AC-HPAT Chemistry Practice Test (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. What is the pH of a 0.020 M hydrochloric acid solution?

A. 1.70

B. 2.00

C. 3.00

D. 1.30

2. Holding volume and temperature constant, if the amount of gas (in moles) is doubled, what happens to the pressure?

A. Pressure halves

B. Pressure remains the same

C. Pressure doubles

D. Pressure quadruples

3. In the reaction 2 H2 + O2 -> 2 H2O, if you start with 4 moles H2 and 2 moles O2, how many moles of H2O can be formed?

A. 2

B. 4

C. 6

D. 8

4. Which element contributes the most to the molar mass of Ca3(PO4)2?

A. Calcium

B. Oxygen

C. Phosphorus

D. Hydrogen

5. Market Value Ratios reflect what?

A. What investors think about the firm and its future prospects

B. The current assets to current liabilities

C. The company's gross margin

D. The proportion of debt to assets

6. Stock Markets are defined as the places where the prices of which instrument are established?

A. Bonds

B. Firms' Stocks

C. Commodities

D. Currencies

7. Which metric calculates the rate of return that makes Net Present Value equal to zero?

A. Internal Rate of Return

B. Net Present Value

C. Payback Period

D. Accounting Rate of Return

8. Henderson-Hasselbalch: For a buffer with pKa = 4.75, what [A-]/[HA] ratio yields pH = 4.00?

A. 0.178

B. 1.78

C. 4.75

D. 0.021

9. A 1.00 mol sample of an ideal gas occupies 2.00 L at 298 K. What is the pressure? (R = 0.0821 L atm mol^-1 K^-1)

A. 1.22 atm

B. 12.2 atm

C. 24.5 atm

D. 0.122 atm

10. Is the redox equation MnO_4^- + 8 H^+ + 5 Fe^{2+} → Mn^{2+} + 5 Fe^{3+} + 4 H_2O balanced?

A. No, atoms balanced but charges not

B. Oxygen not balanced

C. No, too many Fe^{3+} produced

D. Yes

Answers

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

Explanations

1. What is the pH of a 0.020 M hydrochloric acid solution?

A. 1.70

B. 2.00

C. 3.00

D. 1.30

The key idea is that for a strong acid, it fully dissociates in water, so the hydrogen ion concentration equals the acid concentration. With 0.020 M HCl, [H+] = 0.020 M. The pH is defined as pH = -log10([H+]). So pH = -log10(0.020) = -log(2.0×10^-2) = -(log 2.0 + log 10^-2) = -(0.3010 - 2) ≈ 1.699, which rounds to 1.70. That matches the option around 1.70. The other values would correspond to different [H+] (for example, pH 2.00 corresponds to 0.01 M), which isn't the case here since the acid concentration is 0.020 M and HCl is strong.

2. Holding volume and temperature constant, if the amount of gas (in moles) is doubled, what happens to the pressure?

A. Pressure halves

B. Pressure remains the same

C. Pressure doubles

D. Pressure quadruples

Holding volume and temperature fixed, pressure scales with the number of gas particles. From PV = nRT, rearranging gives P = nRT / V. Since R, T, and V are constants, P is directly proportional to n. Doubling the amount of gas doubles the numerator, so the pressure doubles. More particles mean more collisions with the container walls per unit time, raising the pressure in a linear fashion.

3. In the reaction 2 H2 + O2 -> 2 H2O, if you start with 4 moles H2 and 2 moles O2, how many moles of H2O can be formed?

A. 2

B. 4

C. 6

D. 8

Use the balanced equation to relate moles through the mole ratios. The reaction 2 H2 + O2 -> 2 H2O means 2 moles of hydrogen produce 2 moles of water using 1 mole of oxygen. To use all the oxygen you have (2 moles), you would need 4 moles of hydrogen, and you indeed have that amount. That means both reactants are consumed. The amount of water produced corresponds to the hydrogen used: 2 moles of H2 yield 2 moles of H2O, so 4 moles of H2 yield 4 moles of H2O. Therefore four moles of water can be formed.

4. Which element contributes the most to the molar mass of $Ca_3(PO_4)_2$?

A. Calcium

B. Oxygen

C. Phosphorus

D. Hydrogen

Molar mass is found by adding up the masses of all atoms in the formula. In $Ca_3(PO_4)_2$ there are 3 calcium atoms, 2 phosphorus atoms, and 8 oxygen atoms. Using approximate atomic masses: Ca ≈ 40.1, P ≈ 30.97, O ≈ 16.00. The contributions are about 3×40.1 ≈ 120.3 for calcium, 2×30.97 ≈ 61.9 for phosphorus, and 8×16.00 ≈ 128.0 for oxygen. Oxygen adds up to the largest total mass, so it contributes the most to the molar mass. Hydrogen isn't present in this compound.

5. Market Value Ratios reflect what?

A. What investors think about the firm and its future prospects

B. The current assets to current liabilities

C. The company's gross margin

D. The proportion of debt to assets

Market value ratios capture investors' assessment of the firm's value and its future prospects as reflected in the stock price relative to fundamentals like earnings or book value. They synthesize expectations about growth, profitability, risk, and returns, showing what the market is willing to pay for a dollar of earnings or asset value today. This is why they align with what investors think about the firm and its future prospects. The other options describe accounting or financial health measures—liquidity (current assets to current liabilities), profitability (gross margin), and leverage (debt to assets)—which are not about market valuation and investor sentiment.

6. Stock Markets are defined as the places where the prices of which instrument are established?

A. Bonds

B. Firms' Stocks

C. Commodities

D. Currencies

Stock markets are places where the prices of ownership shares in firms are established. The price is set through the interaction of buyers and sellers—each side reveals how much they're willing to pay or accept, and the market finding process (order matching, bids, asks) determines the current price. This price discovery for equities reflects collective judgments about a company's future profits, risk, and growth prospects. Other markets exist for different instruments: bonds have prices driven by yields and credit risk, commodities by supply and demand for physical goods, and currencies by exchange rates and macro factors. So the instrument whose price stock markets establish is firms' stocks.

7. Which metric calculates the rate of return that makes Net Present Value equal to zero?

A. Internal Rate of Return

B. Net Present Value

C. Payback Period

D. Accounting Rate of Return

The concept being tested is the rate of return that makes the net present value of a project zero. The Internal Rate of Return is defined as the discount rate that sets the present value of all future cash inflows equal to the initial investment, so the NPV becomes zero. In other words, you're solving for the yield r in the equation that discounts all cash flows to match the upfront outlay. This rate is useful because you can compare it to your required return or cost of capital to decide whether to proceed. The other metrics measure different ideas: net present value is the value of the project at a given discount rate; the payback period focuses on how long it takes to recover the initial investment and ignores time value after that; the accounting rate of return uses accounting profits rather than cash flows and also ignores the time value of money. So the metric that specifically yields the rate that makes NPV zero is the Internal Rate of Return.

8. Henderson-Hasselbalch: For a buffer with pKa = 4.75, what [A-]/[HA] ratio yields pH = 4.00?

A. 0.178

B. 1.78

C. 4.75

D. 0.021

The Henderson-Hasselbalch equation links pH to pKa and the base/acid ratio: pH = pKa + log([A-]/[HA]). To get pH = 4.00 with pKa = 4.75, the log term must be -0.75. So [A-]/[HA] = 10^(-0.75) ≈ 0.178, i.e., about 0.18. This ratio being less than 1 means the acid form HA is more prevalent than its conjugate base A-, which is consistent with a pH below the pKa. The other given numbers would yield pH values further from 4.00 because they produce different log ratios (e.g., a larger ratio pushes pH higher; a much smaller ratio would push pH lower).

9. A 1.00 mol sample of an ideal gas occupies 2.00 L at 298 K. What is the pressure? (R = 0.0821 L atm mol^-1 K^-1)

A. 1.22 atm

B. 12.2 atm

C. 24.5 atm

D. 0.122 atm

The pressure is found using PV = nRT, solving for P: P = nRT / V. With n = 1.00 mol, R = 0.0821 L atm mol^-1 K^-1, T = 298 K, and V = 2.00 L, compute nRT = 1.00 × 0.0821 × 298 ≈ 24.50 L·atm. Divide by V: 24.50 / 2.00 ≈ 12.25 atm. So the pressure is about 12.2 atm. The other values arise from arithmetic mistakes, such as not dividing by the correct volume or misplacing the decimal.

10. Is the redox equation $MnO_4^- + 8\ H^+ + 5\ Fe^{2+} \rightarrow Mn^{2+} + 5\ Fe^{3+} + 4\ H_2O$ balanced?

A. No, atoms balanced but charges not

B. Oxygen not balanced

C. No, too many Fe^{3+} produced

D. Yes

Balancing redox reactions in acidic solution hinges on equal electrons being transferred between the oxidation and reduction half-reactions. Here, permanganate is reduced from MnO_4^- (Mn in +7) to Mn^{2+} (Mn in +2), which requires 5 electrons. Each Fe^{2+} is oxidized to Fe^{3+} ($Fe^{2+} \rightarrow Fe^{3+} + e^-$), releasing one electron. To match the 5 electrons needed, five Fe^{2+} ions are oxidized, providing 5 e^-. Write the two half-reactions and combine them: - Reduction: $MnO_4^- + 8\ H^+ + 5\ e^- \rightarrow Mn^{2+} + 4\ H_2O$ - Oxidation: $5\ Fe^{2+} \rightarrow 5\ Fe^{3+} + 5\ e^-$ Adding them cancels the electrons and gives: $MnO_4^- + 8\ H^+ + 5\ Fe^{2+} \rightarrow Mn^{2+} + 5\ Fe^{3+} + 4\ H_2O$ Check atoms and charges: Mn and Fe balance (1 Mn, 5 Fe on each side). O balance with 4 in MnO_4^- and 4 H_2O on the right. H balance with 8 H^+ on the left and 4 H_2O containing 8 H on the right. Net charge left is -1 + 8 + 10 = +17; right is +2 + 15 = +17. Everything matches, so the equation is balanced.

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://achpatchem.examzify.com

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