Clouds**
  - C. Nuclear Charge**
  - D. Mass of Protons**
  
- 3. How is the number of moles calculated from grams?**
  - A. Number of moles = mass (g) x molar mass (g/mol)**
  - B. Number of moles = mass (g) / molar mass (g/mol)**
  - C. Number of moles = molar mass (g/mol) / mass (g)**
  - D. Number of moles = mass (g) + molar mass (g/mol)**
  
- 4. Which of the following describes an s orbital?**
  - A. Spherical shape**
  - B. Dumbbell shape**
  - C. Complex shape**
  - D. Zigzag shape**
  
- 5. What is the wavelength of green light?**
  - A. 390 nm**
  - B. 450 nm**
  - C. 680 nm**
  - D. 700 nm**



- 6. According to Boyle's Law, how are pressure and temperature related?**
- A. Inversely related**
  - B. Directly related**
  - C. Proportional**
  - D. Independent**
- 7. What is the relationship between wavelength and energy of a photon?**
- A. Longer wavelength corresponds to higher energy**
  - B. Shorter wavelength corresponds to lower energy**
  - C. Shorter wavelength corresponds to higher energy**
  - D. Wavelength and energy are unrelated**
- 8. Which of the following best describes the role of a primary standard?**
- A. To create a buffer solution**
  - B. To provide accurate measurements in quantitative analysis**
  - C. To act as a catalyst in chemical reactions**
  - D. To indicate the endpoint of a titration**
- 9. What is the term for the mass of one mole of a substance?**
- A. Atomic weight**
  - B. Molar mass**
  - C. Formular mass**
  - D. Gravitational mass**
- 10. What is the ideal gas law?**
- A. A relationship describing the state of solids**
  - B. An equation that relates pressure, volume, temperature, and moles of a gas**
  - C. An expression for the diffusion of gases**
  - D. A formula for calculating the density of liquids**

## **Answers**

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

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## **Explanations**

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**1. What type of bond is formed between two nonmetals with a significant difference in electronegativity?**

**A. Nonpolar covalent bond**

**B. Polar covalent bond**

**C. Ionic bond**

**D. Metallic bond**

A polar covalent bond forms between two nonmetals that have a significant difference in electronegativity. In this scenario, one nonmetal atom attracts the shared electrons more strongly than the other due to its higher electronegativity. This unequal sharing of electrons leads to the development of partial positive and negative charges on the atoms, creating a dipole moment in the molecule. The greater the difference in electronegativity, the more polarized the bond becomes. In distinction to other bond types, a nonpolar covalent bond occurs between nonmetals with similar electronegativities, where electrons are shared equally. An ionic bond typically forms between a metal and a nonmetal, resulting from the complete transfer of electrons, rather than sharing. Metallic bonds involve the pooling of electrons among many metal atoms, contributing to properties like conductivity and malleability. Understanding these distinctions helps in recognizing why polar covalent bonds emerge from nonmetals with notable electronegativity differences.

**2. What determines the energy levels of electrons within an atom?**

**A. Quantum Numbers**

**B. Electron Clouds**

**C. Nuclear Charge**

**D. Mass of Protons**

The energy levels of electrons within an atom are fundamentally determined by quantum numbers, which are sets of numerical values that describe various properties of electrons in an atom. These quantum numbers provide critical information about the electron's energy, orbital shape, orientation, and spin. Specifically, there are four quantum numbers: the principal quantum number ( $n$ ), which primarily indicates the energy level and size of the orbital; the azimuthal quantum number ( $l$ ), which describes the shape of the orbital; the magnetic quantum number ( $m_l$ ), which indicates the orientation of the orbital in space; and the spin quantum number ( $m_s$ ), which describes the intrinsic spin of the electron. Together, these quantum numbers dictate how electrons are arranged in an atom, influencing their energy levels based on their proximity to the nucleus and the effects of electron-electron interactions. This relationship is pivotal in understanding the structure of the atom and the behavior of electrons, which in turn influences chemical properties and reactivity. The other factors referenced, such as electron clouds, nuclear charge, and the mass of protons, play indirect roles in shaping an atom's electron configuration or its overall energy, but it is the quantum numbers that directly define the specific energy levels associated with the electrons.

### 3. How is the number of moles calculated from grams?

A. Number of moles = mass (g) x molar mass (g/mol)

**B. Number of moles = mass (g) / molar mass (g/mol)**

C. Number of moles = molar mass (g/mol) / mass (g)

D. Number of moles = mass (g) + molar mass (g/mol)

The number of moles is calculated by dividing the mass of the substance in grams by its molar mass expressed in grams per mole. This relationship stems from the definition of a mole in chemistry, which is a counting unit used to express quantities of particles, such as atoms or molecules. The calculation effectively converts the mass of the substance into a number of moles by accounting for how much mass corresponds to one mole of that specific substance, which is provided by the molar mass. For instance, if you have 18 grams of water (H<sub>2</sub>O), and knowing that its molar mass is approximately 18 g/mol, the number of moles would be 18 g / 18 g/mol, yielding 1 mole. This method is foundational in stoichiometry and is essential for performing calculations involving chemical equations and reactions, allowing chemists to convert between grams and moles to facilitate various chemical calculations.

### 4. Which of the following describes an s orbital?

**A. Spherical shape**

B. Dumbbell shape

C. Complex shape

D. Zigzag shape

The s orbital is characterized by its spherical shape, which means that the probability distribution of finding an electron is uniform in all directions around the nucleus. This spherical symmetry is a fundamental property of s orbitals and indicates that there are no angular nodes present within the orbital. As a result, electrons in an s orbital are equally likely to be found at various distances from the nucleus in any direction. In contrast, the other shapes mentioned—dumbbell, complex, and zigzag—are associated with different types of atomic orbitals. For example, the dumbbell shape corresponds to p orbitals, which have two lobes on either side of the nucleus. The complex shapes usually refer to d and f orbitals that exhibit more intricate arrangements with multiple lobes and angular nodes. The zigzag shape does not correspond to any standard atomic orbital shape in quantum chemistry. The distinction of the s orbital's spherical symmetry is crucial in understanding electron configurations and the structure of atoms, which is essential for predicting chemical behavior and bonding.

**5. 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.

**6. According to Boyle's Law, how are pressure and temperature related?**

**A. Inversely related**

B. Directly related

C. Proportional

D. Independent

Boyle's Law specifically describes the relationship between pressure and volume of a gas at a constant temperature, not directly pressure and temperature. However, when considering the ideal gas law, which encompasses pressure, volume, temperature, and the amount of gas, the relationship between pressure and temperature can be understood through the manipulation of the equation. In the context of the ideal gas law, when the volume is held constant, an increase in temperature results in an increase in pressure, establishing a direct relationship between temperature and pressure. Therefore, under conditions where volume is constrained, the answer would align with the idea of direct correlation rather than inverse. The notion of inverse relationships comes primarily from Boyle's Law where pressure decreases as volume increases, maintaining a constant temperature. In summary, while pressure and temperature can relate directly under certain conditions, the original question may have led to a misunderstanding about the specific relationship described by Boyle's Law and needs to clarify the context in which pressure and temperature were examined. The correct relationship when considering a constant volume would indeed be direct; thus discussing this relationship in the context of Boyle's Law can lead to confusion.

**7. What is the relationship between wavelength and energy of a photon?**

- A. Longer wavelength corresponds to higher energy**
- B. Shorter wavelength corresponds to lower energy**
- C. Shorter wavelength corresponds to higher energy**
- D. Wavelength and energy are unrelated**

The relationship between wavelength and energy of a photon is described by the equation  $E = \frac{hc}{\lambda}$ , where  $E$  is the energy of the photon,  $h$  is Planck's constant,  $c$  is the speed of light, and  $\lambda$  is the wavelength. According to this equation, energy and wavelength are inversely related. As the wavelength ( $\lambda$ ) decreases (indicating shorter wavelengths), the energy ( $E$ ) of the photon increases. This principle underlines why shorter wavelengths correspond to higher energy; photons associated with ultraviolet or blue light, for example, have shorter wavelengths and carry more energy compared to those associated with red light or infrared light, which have longer wavelengths. This fundamental concept explains why ultraviolet radiation can cause damage to skin (due to its high energy) while infrared radiation does not have the same effect since it is lower in energy. The nature of light as a wave-phenomenon and the quantization of energy in photons combine to form this essential understanding of the electromagnetic spectrum, providing insights not only into physics but also into practical applications like spectroscopy and photochemistry.

**8. Which of the following best describes the role of a primary standard?**

- A. To create a buffer solution**
- B. To provide accurate measurements in quantitative analysis**
- C. To act as a catalyst in chemical reactions**
- D. To indicate the endpoint of a titration**

A primary standard is a substance of known high purity that can be used to determine the concentration of a solution accurately through quantitative analysis. It serves as a reliable basis for titrations and other analytical methods where precise measurements are essential. The correct choice indicates that primary standards provide accurate measurements essential for determining the concentration of solutions and ensuring that subsequent calculations are based on reliable data. For instance, when performing a titration, using a primary standard allows you to precisely calculate the concentration of the titrant or analyte, leading to more accurate results in your experiments. While other options discuss important roles in chemistry, they do not accurately capture the specific function of primary standards. For instance, while buffer solutions can be created, that is not the primary function of a primary standard. Similarly, primary standards do not act as catalysts or indicate the endpoint of a titration—those roles are filled by other substances or methods in chemical analysis.



**9. What is the term for the mass of one mole of a substance?**

- A. Atomic weight
- B. Molar mass**
- C. Formular mass
- D. Gravitational mass

The term for the mass of one mole of a substance is referred to as molar mass. Molar mass is defined as the mass of one mole of a given substance, typically expressed in grams per mole (g/mol). It is an important concept in chemistry because it allows chemists to convert between the mass of a substance and the number of moles, facilitating stoichiometric calculations in chemical reactions. Molar mass is calculated by summing the atomic weights of the individual elements in a compound, each multiplied by the number of times that element appears in the formula. This concept is essential for understanding the relationships between mass and quantity in chemical substances. In contrast, atomic weight refers specifically to the weighted average mass of the isotopes of an element and is dimensionless. Formula mass is a similar concept, usually used when referring to ionic compounds or the mass of a molecular formula but typically does not focus on the quantity associated with one mole. Gravitational mass is a concept relating to the gravitational force an object experiences and is not relevant to the mass of substances in chemical terms.

**10. What is the ideal gas law?**

- A. A relationship describing the state of solids
- B. An equation that relates pressure, volume, temperature, and moles of a gas**
- C. An expression for the diffusion of gases
- D. A formula for calculating the density of liquids

The ideal gas law is an important equation in chemistry that relates the pressure, volume, temperature, and number of moles of an ideal gas. This law is typically expressed as  $PV = nRT$ , where P stands for pressure, V for volume, n for the amount of substance in moles, R is the ideal gas constant, and T is the temperature in Kelvin. This relationship is significant because it allows us to predict how a gas will behave under different conditions. For example, if we know three of the variables (pressure, volume, or temperature), we can calculate the fourth. The ideal gas law assumes that the gas behaves ideally, meaning that the particles do not interact and occupy no volume themselves, which is a good approximation for many real gases under standard conditions. Understanding the ideal gas law is crucial for engineering and various applications in physical sciences because it allows for calculations involving gas properties in different scenarios, such as in chemical reactions or industrial processes.

## 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](mailto: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!**