DAT Bootcamp General 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. **Which statement correctly identifies molybdenum’s electron configuration as an exception?**

   A. [Kr] 5s1 4d5

   B. [Kr] 5s2 4d4

   C. [Kr] 5s2 4d5

   D. [Kr] 4s2 3d10

2. **Higher intermolecular forces generally result in which effect on surface tension?**

   A. Lower surface tension

   B. Higher surface tension

   C. No change

   D. Surface tension becomes zero

3. **According to Henry's Law, the concentration of a dissolved gas is proportional to its partial pressure. Which statement is true?**

   A. Concentration is directly proportional to partial pressure.

   B. Concentration is inversely proportional to partial pressure.

   C. Concentration is independent of partial pressure.

   D. Concentration is proportional to the gas's temperature.

4. **Like dissolves like means polar solutes dissolve in polar solvents and nonpolar solutes in nonpolar solvents. Which statement best reflects this principle?**

   A. Polar solutes dissolve in polar solvents; nonpolar solutes dissolve in nonpolar solvents.

   B. Only temperature matters.

   C. Polar solutes dissolve in nonpolar solvents.

   D. Nonpolar solutes dissolve in polar solvents.

5. **Neutral Anions include which of the following lists?**

   A. F-, OH-, NO2-, CN-, SCN-, N3-

   B. Cl2-, Br2-, I2-, O2-, N2-, CO2

   C. Cl-, Br-, I-, NO3-, ClO4-, ClO3-

   D. HCO3-, SO4^2-, HSO4-, PO4^3-

6. What term describes the lowering of a solvent's freezing point when a nonvolatile solute is dissolved?

A. Freezing Point Depression

B. Boiling Point Elevation

C. Osmosis

D. Osmotic Pressure

7. At equilibrium, ΔG equals what?

A. 0

B. ∞

C. ΔG°

D. Negative value

8. Which of the following is a state function?

A. Heat

B. Work

C. Entropy

D. Path length

9. Which of the following is a classic colligative property observed when a nonvolatile solute is added to a solvent?

A. Color change

B. Vapor pressure decreases

C. Boiling point elevation

D. Osmotic pressure

10. Which term describes the change in boiling point that a liquid experiences when solute is dissolved in it?

A. Boiling Point Elevation

B. Freezing Point Depression

C. Osmosis

D. Osmotic Pressure

Answers

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

Explanations

1. Which statement correctly identifies molybdenum's electron configuration as an exception?

A. [Kr] 5s1 4d5

B. [Kr] 5s2 4d4

C. [Kr] 5s2 4d5

D. [Kr] 4s2 3d10

An important idea is that electron configurations sometimes deviate from the simple filling order because certain arrangements give extra stability. For transition metals, a half-filled or fully filled d subshell often lowers energy due to exchange interactions and reduced repulsion. Molybdenum has atomic number 42, and following a naïve Aufbau fill would suggest 4d^4 5s^2. But the actual ground-state configuration is 4d^5 5s^1. Keeping the 4d subshell half-filled (d^5) while keeping just one electron in 5s creates greater stability, so this arrangement is energetically favored over the expected one. This is the kind of exception seen when a subshell achieves a half-filled stability in the transition metals. So the configuration that matches molybdenum's real electron arrangement is [Kr] 5s^1 4d^5.

2. Higher intermolecular forces generally result in which effect on surface tension?

A. Lower surface tension

B. Higher surface tension

C. No change

D. Surface tension becomes zero

When molecules attract each other strongly, the surface layer of a liquid feels a strong inward pull from its neighbors. This creates a tiny "skin" at the surface that resists being stretched or expanded. Surface tension is the energy required to increase the surface area of a liquid, so the stronger those cohesive forces, the more energy is needed per unit area. That means the liquid resists expansion more, giving a higher surface tension. For example, water has a relatively high surface tension because of strong hydrogen bonding, while liquids with weaker intermolecular forces have lower surface tension. Temperature can affect this too—raising temperature generally decreases surface tension by providing energy to break those interactions. But in terms of the strength of intermolecular forces, higher forces lead to higher surface tension.

3. According to Henry's Law, the concentration of a dissolved gas is proportional to its partial pressure. Which statement is true?

A. Concentration is directly proportional to partial pressure.

B. Concentration is inversely proportional to partial pressure.

C. Concentration is independent of partial pressure.

D. Concentration is proportional to the gas's temperature.

Henry's Law says that at a fixed temperature, the amount of gas dissolved in a liquid is proportional to the partial pressure of that gas above the liquid. Mathematically, C = kH × Pgas, where kH is Henry's constant for the specific gas–solvent pair. This means that if you raise the partial pressure, more gas dissolves (concentration increases) and if you lower the partial pressure, less gas dissolves (concentration decreases). Temperature matters because kH depends on temperature, so the exact amount dissolved at a given pressure can change with temperature, but the fundamental relation is that concentration scales with partial pressure at constant temperature. Therefore, the concentration is directly proportional to the partial pressure.

4. Like dissolves like means polar solutes dissolve in polar solvents and nonpolar solutes in nonpolar solvents. Which statement best reflects this principle?

A. Polar solutes dissolve in polar solvents; nonpolar solutes dissolve in nonpolar solvents.

B. Only temperature matters.

C. Polar solutes dissolve in nonpolar solvents.

D. Nonpolar solutes dissolve in polar solvents.

Like dissolves like means dissolution depends on how well the solute and solvent can interact through similar intermolecular forces. Polar solutes carry dipoles and can form strong dipole-dipole interactions or hydrogen bonds with polar solvents, so these favorable interactions help the solute disperse and stay dissolved. Nonpolar solutes interact mainly via London dispersion forces with nonpolar solvents, and those compatible, weaker interactions are still enough to dissolve when both components are nonpolar. This is why polar solutes dissolve in polar solvents and nonpolar solutes dissolve in nonpolar solvents—the statement captures how matching types of intermolecular forces drive solubility. Relying only on temperature ignores the fundamental compatibility of forces; polar solutes do not dissolve best in nonpolar solvents, and nonpolar solutes do not dissolve best in polar solvents.

5. Neutral Anions include which of the following lists?

A. F-, OH-, NO2-, CN-, SCN-, N3-

B. Cl2-, Br2-, I2-, O2-, N2-, CO2

C. Cl-, Br-, I-, NO3-, ClO4-, ClO3-

D. HCO3-, SO4^2-, HSO4-, PO4^3-

Anions are negatively charged species, and when we talk about a single negative charge, we're looking for monoanions with a -1 charge. The list that fits this idea includes halide ions like chloride, bromide, and iodide, plus common singly charged oxyanions such as nitrate, chlorate, and perchlorate. All of these have a -1 overall charge, which is the hallmark of a monoanion. The other options mix in items that aren't typical singly charged species or involve ions with charges other than -1 (for example, ions with -2 or -3). That's why the set of -1 charged ions best represents "neutral anions" in this context.

6. What term describes the lowering of a solvent's freezing point when a nonvolatile solute is dissolved?

A. Freezing Point Depression

B. Boiling Point Elevation

C. Osmosis

D. Osmotic Pressure

Freezing point depression is the lowering of a solvent's freezing point when a nonvolatile solute is dissolved. This happens because the dissolved particles disrupt the orderly arrangement of solvent molecules needed to form a solid crystal, so the liquid phase remains stable at a lower temperature. The effect depends on how many solute particles are present (not their identity) and is described by ΔTf = iKf m, where i is the van't Hoff factor and m is the molality. This is a colligative property, and it contrasts with boiling point elevation (which raises the boiling point) and with osmotic concepts related to membrane flow.

7. At equilibrium, ΔG equals what?

A. 0

B. ∞

C. ΔG°

D. Negative value

At constant temperature and pressure, the driving force for a reaction is given by ΔG = ΔG° + RT ln Q. At equilibrium there is no net driving force, so ΔG = 0. This happens because Q equals the equilibrium constant K, and ΔG° is related to K by ΔG° = -RT ln K. Substituting Q = K into the equation gives ΔG = (-RT ln K) + RT ln K = 0. So the system's free energy is minimized for the given conditions, and there's no further tendency for the reaction to proceed in either direction. The other options imply a continuing drive or an undefined condition, which does not describe a system at equilibrium.

8. Which of the following is a state function?

A. Heat

B. Work

C. Entropy

D. Path length

In thermodynamics, a state function is a property that depends only on the current state of the system, not on how that state was reached. Entropy fits this idea: the change in entropy between two states is determined solely by those states, regardless of the path taken between them. Heat and work, by contrast, depend on the process path—two identical states can be connected by many different paths, each with different amounts of heat transfer or work performed. Path length describes the extent of the process in state space and is not a thermodynamic property of the state itself. Therefore, entropy is the quantity that is a state function.

9. Which of the following is a classic colligative property observed when a nonvolatile solute is added to a solvent?

A. Color change

B. Vapor pressure decreases

C. Boiling point elevation

D. Osmotic pressure

Colligative properties depend on how many solute particles are in solution, not on what the particles are. When a nonvolatile solute is added, the solvent's tendency to evaporate is reduced, so the solution's vapor pressure is lowered. Boiling occurs when the vapor pressure equals the external pressure, so lowering the vapor pressure means you must heat the solution to a higher temperature. That rise in boiling temperature is the boiling point elevation, a hallmark of colligative behavior (its size depends on concentration and, for electrolytes, the number of particles via the van't Hoff factor). Color change isn't caused by the presence of solute particles affecting vapor or boiling directly. Osmotic pressure is also a colligative property, but it's typically observed in membrane systems rather than just heating a solution. Vapor pressure lowering is another colligative effect, but the classic, most straightforward example people cite is boiling point elevation.

10. Which term describes the change in boiling point that a liquid experiences when solute is dissolved in it?

A. Boiling Point Elevation

B. Freezing Point Depression

C. Osmosis

D. Osmotic Pressure

When you dissolve a nonvolatile solute in a liquid, the boiling point rises. This happens because the dissolved particles lower the solvent's vapor pressure at a given temperature, so you must heat the liquid more to reach a vapor pressure equal to the surrounding pressure. The amount the boiling point increases is described by boiling point elevation, which depends on how many solute particles are present (the van't Hoff factor), the solvent's ebullioscopic constant, and the molality of the solution. The other terms describe different phenomena: freezing point depression lowers the freezing point, while osmosis and osmotic pressure relate to water movement across membranes and the pressure needed to counter that movement, not to boiling point.

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://datbootcampgenchem.examzify.com

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