ACS GENERAL CHEMISTRY 2 PRACTICE EXAM (SAMPLE)

STUDY GUIDE

SAMPLE STUDY GUIDE WITH LIMITED 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. 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. **What is Kb of F-? Ka of HF is 6.8 × 10^-4**

   A. 6.8e10

   B. 6.8e-4

   C. 1.5e3

   D. 1.5e-11

2. **What is the mass of ethanol in the 200 g sample described above (89% by mass ethanol)?**

   A. 22 g

   B. 100 g

   C. 178 g

   D. 46 g

3. **If a nonvolatile solute is added to a solvent, what happens to the freezing point?**

   A. Freezing point increases

   B. Freezing point decreases

   C. Freezing point stays the same

   D. Freezing point becomes undefined

4. **Which factors determine boiling point elevation and freezing point depression for a given solute?**

   A. Temperature and time

   B. Molality of solute particles and van't Hoff factor

   C. Molar mass of solute

   D. Solvent polarity

5. **The half-life for first-order radioactive decay of 32P is 14.3 days. How many days would be required for the activity to decrease to 20.0% of its initial value?**

   A. 33.0 days

   B. 49.2 days

   C. 71.0 days

   D. 286 days

6. Consider the reaction Cu2+ (aq) + Fe (s) Cu (s) + Fe2+ (aq) E° = 0.78 V. What is the value of E when [Cu2+] = 0.040 M and [Fe2+] = 0.40 M?

A. 0.72 V

B. 0.75 V

C. 0.81 V

D. 0.84 V

7. Which expression represents the Nernst equation at 25°C for a cell reaction that transfers n electrons?

A. E = E° − (0.05916/n) log Q

B. E = E° + (0.05916/n) log Q

C. E = E° − (0.05916) log Q

D. E = E° − (0.05916/n) ln Q

8. Which law relates vapor pressure of a liquid mixture to the mole fraction of solvent in an ideal solution?

A. Henry's law

B. Raoult's law

C. Dalton's law

D. Le Chatelier's principle

9. Which acid is the weakest in aqueous solution?

A. acetic acid (Ka = 1.8 × 10^-5)

B. formic acid (Ka = 1.8 × 10^-4)

C. hydrocyanic acid (Ka = 6.2 × 10^-10)

D. nitrous acid (Ka = 4.5 × 10^-4)

10. What are ΔHfus and ΔHvap?

A. Enthalpy of freezing and condensation

B. Enthalpy of fusion (melting) and enthalpy of vaporization (liquefaction to gas)

C. Enthalpy of sublimation and deposition

D. Enthalpy of reaction and activation

Answers

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

Explanations

1. What is Kb of F-? Ka of HF is 6.8 × 10^-4

A. 6.8e10

B. 6.8e-4

C. 1.5e3

D. 1.5e-11

This question uses the relationship between Ka and Kb for conjugate acid–base pairs: Ka × Kb = Kw, with Kw = 1.0 × 10^-14 at 25°C. Since F− is the conjugate base of HF, its base-dissociation constant is Kb(F−) = Kw / Ka(HF). Plugging in Ka(HF) = 6.8 × 10^-4 gives Kb ≈ (1.0 × 10^-14) / (6.8 × 10^-4) ≈ 1.47 × 10^-11, which rounds to 1.5 × 10^-11. So the fluoride ion is a very weak base in water. The other numbers don't fit the Kw/Ka relation: taking 6.8 × 10^-4 would just reproduce Ka, a reciprocal or a unrelated magnitude doesn't come from the Ka–Kb relationship, and 1.5 × 10^3 is not consistent with the expected small Kb at this Ka.

2. What is the mass of ethanol in the 200 g sample described above (89% by mass ethanol)?

A. 22 g

B. 100 g

C. 178 g

D. 46 g

Percent by mass tells you what portion of the total mass is ethanol. To find the mass of ethanol, multiply the total sample mass by the fraction that is ethanol: 0.89 × 200 g = 178 g. So the ethanol mass in the sample is 178 g. The other numbers would correspond to smaller fractions (for example, 22 g is about 11% of 200 g, 100 g is 50%, and 46 g is about 23%), which don't match the given 89% by mass.

3. If a nonvolatile solute is added to a solvent, what happens to the freezing point?

A. Freezing point increases

B. Freezing point decreases

C. Freezing point stays the same

D. Freezing point becomes undefined

This question tests how adding a nonvolatile solute affects the freezing point. Dissolving particles in a solvent lowers the solvent's mole fraction and lowers its vapor pressure, which shifts the equilibrium between the solid and liquid to require a lower temperature for freezing. In other words, the solution's liquid phase remains stable down to a lower temperature because the dissolved particles disrupt the orderly formation of the solid. This freezing-point depression is a classic colligative property and scales with the number of dissolved particles (ΔTf = iKf m for ideal solutions). So, adding a nonvolatile solute causes the freezing point to decrease.

4. Which factors determine boiling point elevation and freezing point depression for a given solute?

A. Temperature and time

B. Molality of solute particles and van't Hoff factor

C. Molar mass of solute

D. Solvent polarity

Colligative properties depend on the number of dissolved particles, not on their identity. The size of both boiling point elevation and freezing point depression is set by how many solute particles are in solution, which is captured by molality and the van't Hoff factor. The equations ΔTb = i Kb m and ΔTf = i Kf m show this directly: m is the molality (moles of solute per kilogram of solvent), and i accounts for how many particles the solute produces in solution (dissociation or association). For a non-electrolyte, i is about 1; for a salt like NaCl, i is about 2 because it dissociates into two ions, increasing the shifts. Increasing concentration or a higher degree of dissociation makes the changes larger. Time isn't a factor in the magnitude once equilibrium is reached, and the molar mass of the solute doesn't directly influence these effects because what matters is particle count, not mass. Solvent polarity can influence how well something dissolves, but after dissolution the shifts depend on the number of particles.

5. The half-life for first-order radioactive decay of 32P is 14.3 days. How many days would be required for the activity to decrease to 20.0% of its initial value?

A. 33.0 days

B. 49.2 days

C. 71.0 days

D. 286 days

In first-order decay, activity falls exponentially with time, and the fraction remaining ties directly to time via N/N0 = (1/2)^{t/t1/2}. Here, we want the activity to be 20% of its initial value, so 0.20 = (1/2)^{t/14.3}. Taking natural logs gives t/14.3 = ln(0.20)/ln(0.50). Using ln(0.20) ≈ -1.6094 and ln(0.50) ≈ -0.6931, we get t ≈ 14.3 × (2.322) ≈ 33.2 days. So about 33 days. Intuitively, two half-lives (about 28.6 days) would leave 25% remaining; reaching 20% requires a bit more time, which matches a little over 33 days. The other time options correspond to significantly more or fewer half-lives and would produce fractions well below 20%.

6. Consider the reaction Cu2+ (aq) + Fe (s) Cu (s) + Fe2+ (aq) E° = 0.78 V. What is the value of E when [Cu2+] = 0.040 M and [Fe2+] = 0.40 M?

A. 0.72 V

B. 0.75 V

C. 0.81 V

D. 0.84 V

Using the Nernst equation to relate the cell potential to the standard potential and the reaction quotient under nonstandard conditions. For this reaction, copper(II) is reduced and iron is oxidized, so the standard potential is 0.78 V and two electrons are transferred (n = 2). The reaction quotient is determined by the activities of the species that appear in the equation, with solids having activity 1: Q = [Fe2+]/[Cu2+] = 0.40 / 0.040 = 10. At 25°C, the Nernst equation gives E = E° − (0.05916/n) log Q. Substituting in the values, log Q = log 10 = 1 and n = 2, so E = 0.78 − (0.05916/2)(1) = 0.78 − 0.02958 ≈ 0.750 V. The result is slightly less than the standard potential because the product concentration is higher relative to the reactant, which lowers the driving force for the reaction under these conditions.

7. Which expression represents the Nernst equation at 25°C for a cell reaction that transfers n electrons?

A. $E = E° - (0.05916/n) \log Q$

B. $E = E° + (0.05916/n) \log Q$

C. $E = E° - (0.05916) \log Q$

D. $E = E° - (0.05916/n) \ln Q$

The main idea is the Nernst equation at standard room temperature, which connects the cell potential to the standard potential and the reaction quotient while accounting for the number of electrons transferred. At 25°C, the equation can be written with base-10 logarithm as $E = E° - (0.05916/n) \log Q$. The negative sign means that higher Q (more products, or the reaction proceeding toward products) lowers the cell potential, while a smaller Q raises it. The factor 0.05916 V comes from converting the natural logarithm form, $E = E° - (RT/nF) \ln Q$, to base-10 logarithm form using $\ln Q = 2.303 \log Q$, with T = 298 K giving $RT/F \approx 0.025693$ V and $2.303 \times 0.025693 \approx 0.05916$. The division by n reflects that the potential change scales with the number of electrons transferred in the half-reaction or overall cell reaction. The other forms are incorrect because they would either have the wrong sign, omit the division by n, or use the natural logarithm instead of the base-10 log.

8. Which law relates vapor pressure of a liquid mixture to the mole fraction of solvent in an ideal solution?

A. Henry's law

B. Raoult's law

C. Dalton's law

D. Le Chatelier's principle

In ideal solutions, the vapor pressure contributed by each component scales with its mole fraction. This is captured by Raoult's law: the partial vapor pressure of a component equals its mole fraction in the liquid times its pure (unmixed) vapor pressure, $P_{component} = x_{component} \times P_{component}°$. For a solvent in a mixture, the vapor pressure of that solvent is $P_{solvent} = x_{solvent} \times P_{solvent}°$. The total vapor pressure of the liquid mixture is the sum of these partial pressures for all components. This relationship directly links vapor pressure to the mole fraction of the solvent in an ideal solution. Henry's law describes gas solubility in liquids, not the vapor pressure of a liquid mixture. Dalton's law concerns partial pressures in a gas mixture, not how a liquid's vapor pressure depends on composition. Le Châtelier's principle deals with shifts in equilibrium under stress, not vapor pressures in solutions.

9. Which acid is the weakest in aqueous solution?

A. acetic acid (Ka = 1.8 × 10^-5)

B. formic acid (Ka = 1.8 × 10^-4)

C. hydrocyanic acid (Ka = 6.2 × 10^-10)

D. nitrous acid (Ka = 4.5 × 10^-4)

Strength in water is governed by the acid dissociation constant, Ka. A larger Ka means more dissociation into H+ and A−, so a stronger acid; a very small Ka means little dissociation and a weaker acid. Hydrocyanic acid has Ka = 6.2 × 10^-10, which is far smaller than the Ka values of the other acids listed. That tiny Ka indicates it barely donates protons to water, making it the weakest acid among them. The others—with Ka on the order of 10^-5 to 10^-4—dissociate much more and are correspondingly stronger acids.

10. What are ΔHfus and ΔHvap?

A. Enthalpy of freezing and condensation

B. Enthalpy of fusion (melting) and enthalpy of vaporization (liquefaction to gas)

C. Enthalpy of sublimation and deposition

D. Enthalpy of reaction and activation

This question tests understanding of enthalpy changes that accompany phase transitions. ΔHfus is the enthalpy change when a solid melts to a liquid at the melting point; this is the enthalpy of fusion. ΔHvap is the enthalpy change when a liquid boils to a gas at the boiling point; this is the enthalpy of vaporization. Both values are positive because energy must be absorbed to overcome the intermolecular forces holding the solid in a lattice or the liquid together to produce separate molecules in the gas phase. The reverse processes—freezing and condensation—release the same amount of energy (negative ΔH) as they revert to the more ordered phase. Sublimation and deposition involve solid–gas transitions and have their own distinct enthalpies. Activation energy and enthalpy of reaction pertain to chemical reactions, not phase changes.

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://acsgenchem2.examzify.com

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