ACS Organic Chemistry Practice Test (Sample)

Study Guide

Everything you need from our exam experts!

Sample study guide. For the full version with hundreds of questions, visit: https://acsorganicchem.examzify.com

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Table of Contents

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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. **Keq is generally considered to be dimensionless under standard conditions. Which statement best captures this?**

   A. Keq has units that depend on the number of moles in the balanced equation.

   B. Keq is dimensionless under standard state conditions.

   C. Keq always has units of concentration.

   D. Keq cannot be compared between reactions.

2. **According to Gay-Lussac's law (at constant volume), what happens to pressure when temperature increases?**

   A. Pressure increases in direct proportion to Temperature

   B. Pressure decreases

   C. Pressure stays the same

   D. Pressure is independent of temperature

3. **What is the effect of increasing surface area on collision frequency?**

   A. Collision frequency decreases

   B. Collision frequency increases

   C. Collision frequency stays the same

   D. Collision frequency depends only on temperature

4. **If a compound has molecular formula C6H6 and empirical formula CH, what is the smallest whole-number multiple that relates them?**

   A. 1

   B. 6

   C. 3

   D. 2

5. **In multiplying or dividing measurements, how should you round the result?**

   A. The least number of decimal places

   B. The most precise measurement

   C. The fewest total digits

   D. The least number of significant figures

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6. If a polyatomic ion contains a -3 charge, what is the sum of oxidation numbers for that ion?

A. -3

B. 0

C. +3

D. -1

7. Across a period, how does atomic size change?

A. Increases

B. Stays constant

C. Decreases

D. Fluctuates widely

8. Which formula correctly computes Percent Error?

A. ((experimental - accepted) / accepted) × 100

B. ((experimental - accepted) × 100) / accepted

C. (|experimental - accepted| / accepted) × 100

D. (|accepted - experimental|) × 100

9. Which equation represents a single replacement reaction?

A. AB + C --> AC + B

B. AB + CD --> AD + CB

C. AB --> A + B

D. A + B --> AB

10. Why is the volume of a gas inversely proportional to pressure?

A. P1 x V1 = P2 x V2...because as volume increases, there is less opportunity for particles to collide

B. P1/T1 = P2/T2... temperature relation

C. P1 + V1 = P2 + V2

D. P1 - V1 = P2 - V2

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Answers

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

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Explanations

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1. Keq is generally considered to be dimensionless under standard conditions. Which statement best captures this?

A. Keq has units that depend on the number of moles in the balanced equation.

B. Keq is dimensionless under standard state conditions.

C. Keq always has units of concentration.

D. Keq cannot be compared between reactions.

The main idea is that equilibrium constants are defined from activities, and when activities are measured relative to standard states they become dimensionless. For solutions, each activity is defined as a_i = [i]/c°, with c° = 1 M; for gases, a_i = P_i/P°, with P° = 1 atm. The equilibrium constant expression uses these activities in ratios, so every factor is a dimensionless ratio to its standard state. Multiply and divide as required by the balanced equation, and the units cancel, giving Keq as a pure number under standard conditions. That's why the statement stating Keq is dimensionless under standard state conditions is the best choice. It reflects the convention that standard-state activities set the scale, making the entire ratio unitless. In contrast, thinking Keq always has units of concentration isn't consistent with the standard-state definition, and while you could construct expressions with units if you ignore standard states, the standard convention yields a dimensionless quantity. Also, because Keq is dimensionless, you can compare equilibrium positions across reactions more meaningfully.

2. According to Gay-Lussac's law (at constant volume), what happens to pressure when temperature increases?

A. Pressure increases in direct proportion to Temperature

B. Pressure decreases

C. Pressure stays the same

D. Pressure is independent of temperature

Direct proportionality of pressure to temperature at constant volume is what Gay-Lussac's law describes. As temperature rises, gas molecules move faster and collide with container walls more forcefully, so the pressure increases. For an ideal gas, P is proportional to T when volume is fixed, so P2 = P1(T2/T1) with temperatures in Kelvin. Using Kelvin is essential because 0 K corresponds to zero molecular motion and provides a meaningful zero point. Therefore, increasing temperature results in a higher pressure, in direct proportion. The other statements—pressure decreasing, staying the same, or being independent of temperature—do not align with this relationship.

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3. What is the effect of increasing surface area on collision frequency?

A. Collision frequency decreases

B. Collision frequency increases

C. Collision frequency stays the same

D. Collision frequency depends only on temperature

Increasing surface area exposes more reactive sites, so more collisions can occur per unit time. When a solid reacts with a gas or liquid, breaking it into smaller pieces or grinding it into powder raises the area in contact with the other reactant. That larger contact area means more opportunities for collisions, which raises the collision frequency and typically speeds up the reaction (assuming there's enough energy in those collisions for reaction to proceed). Temperature still affects whether those collisions lead to products, but surface area directly increases how often collisions happen.

4. If a compound has molecular formula C6H6 and empirical formula CH, what is the smallest whole-number multiple that relates them?

A. 1

B. 6

C. 3

D. 2

Empirical formulas show the simplest whole-number ratio of atoms, while the molecular formula is that ratio scaled by an integer. For C6H6, the simplest ratio of carbon to hydrogen is 1:1, so the empirical formula is CH. The greatest common divisor of the subscripts (6 and 6) is 6, so dividing the molecular formula by 6 gives CH. This means the molecular formula is obtained by multiplying CH by 6: CH × 6 = C6H6. Therefore, the smallest whole-number multiplier is 6. If you used 1, 2, or 3, you'd get CH, C2H2, or C3H3, none of which match C6H6.

5. In multiplying or dividing measurements, how should you round the result?

A. The least number of decimal places

B. The most precise measurement

C. The fewest total digits

D. The least number of significant figures

The key idea is that precision in multiplication or division is limited by the least precise measurement involved. When you multiply or divide numbers, the final result should be reported with the same number of significant figures as the input with the fewest significant figures. This keeps the reported precision honest to what the data actually supports. For example, multiply 3.0 (two significant figures) by 2.50 (three significant figures). The exact product is 7.50, but since the limiting measurement has two significant figures, you round the result to two significant figures, giving 7.5. This rule ensures you don't imply more certainty than your measurements justify. Note that this approach is specific to multiplication and division; rounding by decimal places is the guideline used for addition and subtraction.

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6. If a polyatomic ion contains a -3 charge, what is the sum of oxidation numbers for that ion?

A. -3

B. 0

C. +3

D. -1

Oxidation numbers inside a polyatomic ion add up to the ion's overall charge. If the ion carries a -3 charge, the sum of all the oxidation states must be -3. So the total oxidation-number sum is -3. A sum of 0 would mean a neutral species, +3 would indicate an overall positive ion, and -1 would correspond to a singly negatively charged ion with charge -1.

7. Across a period, how does atomic size change?

A. Increases

B. Stays constant

C. Decreases

D. Fluctuates widely

As you move across a period, atomic size decreases. The electrons are filling the same principal energy level, so shielding from inner electrons stays about the same. Meanwhile, the nucleus gains more protons, increasing the effective nuclear charge it exerts on the outer electrons. That stronger attraction pulls the electron cloud closer to the nucleus, shrinking the atomic radius. This trend continues across the period until a new energy level is started in the next row, at which point the radius increases again. The net effect is a progressively smaller atom as you go from left to right across a period.

8. Which formula correctly computes Percent Error?

A. ((experimental - accepted) / accepted) × 100

B. ((experimental - accepted) × 100) / accepted

C. (|experimental - accepted| / accepted) × 100

D. (|accepted - experimental|) × 100

Percent error measures how far your experimental value is from the accepted value, expressed as a percentage of the accepted value. The key is the magnitude of the deviation, not its direction, so you use the absolute value of the difference. The correct form is the absolute difference between experimental and accepted, divided by the accepted value, times 100. This yields a nonnegative percentage that's normalized to the true value. For example, with an experimental value of 92 and an accepted value of 100: |92 − 100| / 100 × 100 = 8%. If you omit the absolute value, you'd get a signed result (negative when the measurement is lower than the true value), which isn't the standard way percent error is reported. A formula that multiplies the absolute difference by 100 without dividing by the accepted value wouldn't give a proper percentage of the true value.

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9. Which equation represents a single replacement reaction?

A. AB + C --> AC + B

B. AB + CD --> AD + CB

C. AB --> A + B

D. A + B --> AB

Single replacement (single displacement) reactions involve one element taking the place of another element in a compound, yielding a new compound and a free element. In AB + C → AC + B, the single element C replaces B in the compound AB, forming AC and freeing B. This illustrates the defining pattern of a single replacement. For contrast, the other forms represent different types of reactions. AB + CD → AD + CB is a double displacement, where partners in two compounds swap. AB → A + B is a decomposition, where a compound breaks into simpler substances. A + B → AB is a synthesis, where two substances combine to form a single compound.

10. Why is the volume of a gas inversely proportional to pressure?

A. P1 x V1 = P2 x V2...because as volume increases, there is less opportunity for particles to collide

B. P1/T1 = P2/T2... temperature relation

C. P1 + V1 = P2 + V2

D. P1 - V1 = P2 - V2

Pressure in a gas comes from molecules colliding with the container walls. If you keep the temperature and the amount of gas fixed and you increase the volume, the gas has more space to move, so collisions with the walls become less frequent and, on average, less force is exerted per unit area. That means the pressure drops. This behavior is captured by Boyle's law: the product of pressure and volume stays constant (P times V remains the same) when temperature and the amount of gas don't change. So, as volume goes up, pressure goes down, showing the inverse relationship. The other expressions involve temperature changes or different kinds of relationships, which don't describe how pressure and volume relate at constant temperature and amount.

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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://acsorganicchem.examzify.com

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

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