NMAT CHEMISTRY PRACTICE TEST (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. A reaction between a bronsted acid or base and water to produce an acidic or basic solution?

A. Hydrolysis reaction

B. Titration

C. Buffer Solution

D. pH

2. An atom or a group of bonded atoms that carries an electrical charge is called?

A. Ion

B. Atom

C. Element

D. Molecule

3. A negatively charged ion is called a?

A. Anion

B. Electron

C. Cation

D. Neutron

4. Which term describes the rate of reaction at a specific instant, which may vary as the reaction proceeds?

A. Instantaneous rate

B. Rate Law

C. Catalyst

D. Activated complex

5. The statement that the overall enthalpy of a reaction equals the sum of the enthalpies of its steps is known as which law?

A. Le Chatelier's Principle

B. Dalton's Law

C. Kirchhoff's Law

D. Hess's Law

6. When a system at dynamic equilibrium is perturbed, the system will adjust itself to minimize the effects of the perturbation.

A. Phase Boundaries

B. Le Chatelier's Principle

C. Triple Point

D. Critical Point

7. A method for determining the concentration of an acid (or base) by neutralization of a known volume of that acid (or base) with a known volume of base (or acid) at a known concentration.

A. Buffer Solution

B. pH

C. Strong acid (or base)

D. Titration

8. Which theory states that bonds form through the spatial overlap of orbitals containing valence electrons?

A. Valence-bond theory

B. Molecular orbital theory

C. VSEPR theory

D. Hybridization theory

9. Which term describes a solution that resists changes in pH when small amounts of acid or base are added?

A. Buffer Solution

B. Polyprotic acid

C. Amphiprotic species

D. Hydrolysis reaction

10. Which term refers to chemical equations that show oxidation and reduction separately and can be combined to yield the overall redox equation?

A. Full Reactions

B. Redox Equations

C. Half-reactions

D. Electrochemical Cells

Answers

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

Explanations

1. A reaction between a bronsted acid or base and water to produce an acidic or basic solution?

A. Hydrolysis reaction

B. Titration

C. Buffer Solution

D. pH

Hydrolysis captures the idea of a substance reacting with water to change the solution's acidity or basicity. When a Bronsted acid dissolves in water, it donates a proton to water: HA + H2O H3O+ + A−, which makes the solution acidic. When a Bronsted base dissolves in water, it accepts a proton from water: B + H2O BH+ + OH−, producing hydroxide and a basic solution. The key is the direct interaction with water that generates hydronium or hydroxide ions, altering pH. Titration is a method for determining concentration, not the reaction with water that changes pH; a buffer is a system that resists pH change and often involves acid–base conjugates; pH is the measure of the acidity or basicity, not a reaction.

2. An atom or a group of bonded atoms that carries an electrical charge is called?

A. Ion

B. Atom

C. Element

D. Molecule

Ion is the term for an atom or a group of bonded atoms that carries a net electric charge. This happens when there's an unequal number of protons and electrons: losing electrons gives a positive charge, while gaining electrons gives a negative charge. Monoatomic ions are single atoms with a charge, like Na+ or Cl−, while polyatomic ions are groups of bonded atoms that together carry a charge, such as NH4+ or SO4^2−. In contrast, a neutral atom has no overall charge, and a molecule is typically a neutral group of atoms bonded together, though charged groups of atoms are described as ions.

3. A negatively charged ion is called a?

A. Anion

B. Electron

C. Cation

D. Neutron

When atoms gain electrons, they become negatively charged ions. The species with that negative charge is called an anion. This contrasts with cations, which form when atoms lose electrons and carry a positive charge. An electron is a negatively charged particle, not an ion by itself, and a neutron is neutral. For example, chlorine that gains an electron forms Cl− (an anion), while sodium that loses an electron forms Na+ (a cation). The suffix -ide often appears in simple anions, like oxide (O2−) or chloride (Cl−). The key idea is that a negative charge identifies the species as an anion.

4. Which term describes the rate of reaction at a specific instant, which may vary as the reaction proceeds?

A. Instantaneous rate

B. Rate Law

C. Catalyst

D. Activated complex

The rate of a reaction at a specific moment is the instantaneous rate. It is the slope of the concentration-versus-time curve at that exact moment, or, in calculus terms, the derivative of concentration with respect to time (often written as -d[A]/dt). This value can change as the reaction proceeds because reactant concentrations are changing, so the driving force for the reaction—and thus the rate—can increase or decrease over time. In practice, you determine it by looking at the tangent to the concentration–time plot at that moment or by evaluating the rate law with the current concentrations. The rate law describes how the rate depends on concentrations (and possibly other factors) and gives a relationship to calculate the rate, but the instantaneous rate is the actual numerical rate at a specific time. A catalyst, while it speeds up the reaction by providing a lower-energy pathway, changes the rate constant but is not itself a rate measured at an instant. The activated complex is the transient high-energy state in the transition from reactants to products, not a rate.

5. The statement that the overall enthalpy of a reaction equals the sum of the enthalpies of its steps is known as which law?

A. Le Chatelier's Principle

B. Dalton's Law

C. Kirchhoff's Law

D. Hess's Law

Enthalpy is a state function, so the energy change depends only on the starting and ending states, not on the path taken. Because of this, you can break a reaction into a sequence of steps, find the enthalpy change for each step, and add them together to get the overall enthalpy change. This is Hess's Law. It's particularly useful for calculating the heat of a reaction by combining known step enthalpies, such as formation or combustion values, to obtain the total ΔH. The other laws describe different ideas: Le Châtelier's Principle explains how equilibria respond to stresses, Dalton's Law deals with partial pressures in gas mixtures, and Kirchhoff's Law concerns how enthalpy changes vary with temperature rather than summing steps.

6. When a system at dynamic equilibrium is perturbed, the system will adjust itself to minimize the effects of the perturbation.

A. Phase Boundaries

B. Le Chatelier's Principle

C. Triple Point

D. Critical Point

Le Chatelier's principle explains how a system in dynamic equilibrium responds when disturbed. When you perturb the system—by changing concentration, pressure, or temperature—the balance shifts in the direction that counteracts the change, moving toward a new equilibrium to minimize the effect of the disturbance. For example, adding more reactant increases its concentration, so the system shifts toward products to consume the added reactant. If you remove product, the equilibrium also shifts toward the product side to replenish it. Increasing pressure pushes the system toward the side with fewer moles of gas, while decreasing pressure favors the side with more moles of gas. Temperature changes depend on whether the reaction is endothermic or exothermic: raising temperature favors the endothermic direction, while lowering temperature favors the exothermic direction. Terms that describe phase behavior on a diagram, such as phase boundaries, the triple point, or the critical point, don't directly describe how a system at equilibrium counteracts a perturbation, so they don't capture this dynamic response as clearly.

7. A method for determining the concentration of an acid (or base) by neutralization of a known volume of that acid (or base) with a known volume of base (or acid) at a known concentration.

A. Buffer Solution

B. pH

C. Strong acid (or base)

D. Titration

This item tests the method used to determine concentration by neutralization, where a known volume of the acid or base (the analyte) is reacted with a solution of known concentration (the titrant) until neutralization is complete. That method is titration. In a titration, you add the titrant gradually to the analyte and use the point at which the reaction is complete (the equivalence point) to calculate the unknown concentration, using the known volumes and the stoichiometry of the reaction, typically expressed as M1V1 = M2V2 for the balanced equation. Practically, you'll detect the endpoint with an indicator that changes color (or with a pH meter) at a pH appropriate for the equivalence point, so you know when to stop and perform the calculation. This approach works for both acids and bases and is widely used because it ties measurable quantities (volumes and known concentration) to the unknown concentration. The other ideas describe either substances or concepts that don't provide a procedure for determining concentration by neutralization: a buffer resists pH change and isn't a method for finding concentration; pH is a measurement of acidity, not a determination method; and describing a strong acid or base refers to strength, not to how you quantify concentration.

8. Which theory states that bonds form through the spatial overlap of orbitals containing valence electrons?

A. Valence-bond theory

B. Molecular orbital theory

C. VSEPR theory

D. Hybridization theory

Bonds form when valence atomic orbitals from adjacent atoms spatially overlap, allowing a pair of electrons to be shared and creating a localized bond between the nuclei. This idea is the essence of valence-bond theory: the strength and type of bond come from how these orbitals overlap. Direct end-to-end overlap of orbitals between two atoms produces a sigma bond, while sideways overlap of p orbitals gives a pi bond, and multiple overlaps explain single, double, or triple bonds in a localized picture. Other theories describe bonding differently: molecular orbital theory treats electrons as occupying molecular orbitals that extend over the entire molecule rather than just between two overlapping orbitals; VSEPR explains molecular shapes from repulsion between electron pairs; hybridization theory describes mixing of atomic orbitals to form new, geometry-suited hybrids, often used within the valence-bond framework but not by itself defining bond formation through orbital overlap.

9. Which term describes a solution that resists changes in pH when small amounts of acid or base are added?

A. Buffer Solution

B. Polyprotic acid

C. Amphiprotic species

D. Hydrolysis reaction

A solution that resists changes in pH when small amounts of acid or base are added is a buffer. This works because a buffer contains a weak acid and its conjugate base (or a weak base and its conjugate acid). If acid is added, the conjugate base neutralizes some of the extra H+ by forming more of the weak acid, so the pH doesn't drop much. If base is added, the weak acid donates a proton to neutralize the OH−, forming more of the conjugate base and keeping the pH from rising significantly. The Henderson–Hasselbalch relationship pH = pKa + log([A−]/[HA]) shows that when the ratio of base form to acid form stays near the right balance, the pH remains fairly stable. Buffer capacity increases with higher concentrations of both species. Examples include acetic acid with acetate or ammonia with ammonium; these pairs illustrate the ongoing neutralization that dampens pH changes. The other terms describe related ideas (polyprotic acids can donate multiple protons, amphiprotic species can act as both acid and base in some contexts, and hydrolysis is a reaction with water) but do not define a solution that resists pH changes as precisely as a true buffer does.

10. Which term refers to chemical equations that show oxidation and reduction separately and can be combined to yield the overall redox equation?

A. Full Reactions

B. Redox Equations

C. Half-reactions

D. Electrochemical Cells

Oxidation and reduction are analyzed by writing two separate equations called half-reactions. They show where electrons are released in oxidation and where they are gained in reduction. Since electrons must be conserved, the number of electrons in both halves is the same; balance each half for atoms and charge, usually by adding H+, H2O, or OH− as needed depending on the medium. Once both halves are balanced, add them together and cancel the electrons to obtain the overall redox equation. This separation and subsequent recombination is the standard way to analyze redox processes, making it clear which species are oxidized and reduced and ensuring the equation is balanced. For example, in an acidic solution, oxidizing Fe2+ to Fe3+ gives Fe2+ Fe3+ + e−, while reducing MnO4− to Mn2+ in acidic solution gives MnO4− + 8 H+ + 5 e− Mn2+ + 4 H2O. To balance, multiply the oxidation half by 5 so electrons match, then add to the reduction half, cancelling the electrons to yield the overall equation. The term that refers to these separate oxidation and reduction pieces is half-reactions. Full reactions describe the complete transformation without showing the split; redox equations refer to the overall electron transfer, while electrochemical cells are devices that harness or drive such reactions.

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://nmatchemistry.examzify.com

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