ACS Organic Chemistry Practice Test (Sample)

Study Guide

BY EXAMZIFY

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. **Which term describes the closeness of a set of measurements to each other?**

   A. Precision

   B. Accuracy

   C. Calibration

   D. Uncertainty

2. **From a reaction energy diagram, which expression gives ΔH, the enthalpy change?**

   A. ΔH = Er - Ep

   B. ΔH = Ep + Er

   C. ΔH = Eac - Er

   D. ΔH = Ep - Er（Ep is energy of products, Er energy of reactants）

3. **Which of the following is a homogeneous mixture?**

   A. Sand and water

   B. Rice and beans

   C. Mud in water

   D. Salt water

4. **What does the Atomic Mass Number represent?**

   A. Number of protons

   B. Number of neutrons

   C. Number of protons and neutrons

   D. Number of electrons

5. **Percent by mass is defined as what?**

   A. % m/m = (mass solute / mass solution) × 100

   B. % m/m = (mass solvent / mass solution) × 100

   C. % m/m = (mass solute / mass solvent) × 100

   D. % m/m = (mass solute / mass solution) × 10

6. **Which equation correctly represents the heat q in terms of mass m, specific heat capacity c, and temperature change ΔT?**

   A. **$q = mc\Delta T$**

   B. **$q = m\ c\ \Delta T^2$**

   C. **$q = \Delta T/(mc)$**

   D. **$q = m/(c\Delta T)$**

7. **Molar mass, as a concept, is defined as which of the following?**

   A. **The mass of a single atom in grams.**

   B. **The mass of the solvent per mole.**

   C. **The mass per mole, expressed as g/mol.**

   D. **The volume per mole, expressed as L/mol.**

8. **In a reaction with stoichiometry A + 2B → products, if you have 1 mole of A and 1 mole of B, which reactant is limiting?**

   A. **A**

   B. **B**

   C. **Neither**

   D. **Both**

9. **What is Avogadro's number?**

   A. **6.022×10^{23} grams = 1 mole**

   B. **6.022×10^{23} liters = 1 mole**

   C. **6.022×10^{23} particles is equal to 10 moles**

   D. **6.022×10^{23} particles = 1 mole**

10. **Why is the pressure of a gas directly proportional to the number of particles?**

   A. **$P_1/N_1 = P_2/N_2$....because pressure is caused by collisions of gas, and more particles means more collisions**

   B. **$P_1 \times V_1 = P_2 \times V_2$... because volume is inversely related to pressure**

   C. **$P_1/T_1 = P_2/T_2$... pressure is proportional to temperature**

   D. **$P_1 - N_1 = P_2 - N_2$... no relation**

Answers

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

Explanations

1. Which term describes the closeness of a set of measurements to each other?

A. Precision

B. Accuracy

C. Calibration

D. Uncertainty

Precision is about how closely repeated measurements agree with one another. It reflects reproducibility: if you measure the same quantity several times and the results cluster tightly, you have high precision. This can happen even if the measurements aren't close to the true value, which would mean low accuracy. Calibration is the process of adjusting an instrument to match a standard, and uncertainty is the doubt or range around a measurement. For example, multiple measurements yielding values that are very close to each other show high precision, even if that common value isn't the true quantity. Therefore, the term that describes the closeness of a set of measurements to each other is precision.

2. From a reaction energy diagram, which expression gives ΔH, the enthalpy change?

A. ΔH = Er - Ep

B. ΔH = Ep + Er

C. ΔH = Eac - Er

D. ΔH = Ep - Er（Ep is energy of products, Er energy of reactants）

Enthalpy change is the difference in energy between the final and initial states. On a reaction energy diagram, the energy of the reactants is Er and the energy of the products is Ep, so the net enthalpy change is ΔH = Ep − Er. This difference tells you whether the final state is higher or lower in energy than the initial state: Ep > Er means ΔH is positive (endothermic), Ep < Er means ΔH is negative (exothermic). The activation energy, the energy barrier from reactants to the highest point on the curve, does not determine ΔH. It describes the rate barrier, not the net energy change. Expressions involving a sum Ep + Er aren't meaningful for ΔH, as enthalpy change is a difference between final and initial energies.

3. Which of the following is a homogeneous mixture?

A. Sand and water

B. Rice and beans

C. Mud in water

D. Salt water

A homogeneous mixture has a uniform composition throughout the sample, so you can't tell the different components apart by eye. When table salt dissolves in water, the salt ions disperse evenly among the water molecules to form one kind of substance—salt water. You can't see separate salt particles, and the solution has the same composition wherever you sample it. The other options don't form a single phase. Sand and water keep distinct parts—solid sand grains and liquid water—so the mixture isn't uniform. Rice and beans are two separate foods mixed together but not dissolved, so you can still identify the components. Mud in water contains solid particles that either float or settle, so it's not a single uniform phase either.

4. What does the Atomic Mass Number represent?

A. Number of protons

B. Number of neutrons

<u>C. Number of protons and neutrons</u>

D. Number of electrons

The mass number is the total count of nucleons in the nucleus, which means protons plus neutrons. It equals Z + N, where Z is the number of protons (defining the element) and N is the number of neutrons. Electrons don't contribute to this count because their mass is negligible and they sit outside the nucleus. Different isotopes have the same number of protons but different numbers of neutrons, giving different mass numbers. So the mass number represents protons plus neutrons.

5. Percent by mass is defined as what?

<u>A. % m/m = (mass solute / mass solution) × 100</u>

B. % m/m = (mass solvent / mass solution) × 100

C. % m/m = (mass solute / mass solvent) × 100

D. % m/m = (mass solute / mass solution) × 10

Percent by mass measures what fraction of the total mass is the dissolved substance. It is defined as the mass of solute divided by the mass of the entire solution, multiplied by 100. Since the solution's mass is the sum of solute and solvent, you can compute it from those quantities: percent by mass = (mass solute / mass solution) × 100. For example, dissolving 2 g of solute in 8 g of solvent gives a total solution mass of 10 g, so the percent by mass is (2 g / 10 g) × 100 = 20%. The other forms don't fit the definition: using mass of solvent in the numerator gives the percent by mass of the solvent, not the solute; using mass solute over mass solvent is a ratio to the solvent, not to the total solution; and multiplying by 10 instead of 100 yields the wrong scale.

6. Which equation correctly represents the heat q in terms of mass m, specific heat capacity c, and temperature change ΔT?

<u>A. $q = mc\Delta T$</u>

B. $q = m\ c\ \Delta T^2$

C. $q = \Delta T/(mc)$

D. $q = m/(c\Delta T)$

Heat transferred to a substance depends on how much substance there is, how well it stores heat, and how much its temperature changes. This is captured by $q = m\ c\ \Delta T$, where m is the mass, c is the specific heat capacity, and ΔT is the temperature change. The specific heat c tells you how much heat is needed to raise the temperature of a given mass by 1 unit, so multiplying m, c, and ΔT gives the total heat in joules. The units line up: mass times specific heat (J/(kg·K)) times a temperature change (K or °C) yields joules. An expression with ΔT squared would imply heat depends on the square of the temperature change, which isn't how heat capacity is defined. An expression with ΔT in the denominator would imply heat decreases as the temperature change increases, which contradicts the idea that more heat is needed to produce a larger temperature rise. Expressions where the variables are inverted (for example, using m or c in the denominator) would give the wrong units and the wrong dependence on each quantity.

7. Molar mass, as a concept, is defined as which of the following?

A. The mass of a single atom in grams.

B. The mass of the solvent per mole.

C. The mass per mole, expressed as g/mol.

D. The volume per mole, expressed as L/mol.

The main idea is that molar mass is the mass of one mole of a substance, expressed in grams per mole. This ties microscopic masses to a macroscopic amount of material: you can take the number of moles and multiply by this mass to get the total grams you have. For a pure element, the molar mass in g/mol equals the atomic mass in atomic mass units (amu). For a compound, you add up the atomic masses of all atoms in the formula, accounting for how many of each atom are present (for example, water has a molar mass about 18.015 g/mol: 2 × 1.008 for hydrogen plus 16.00 for oxygen). It's not the mass of a single atom in grams, and it isn't the mass of solvent per mole or a volume per mole—that would be molar volume. Therefore, the correct definition is the mass per mole, expressed as g/mol.

8. In a reaction with stoichiometry A + 2B → products, if you have 1 mole of A and 1 mole of B, which reactant is limiting?

A. A

B. B

C. Neither

D. Both

The limiting reagent is found by comparing what you have to what the balanced equation requires. Here, one mole of the first reactant needs two moles of the second reactant for complete consumption of the first. With 1 mole of the first and 1 mole of the second, you can only use 1 mole of the second to react with 0.5 mole of the first, so the second reactant runs out first. That makes the second reactant the limiting one, and the first reactant remains in excess (about 0.5 mole left unreacted).

9. What is Avogadro's number?

A. 6.022 x 10^23 grams = 1 mole

B. 6.022 x 10^23 liters = 1 mole

C. 6.022 x 10^23 particles is equal to 10 moles

D. 6.022 x 10^23 particles = 1 mole

Avogadro's number is the number of discrete particles in one mole, providing the bridge between the microscopic world and macroscopic measurements. By definition, one mole contains 6.022 × 10^23 particles (atoms, molecules, or other entities, depending on the substance). This means the amount of substance in moles times Avogadro's number gives the total number of particles: N = n × Na, with Na = 6.022 × 10^23 mol^-1. So 1 mole equals 6.022 × 10^23 particles. The other statements mix up units or scales: grams are a mass, liters a volume, and 10 moles would contain 6.022 × 10^24 particles, not 6.022 × 10^23.

10. Why is the pressure of a gas directly proportional to the number of particles?

- **A. P1/N1 = P2/N2....because pressure is caused by collisions of gas, and more particles means more collisions**
- **B. P1 x V1 = P2 x V2... because volume is inversely related to pressure**
- **C. P1/T1 = P2/T2... pressure is proportional to temperature**
- **D. P1 - N1 = P2 - N2... no relation**

Pressure comes from molecules colliding with the walls of the container. If you keep the volume and temperature fixed and simply add more particles, collisions with the walls happen more often, so the average impulse delivered per unit area increases and the pressure rises. In other words, pressure is proportional to how many particles are present when V and T are fixed, which is why P ∝ N. This aligns with the ideal gas law in the form PV = nRT: with V and T constant, pressure increases in proportion to the amount of substance, and the amount of substance grows with the number of particles. The other relations describe how pressure changes with volume or with temperature, not directly with particle number, so they don’t capture the direct link to N.

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!