

# AAMC Chemical and Physical Foundations of Biological Systems (C/P) Full-Length (FL) 5 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

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- 1. What is the primary function of the ribosome in a cell?**
  - A. Energy production**
  - B. Protein synthesis**
  - C. DNA replication**
  - D. Lipid synthesis**
- 2. If the normal force applied during defibrillation is 100 N with an area of  $0.005 \text{ m}^2$ , what is the pressure exerted on the chest?**
  - A. 5 kPa**
  - B. 10 kPa**
  - C. 15 kPa**
  - D. 20 kPa**
- 3. In the context of enzyme studies, what is the significance of the cation concentration used?**
  - A. It directly alters enzyme kinetic parameters**
  - B. It serves as a control variable for experimentation**
  - C. It facilitates optimal enzyme activity**
  - D. It prevents enzyme degradation**
- 4. What best describes a ketone?**
  - A.  $\text{R}(\text{C}=\text{O})\text{H}$**
  - B.  $\text{RCO}_2\text{H}$**
  - C.  $\text{R}(\text{C}=\text{O})\text{R}'$**
  - D.  $\text{RCO}_2\text{R}'$**
- 5. What is the primary type of chemical bond found in water molecules?**
  - A. Covalent bond**
  - B. Ionic bond**
  - C. Hydrogen bond**
  - D. Van der Waals forces**

6. What functional group transformation occurs in the product of the reaction catalyzed by Na<sup>+</sup>-NQR?
- A.  $\text{RC(=O)R} \rightarrow \text{RCH(OH)R}$
  - B.  $\text{ROPO}_3^{2-} \rightarrow \text{ROH} + \text{Pi}$
  - C.  $\text{RC(=O)NHR}' \rightarrow \text{RCOOH} + \text{R}'\text{NH}_2$
  - D.  $\text{RC(=O)OR}' \rightarrow \text{RCOOH} + \text{R}'\text{OH}$
7. According to the energy of a photon equation, what is the relationship between energy and frequency?
- A.  $E = h/f$
  - B.  $E = hf$
  - C.  $E = h\lambda$
  - D.  $E = f/\lambda$
8. What is the structure of a carboxylic acid?
- A.  $\text{R(C=O)R}'$
  - B.  $\text{R(C=O)H}$
  - C.  $\text{RCO}_2\text{R}'$
  - D.  $\text{RCO}_2\text{H}$
9. What type of reaction is characterized by the transfer of electrons between species?
- A. Decomposition reaction
  - B. Synthesis reaction
  - C. Redox reaction
  - D. Combustion reaction
10. What is a major challenge faced in nuclear fusion reactors?
- A. Maintaining low temperatures
  - B. Slow reaction rates
  - C. Containment of fuel at high temperatures
  - D. Insufficient neutron production

## Answers

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

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## **Explanations**

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## 1. What is the primary function of the ribosome in a cell?

- A. Energy production
- B. Protein synthesis**
- C. DNA replication
- D. Lipid synthesis

The ribosome's primary function in a cell is protein synthesis, a critical process for cell function and structure. Ribosomes facilitate the translation of messenger RNA (mRNA) sequences into polypeptide chains, which fold into functional proteins. This process involves the ribosome reading the codons on the mRNA and using transfer RNA (tRNA) to bring the corresponding amino acids to the growing polypeptide chain. Proteins synthesized by ribosomes are essential for numerous cellular activities, including enzymatic functions, structural components of cells, signaling, and regulatory mechanisms. Therefore, the central role of ribosomes in translating genetic information into functional proteins highlights their importance in maintaining cellular operations and overall tissue health. The other options involve different cellular processes: energy production typically occurs in mitochondria, DNA replication happens at the replication fork during the cell cycle, and lipid synthesis occurs in the smooth endoplasmic reticulum. Each of these processes is vital for cellular function but does not involve the ribosome directly.

## 2. If the normal force applied during defibrillation is 100 N with an area of 0.005 m<sup>2</sup>, what is the pressure exerted on the chest?

- A. 5 kPa
- B. 10 kPa
- C. 15 kPa
- D. 20 kPa**

To determine the pressure exerted on the chest during defibrillation, we can use the formula for pressure, which is defined as force divided by area:  $\text{Pressure} = \frac{\text{Force}}{\text{Area}}$ . In this case, the force exerted is 100 N and the area is 0.005 m<sup>2</sup>. Plugging these values into the formula gives:  $\text{Pressure} = \frac{100 \text{ N}}{0.005 \text{ m}^2}$ . Calculating this results in:  $\text{Pressure} = 20000 \text{ N/m}^2 = 20000 \text{ Pa} = 20 \text{ kPa}$ . Therefore, the pressure exerted on the chest during defibrillation is 20 kPa, which corresponds to the correct answer. This value represents how force is distributed over a given area, and higher pressure values can signify either greater force or smaller areas being utilized. In medical contexts, such calculations are critical for ensuring that the necessary force is applied effectively to achieve desired physiological responses.

3. In the context of enzyme studies, what is the significance of the cation concentration used?

- A. It directly alters enzyme kinetic parameters**
- B. It serves as a control variable for experimentation
- C. It facilitates optimal enzyme activity
- D. It prevents enzyme degradation

The significance of cation concentration in enzyme studies is primarily linked to its impact on enzyme kinetics. The presence of cations can influence the structure and stability of the enzyme, which in turn can alter the enzyme's kinetic parameters, such as the maximum velocity ( $V_{max}$ ) and the Michaelis constant ( $K_m$ ). Different enzymes may require specific cations for optimal activity, as these ions can affect substrate binding, catalytic activity, and overall enzyme conformation. Cation concentration is crucial because if it is too low or too high, it can impair enzyme function and impact the rates at which reactions occur. This alteration in kinetic parameters can help researchers understand the enzyme's behavior under different conditions and can be a vital aspect in enzyme catalysis studies and applications. In contrast, the roles described in the other options—serving as a control variable, facilitating optimal enzyme activity, and preventing enzyme degradation—while relevant, do not specifically address the direct impact on kinetic parameters as the correct option does. Thus, the correct answer underscores the importance of how varying cation concentrations can lead to changes in enzyme efficiency and reaction rates.

4. What best describes a ketone?

- A.  $R(C=O)H$
- B.  $RCO_2H$
- C.  $R(C=O)R'$**
- D.  $RCO_2R'$

A ketone is characterized by the presence of a carbonyl group ( $C=O$ ) flanked by two alkyl groups or carbon-containing substituents. This is represented by the structure  $R(C=O)R'$ , where R and R' can be either the same or different alkyl groups. The carbonyl carbon must be bonded to two other carbons to fulfill the definition of a ketone, distinguishing it from other carbonyl-containing compounds such as aldehydes, acids, or esters. In this context, options that describe other functional groups support the understanding of what a ketone is not. For instance, the choice representing  $R(C=O)H$  describes an aldehyde, characterized by a hydrogen atom connected to the carbonyl carbon, while  $RCO_2H$  depicts a carboxylic acid, which includes the part  $-COOH$ . Lastly, the option  $RCO_2R'$  correlates with an ester, where the carbonyl carbon is bonded to an alkoxy group instead of two carbon substituents. Thus, the structural requirement of two carbon chains connected to the carbonyl in the ketone structure is what validates the choice of  $R(C=O)R'$  as the correct representation of a ketone.

5. What is the primary type of chemical bond found in water molecules?

- A. **Covalent bond**
- B. Ionic bond
- C. Hydrogen bond
- D. Van der Waals forces

The primary type of chemical bond found in water molecules is the covalent bond. In a water molecule ( $\text{H}_2\text{O}$ ), each hydrogen atom shares an electron with the oxygen atom, forming two covalent bonds. This sharing of electrons allows the molecule to achieve greater stability. The covalent bonds in water are polar due to the differences in electronegativity between oxygen and hydrogen. Oxygen, being more electronegative, attracts the shared electrons more strongly, leading to a partial negative charge on the oxygen and a partial positive charge on each hydrogen. This polarity is crucial as it influences the molecule's properties, including its solvent capabilities, boiling and freezing points, and other physical and chemical characteristics. While hydrogen bonds are present in water due to the attraction between the partially positive hydrogen atoms of one molecule and the partially negative oxygen atoms of neighboring water molecules, they are not classified as the primary bond within the individual water molecule itself. Instead, hydrogen bonds occur between water molecules, contributing to properties like cohesion and surface tension. Other bonding types, such as ionic bonds or van der Waals forces, do not play a role in the water molecule's structure. Understanding that covalent bonds within the molecule are what define its internal structure is key to grasping the

6. What functional group transformation occurs in the product of the reaction catalyzed by  $\text{Na}^+ \text{-NQR}$ ?

- A.  **$\text{RC}(=\text{O})\text{R} \rightarrow \text{RCH}(\text{OH})\text{R}$**
- B.  $\text{ROPO}_3^{2-} \rightarrow \text{ROH} + \text{Pi}$
- C.  $\text{RC}(=\text{O})\text{NHR}' \rightarrow \text{RCOOH} + \text{R}'\text{NH}_2$
- D.  $\text{RC}(=\text{O})\text{OR}' \rightarrow \text{RCOOH} + \text{R}'\text{OH}$

The reaction catalyzed by  $\text{Na}^+ \text{-NQR}$  is involved in the electron transport chain of certain bacteria and is known for facilitating the reduction of carbonyl groups to alcohols. Specifically, the transformation in choice A shows the conversion of a ketone (or aldehyde) functional group, represented as  $\text{RC}(=\text{O})\text{R}$ , into an alcohol functional group, indicated by  $\text{RCH}(\text{OH})\text{R}$ . This transformation is characterized by the reduction of the carbonyl carbon, where the double bond between the carbon and oxygen in the carbonyl moiety is broken, and a hydroxyl group ( $-\text{OH}$ ) is introduced in its place. The reaction typically involves the gain of electrons (reduction) and often requires a reducing agent, which can be provided in biological systems by electron transport mechanisms. In the context of the other options, they represent different transformations that do not take place in the specific reaction catalyzed by  $\text{Na}^+ \text{-NQR}$ . For instance, the second option describes the hydrolysis of a phosphate group, which is unrelated. The third option indicates the conversion of an amide to a carboxylic acid and an amine, and the fourth option involves the hydrolysis of an ester to a carboxylic acid and an

7. According to the energy of a photon equation, what is the relationship between energy and frequency?

- A.  $E = h/f$
- B.  $E = hf$**
- C.  $E = h\lambda$
- D.  $E = f/\lambda$

The equation that relates the energy of a photon to its frequency is expressed as  $E = hf$ , where  $E$  is the energy,  $h$  is Planck's constant, and  $f$  is the frequency of the photon. This relationship shows that the energy of a photon is directly proportional to its frequency. As the frequency increases, the energy of the photon also increases, indicating that higher frequency photons (such as gamma rays) carry more energy than lower frequency photons (like radio waves). This fundamental relationship is crucial in understanding various concepts in quantum mechanics and electromagnetic radiation, including how photons interact with matter, the behaviors of different types of electromagnetic waves, and applications in technologies like lasers and photovoltaics. The other choices presented do not accurately represent the established relationship between photon energy and frequency, which is why they do not align with the correct understanding of this concept.

8. What is the structure of a carboxylic acid?

- A.  $R(C=O)R'$
- B.  $R(C=O)H$
- C.  $RCO_2R'$
- D.  $RCO_2H$**

The structure of a carboxylic acid is represented by  $RCO_2H$ . In this notation,  $R$  stands for a hydrocarbon chain or any substituent group attached to the carboxylic acid functional group. The carboxylic acid functional group consists of a carbon atom (C) double-bonded to an oxygen atom (O) and also single-bonded to a hydroxyl group (OH). This characteristic grouping is known as a carboxyl group ( $-COOH$ ), which exemplifies the defining feature of carboxylic acids. The presence of both a carbonyl group ( $C=O$ ) and the hydroxyl group ( $-OH$ ) is essential for classifying a compound as a carboxylic acid, as these components directly contribute to the functional properties of carboxylic acids, including their acidity. In contrast, other options represent different structures. For example, the presence of two  $R$  groups linked by a carbonyl (as in the first option) indicates a ketone or possibly an ester if there is an  $-OR$  group instead of  $-OH$ . Therefore, the option that clearly fits the definition of a carboxylic acid, with the  $-COOH$  group specified, is the

**9. What type of reaction is characterized by the transfer of electrons between species?**

- A. Decomposition reaction**
- B. Synthesis reaction**
- C. Redox reaction**
- D. Combustion reaction**

The correct answer is characterized by the transfer of electrons between species, which defines a redox reaction. In redox reactions, there are two key processes: oxidation, which involves the loss of electrons, and reduction, which involves the gain of electrons. This transfer of electrons is fundamental to the reaction, influencing the oxidation states of the reactants involved. Redox reactions are pivotal in many biological and chemical processes, from cellular respiration to combustion. For instance, when organic molecules are oxidized, they lose electrons, while another species, typically a molecular oxygen or a metal ion, gains those electrons, effectively reducing itself. In contrast, other types of reactions such as decomposition and synthesis do not primarily focus on the transfer of electrons between species. Decomposition reactions involve the breaking down of a compound into simpler substances, while synthesis reactions involve the combination of two or more reactants to form a more complex product. Combustion reactions are a specific type of redox reaction that involves the reaction of a substance with oxygen, producing heat and light, but they are not solely defined by the electron transfer aspect alone. Hence, redox reactions uniquely illustrate the principle of electron transfer, highlighting their importance in both chemistry and biological systems.

**10. What is a major challenge faced in nuclear fusion reactors?**

- A. Maintaining low temperatures**
- B. Slow reaction rates**
- C. Containment of fuel at high temperatures**
- D. Insufficient neutron production**

In nuclear fusion reactors, one of the major challenges is the containment of fuel at high temperatures. Fusion reactions, which power the sun and other stars, require extremely high temperatures—often in the order of millions of degrees Celsius—to provide the energy necessary to overcome the electrostatic repulsion between positively charged atomic nuclei. At these temperatures, the fuel exists in a plasma state, where ions and electrons are separated. To maintain these high temperatures while simultaneously confining the plasma for an extended period is incredibly challenging. Magnetic confinement, used in devices like tokamaks, relies on powerful magnetic fields to keep the hot plasma stable and contained. Any failure in this containment can lead to loss of the plasma, and thus, the reaction would stop. While other challenges exist within nuclear fusion, such as producing sufficient neutron output or managing reaction rates, the critical aspect that hinders progress in making fusion a viable energy source is effectively managing the high energy and temperature conditions necessary for sustained fusion 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](mailto:hello@examzify.com).**

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

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