

SQA Higher Chemistry Practice Exam (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 of the following best describes environmental considerations in chemistry?**
 - A. Minimizing waste**
 - B. Avoiding the use or production of toxic substances**
 - C. Designing products that will biodegrade if appropriate**
 - D. All of the above**
- 2. What occurs during a protein condensation reaction?**
 - A. The carboxyl group of one amino acid joins with another**
 - B. The amino group of one amino acid and the carboxyl group of another join**
 - C. Water is added to break the bond**
 - D. Amino acids are separated by hydrolysis**
- 3. What happens when purple permanganate solution is reduced in a titration?**
 - A. It turns colorless**
 - B. It becomes bluer**
 - C. It turns green**
 - D. It darkens further**
- 4. Unsaturated compounds can be identified by their reaction with which of the following?**
 - A. Hydrochloric acid**
 - B. Water**
 - C. Bromine solution**
 - D. Sodium chloride**
- 5. What does a longer R group indicate about an alcohol?**
 - A. The alcohol is more polar**
 - B. The alcohol is less polar**
 - C. The alcohol has a higher boiling point**
 - D. The alcohol is more soluble in water**

- 6. How do unsaturated compounds react with bromine solution?**
- A. They decolourise it quickly**
 - B. They precipitate a solid**
 - C. They produce a gas**
 - D. They remain unchanged**
- 7. Which method can be used to differentiate between an aldehyde and a ketone?**
- A. Solubility tests**
 - B. Colorimetric analysis**
 - C. Oxidizing agents**
 - D. pH testing**
- 8. What are the steps involved in free radical chain reactions?**
- A. Evaporation, condensation, and precipitation**
 - B. Initiation, propagation, and termination**
 - C. Formation, transformation, and destruction**
 - D. Activation, reaction, and resolution**
- 9. Essential oils are composed of which kind of compounds?**
- A. Water-soluble compounds**
 - B. Volatile aroma compounds**
 - C. Solid crystalline compounds**
 - D. Stable reactive compounds**
- 10. What is the role of hydroxyl functional groups in alcohols?**
- A. To increase steric hindrance**
 - B. To promote volatility**
 - C. To modify solubility and reactivity**
 - D. To eliminate molecular stability**

Answers

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

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Explanations

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1. Which of the following best describes environmental considerations in chemistry?
- A. Minimizing waste
 - B. Avoiding the use or production of toxic substances
 - C. Designing products that will biodegrade if appropriate
 - D. All of the above**

Environmental considerations in chemistry encompass a variety of approaches aimed at reducing negative impacts on the environment, promoting sustainability, and ensuring the safety of chemical processes and products. Minimizing waste is a fundamental principle in green chemistry, as it helps reduce the quantity of harmful substances that could enter the environment. By employing more efficient processes and utilizing raw materials wisely, chemists can significantly decrease waste generation. Avoiding the use or production of toxic substances is crucial to protect both human health and the ecosystem. The goal is to design chemical processes that do not lead to hazardous by-products, which could pose risks to living organisms and contribute to pollution. Designing products that will biodegrade if appropriate is another essential aspect. Biodegradation refers to the process by which organic substances are broken down by the action of living organisms. By creating products that can naturally decompose, the long-term environmental impact can be mitigated, allowing us to manage waste in a more sustainable manner. All these aspects - minimizing waste, avoiding toxic substances, and ensuring that products can biodegrade - are integral to promoting a more sustainable practice in chemistry. Therefore, choosing all of the above accurately captures the multifaceted approach required for responsible environmental management in the field of chemistry.

2. What occurs during a protein condensation reaction?
- A. The carboxyl group of one amino acid joins with another
 - B. The amino group of one amino acid and the carboxyl group of another join**
 - C. Water is added to break the bond
 - D. Amino acids are separated by hydrolysis

During a protein condensation reaction, also known as a peptide bond formation, the amino group of one amino acid reacts with the carboxyl group of another amino acid. This reaction involves the removal of a molecule of water (a process called dehydration synthesis) and results in the formation of a covalent bond, specifically a peptide bond, between the two amino acids. This process is fundamental in the biosynthesis of proteins, leading to the formation of polypeptide chains. In this context, the joining of the amino group from one amino acid with the carboxyl group of another is crucial for linking multiple amino acids together, a key step in protein formation. As a result of this reaction, a dipeptide is formed, which can further join with other amino acids through similar condensation reactions to create longer polypeptide chains, ultimately leading to functional proteins.

3. What happens when purple permanganate solution is reduced in a titration?

- A. It turns colorless**
- B. It becomes bluer**
- C. It turns green**
- D. It darkens further**

When purple permanganate solution undergoes reduction in a titration, it turns colorless. This occurs because permanganate ions (MnO_4^-) are reduced to manganese (II) ions (Mn^{2+}), which are colorless in solution. The distinct violet color of the permanganate is a result of its high oxidation state. The decolorization indicates that the reaction is progressing, allowing the analyst to see when the endpoint of the titration is reached. This property of permanganate makes it a popular choice as a titrant in redox titrations, as the visible color change provides clear evidence of the reaction's completion. In contrast, the other options do not accurately describe the behavior of permanganate during reduction. It does not become bluer, turn green, or darken further; these options are not aligned with the known chemical behavior of permanganate ions in a reduction reaction.

4. Unsaturated compounds can be identified by their reaction with which of the following?

- A. Hydrochloric acid**
- B. Water**
- C. Bromine solution**
- D. Sodium chloride**

Unsaturated compounds, which contain carbon-carbon double or triple bonds, can be identified by their ability to react with bromine solution. This is known as a bromination reaction. When bromine, which is a reddish-brown liquid, is added to an unsaturated compound, the double or triple bonds in the molecule react with bromine to form a saturated compound. As a result of this reaction, the reddish-brown color of the bromine solution disappears, indicating the presence of unsaturation in the compound. This color change is a clear and straightforward visual test for unsaturation. In contrast, hydrochloric acid, water, and sodium chloride do not specifically indicate the presence of unsaturation. Hydrochloric acid typically reacts with alkenes but does not provide a clear test for unsaturation, and water can react with certain unsaturated compounds under specific conditions without clearly demonstrating the unsaturation. Sodium chloride is not generally involved in reactions that would help identify unsaturation in organic compounds. Thus, bromine solution stands out as the most reliable option for indicating unsaturation in organic chemistry.

5. What does a longer R group indicate about an alcohol?

- A. The alcohol is more polar**
- B. The alcohol is less polar**
- C. The alcohol has a higher boiling point**
- D. The alcohol is more soluble in water**

In the context of alcohols, the length of the R group, which represents the carbon chain of the molecule, plays a significant role in determining the properties of the alcohol. A longer R group primarily contributes to an overall increase in the hydrophobic character of the molecule. As the R group lengthens, the non-polar carbon and hydrogen portion of the molecule becomes much greater relative to the polar hydroxyl (-OH) group. This means that the hydrophilic (water-attracting) nature of the alcohol, due to the presence of the hydroxyl group, is increasingly overshadowed by the hydrophobic (water-repelling) nature of the longer carbon chain. Consequently, this results in the alcohol being less polar overall. Additionally, while polarity is related to solubility and boiling points, a longer R group typically leads to decreased solubility in water and potentially a higher boiling point due to increased van der Waals forces, but this must be balanced against the polar nature of the hydroxyl group. The correct interpretation focuses on the impact of the R group's length on the overall polarity of the molecule.

6. How do unsaturated compounds react with bromine solution?

- A. They decolourise it quickly**
- B. They precipitate a solid**
- C. They produce a gas**
- D. They remain unchanged**

Unsaturated compounds, which contain double or triple bonds in their molecular structure, readily react with bromine solution. This reaction involves the addition of bromine across the double or triple bond, leading to a saturation of the molecule. This process is characterized by the decolorization of the bromine solution, which transitions from its distinctive brownish-orange color to colorless as the bromine is consumed during the reaction. The speed of this decolorization is what distinguishes the reactivity of unsaturated compounds, indicating that they are more reactive due to the presence of the reactive pi bonds. This is a valuable qualitative test for the presence of unsaturation in organic compounds, as saturated compounds, which do not have these double or triple bonds, would not react with bromine in this way and thus would leave the solution unchanged.

7. Which method can be used to differentiate between an aldehyde and a ketone?

- A. Solubility tests**
- B. Colorimetric analysis**
- C. Oxidizing agents**
- D. pH testing**

The ability to differentiate between an aldehyde and a ketone lies primarily in the behavior of these compounds when reacted with oxidizing agents. Aldehydes can be readily oxidized to carboxylic acids, whereas ketones are generally more stable and do not undergo oxidation under similar conditions. This fundamental difference allows for a chemical test using oxidizing agents to distinguish between the two functional groups. When an oxidizing agent, such as Tollens' reagent or Fehling's solution, is added to an aldehyde, a visible change occurs — typically the formation of a carboxylic acid along with a color change or precipitate. In contrast, a ketone will not react in the same way; it will remain unchanged when exposed to these oxidizing agents. Thus, the reaction with oxidizing agents is a reliable method for distinguishing between aldehydes and ketones based on their contrasting reactivity. Other methods, such as solubility tests, colorimetric analysis, and pH testing, do not provide a clear and distinct differentiation between these two classes of compounds since they can overlap in solubility and acidity/alkalinity characteristics. Therefore, using oxidizing agents is the most effective means of achieving this differentiation.

8. What are the steps involved in free radical chain reactions?

- A. Evaporation, condensation, and precipitation**
- B. Initiation, propagation, and termination**
- C. Formation, transformation, and destruction**
- D. Activation, reaction, and resolution**

Free radical chain reactions consist of a series of steps that contribute to the overall mechanism of the reaction. The correct answer identifies these steps as initiation, propagation, and termination. During the initiation stage, free radicals are generated, typically through the breaking of covalent bonds via heat or light, creating highly reactive species that can initiate the chain reaction. Next, in the propagation stage, these free radicals react with stable molecules to produce new radicals and more products. This step repeats, as the newly formed radicals can continue to react, leading to the propagation of the reaction and resulting in the formation of larger products. Finally, in the termination stage, two free radicals can combine to form a stable product, which effectively stops the chain reaction as it reduces the number of active radicals. These steps highlight the dynamic nature of free radical chain reactions and illustrate the transformation from reactive intermediates to more stable products, which is key to understanding processes such as polymerization and combustion. The other choices presented do not accurately represent the stages in a free radical chain mechanism, as they refer to unrelated processes or incorrect terminologies.

9. Essential oils are composed of which kind of compounds?

- A. Water-soluble compounds
- B. Volatile aroma compounds**
- C. Solid crystalline compounds
- D. Stable reactive compounds

Essential oils are primarily composed of volatile aroma compounds. These are substances that easily evaporate at room temperature, contributing the characteristic scents associated with various plants. The volatile nature of these compounds is what allows them to disperse into the air, making them effective in aromatherapy, perfumery, and as flavoring agents. The term "volatile" refers to the tendency of these compounds to vaporize, which is essential to their functionality as essential oils. This volatility also explains why they have distinct fragrances and why they are used in products designed to impart scent. The aromatic properties of these compounds are often a result of their molecular structure, which can include terpenes, esters, aldehydes, and alcohols. In contrast, water-soluble compounds typically do not exhibit the same strong aromatic characteristics and are more likely to dissolve in water rather than evaporate. Solid crystalline compounds generally do not have the aroma profiles characteristic of essential oils and are not classified in the same way. Stable reactive compounds suggest substances that can engage in chemical reactions but would not necessarily be volatile or aromatic. The focus on volatile aroma compounds highlights the unique attributes of essential oils that make them desirable for various uses, both in personal care and industrial applications.

10. What is the role of hydroxyl functional groups in alcohols?

- A. To increase steric hindrance
- B. To promote volatility
- C. To modify solubility and reactivity**
- D. To eliminate molecular stability

Hydroxyl functional groups, represented by the -OH group, play a crucial role in the behavior of alcohols. Their presence significantly influences both the solubility and reactivity of the alcohol. In terms of solubility, the hydroxyl group is polar, allowing alcohols to form hydrogen bonds with water molecules. This increases the solubility of alcohols in water compared to hydrocarbons, which lack such functional groups. In addition to enhancing solubility, hydroxyl groups also affect reactivity. The presence of the -OH group can make alcohols more reactive in various chemical reactions, such as esterification or oxidation. The ability of the hydroxyl group to donate a hydrogen bond can facilitate interactions with other molecules, thus affecting the rate and type of reactions that alcohols undergo. The other choices do not encompass the primary influences of hydroxyl groups. While steric hindrance and molecular stability can play roles in certain contexts, they are not the defining aspects of how hydroxyl groups operate in alcohols. Instead, modifying solubility and reactivity is central to understanding the unique properties that alcohols display in chemical contexts.

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://sqahigherchemistry.examzify.com>

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