MOLECULAR AND CELLULAR BIOLOGY EXAM 1 PRACTICE (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.

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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!

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Questions

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1. Which statement best describes promoter proximal elements in transcription regulation?

A. Distal regulatory elements that loop to promoter.

B. Regulatory elements near the transcription start site that recruit RNA polymerase II.

C. They are the same as enhancers.

D. They are located in introns and do not affect transcription.

2. Which statement correctly characterizes the structure of ribosomes in prokaryotes and eukaryotes?

A. Prokaryotic ribosomes are 70S (30S+50S) and eukaryotic ribosomes are 80S (40S+60S)

B. Both ribosomes are 60S

C. Prokaryotic ribosomes have no RNA

D. Eukaryotic ribosomes are 70S (30S+50S)

3. Which molecules store cellular information and are polymers of nucleotides?

A. DNA and RNA

B. Proteins

C. Carbohydrates

D. Lipids

4. Atomic number equals the number of which subatomic particles?

A. Neutrons

B. Electrons

C. Protons plus neutrons

D. Protons

5. Anabolism involves which characteristic?

A. It breaks down molecules to release energy

B. It synthesizes complex molecules and requires energy

C. It stores energy in ATP by catabolic reactions only

D. It occurs only in plants

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6. How do cytosolic glycolysis and mitochondrial ATP production differ in substrates, products, and overall ATP yield per glucose?

A. Cytosolic glycolysis yields 4 ATP per glucose and no NADH; mitochondria yield all NADH.

B. Cytosolic glycolysis yields 2 ATP and 2 NADH; mitochondrial processes yield about 26–30 ATP per glucose.

C. Cytosolic glycolysis yields 30 ATP; mitochondria yield 2 ATP.

D. Cytosolic glycolysis yields no ATP; mitochondrial processes yield all ATP.

7. What best describes the structure of the cell membrane?

A. A rigid protein sheet with no lipids.

B. A lipid bilayer with integral proteins; hydrophobic regions reside in the lipid layer, and hydrophilic regions are on the surfaces; membrane fluidity can be altered by fatty acid chains.

C. A single layer of lipid molecules with embedded nucleic acids.

D. A protein-only barrier.

8. Which process occurs in the rough endoplasmic reticulum?

A. Glycosylation of proteins

B. DNA replication

C. Lipid beta-oxidation

D. Sugar fermentation

9. Which statement correctly describes the basic atomic structure?

A. Protons and neutrons in the nucleus, electrons orbit in shells

B. Protons orbit the nucleus, electrons reside in the nucleus

C. Neutrons orbit the nucleus, protons orbit electrons

D. Electrons orbit the nucleus, protons and neutrons orbit electrons

10. Which statement about fats is true?

A. Saturated fats are liquid at room temperature

B. Used as a long term energy storage

C. Plant fats contain only saturated lipids

D. Unsaturated fats pack more tightly than saturated fats

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Answers

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

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Explanations

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1. Which statement best describes promoter proximal elements in transcription regulation?

A. Distal regulatory elements that loop to promoter.

B. Regulatory elements near the transcription start site that recruit RNA polymerase II.

C. They are the same as enhancers.

D. They are located in introns and do not affect transcription.

Promoter proximal elements are regulatory sequences located just upstream of the transcription start site that help recruit RNA polymerase II and other transcription factors to assemble the transcription machinery, boosting initiation. Their close proximity to the start site means they act locally to enhance transcription, unlike distal elements like enhancers that can be far away and loop to the promoter. That's why describing them as near the transcription start site and involved in recruiting RNA polymerase II best fits their role. The idea that they're in introns and don't affect transcription isn't correct, since their purpose is to influence transcription initiation, typically from just upstream of the start site.

2. Which statement correctly characterizes the structure of ribosomes in prokaryotes and eukaryotes?

A. Prokaryotic ribosomes are 70S (30S+50S) and eukaryotic ribosomes are 80S (40S+60S)

B. Both ribosomes are 60S

C. Prokaryotic ribosomes have no RNA

D. Eukaryotic ribosomes are 70S (30S+50S)

Ribosome size and subunit composition differ between prokaryotes and eukaryotes, reflected by the sedimentation coefficients that describe how they behave in a centrifuge. Prokaryotic ribosomes are 70S in total, made of a small 30S subunit and a large 50S subunit. Eukaryotic ribosomes are 80S in total, built from a small 40S subunit and a large 60S subunit. The S value is a measure of sedimentation rate, influenced by both mass and shape, so the two classes aren't simply "the same size" even though they're both ribosomes. This is why the statement describing prokaryotic ribosomes as 70S (30S+50S) and eukaryotic ribosomes as 80S (40S+60S) correctly characterizes their structure. The other options aren't accurate because ribosomes do contain RNA, prokaryotes don't have 60S as their large subunit, and prokaryotic ribosomes aren't 60S-only, and eukaryotes aren't 70S.

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3. Which molecules store cellular information and are polymers of nucleotides?

A. DNA and RNA

B. Proteins

C. Carbohydrates

D. Lipids

Nucleic acids store cellular information and are polymers of nucleotides. DNA holds the genetic blueprint in the sequence of deoxyribonucleotides, designed to be copied and transmitted with high fidelity. RNA is built from ribonucleotides and carries or acts on the information in various ways, such as mRNA conveying code from DNA to the protein-making machinery, and tRNA and rRNA participating directly in translation. These polymers are defined by their nucleotide units and their role in information storage and transfer. Proteins are polymers of amino acids and perform most cellular functions rather than storing genetic information. Carbohydrates and lipids have other primary roles, such as energy storage and membrane structure, and are not polymers of nucleotides.

4. Atomic number equals the number of which subatomic particles?

A. Neutrons

B. Electrons

C. Protons plus neutrons

D. Protons

Atomic number is the number of protons in the nucleus. That count defines which element the atom is. Neutrons add to mass but don't change an element's identity. Electrons orbit the nucleus and only in a neutral atom do they equal the protons; they don't set the atomic number. The sum of protons and neutrons gives the mass number, not the atomic number. Even when the atom is charged and has a different number of electrons, the atomic number remains the protons in the nucleus.

5. Anabolism involves which characteristic?

A. It breaks down molecules to release energy

B. It synthesizes complex molecules and requires energy

C. It stores energy in ATP by catabolic reactions only

D. It occurs only in plants

Anabolism involves building larger, more complex molecules from smaller units and requires energy input. That's why the description that it synthesizes complex molecules and needs energy is the best choice. In metabolic pathways, cells use energy from ATP and other high-energy carriers to form new bonds, driving biosynthesis of macromolecules like proteins from amino acids, nucleic acids from nucleotides, polysaccharides from sugars, and lipids from building blocks. This contrasts with catabolism, which breaks down molecules to release energy, providing the power for anabolic reactions but not describing them. The idea that energy is stored in ATP only by catabolic reactions is inaccurate, since anabolic steps consume ATP as well; and anabolic processes occur in all organisms, not just plants.

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6. How do cytosolic glycolysis and mitochondrial ATP production differ in substrates, products, and overall ATP yield per glucose?

A. Cytosolic glycolysis yields 4 ATP per glucose and no NADH; mitochondria yield all NADH.

B. Cytosolic glycolysis yields 2 ATP and 2 NADH; mitochondrial processes yield about 26–30 ATP per glucose.

C. Cytosolic glycolysis yields 30 ATP; mitochondria yield 2 ATP.

D. Cytosolic glycolysis yields no ATP; mitochondrial processes yield all ATP.

In aerobic glucose oxidation, the energy payoff is split between cytosolic glycolysis and mitochondrial respiration. Glycolysis in the cytosol converts one glucose to two pyruvate, producing a net of 2 ATP by substrate-level phosphorylation and generating 2 NADH. Those NADH must be shuttled into the mitochondria to fuel oxidative phosphorylation, and the exact ATP gained from them depends on the shuttle system (about 2.5 ATP per cytosolic NADH with the malate-aspartate shuttle, or about 1.5 ATP with the glycerol-3-phosphate shuttle). Inside the mitochondria, the two acetyl-CoA units derived from glucose enter the TCA cycle, yielding 2 GTP (equivalent to 2 ATP), 6 NADH, and 2 FADH2 per glucose. The NADH and FADH2 feed the electron transport chain to drive most of the ATP production, roughly 20–25 ATP from NADH and FADH2 combined depending on the exact coupling efficiency and shuttle type, plus the 2 ATP from glycolysis and the 2 ATP equivalent from the TCA step, giving a total on the order of 26–30 ATP per glucose. So, cytosolic glycolysis provides a small, direct ATP payoff and the NADH to be used by mitochondria, while mitochondrial respiration supplies the majority of ATP, yielding about 26–30 ATP per glucose.

7. What best describes the structure of the cell membrane?

A. A rigid protein sheet with no lipids.

B. A lipid bilayer with integral proteins; hydrophobic regions reside in the lipid layer, and hydrophilic regions are on the surfaces; membrane fluidity can be altered by fatty acid chains.

C. A single layer of lipid molecules with embedded nucleic acids.

D. A protein-only barrier.

Membranes are built from a phospholipid bilayer, an arrangement where hydrophobic fatty acid tails hide in the interior while hydrophilic heads face the watery outside and inside of the cell. This amphipathic structure creates a flexible, selectively permeable barrier. Proteins are embedded in or associated with this bilayer, performing transport, signaling, and structural roles. The description that fits best is a lipid bilayer with integral proteins; hydrophobic regions reside in the lipid layer, and hydrophilic regions are on the surfaces; membrane fluidity can be altered by fatty acid chains. Other options describe an incorrect setup—for example, a rigid protein sheet with no lipids ignores the essential lipid matrix; a single lipid layer with nucleic acids is not how membranes are organized; and a protein-only barrier omits the lipid component that gives membranes their fundamental properties.

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8. Which process occurs in the rough endoplasmic reticulum?

A. Glycosylation of proteins

B. DNA replication

C. Lipid beta-oxidation

D. Sugar fermentation

Glycosylation of proteins is a processing step that happens in the rough endoplasmic reticulum. As ribosomes coated with translating protein synthesize secretory and membrane proteins, the nascent chains enter the ER lumen where oligosaccharide chains are attached to specific asparagine residues (N-linked glycosylation). This modification aids proper folding, stability, and trafficking of these proteins to their destinations, such as secretion outside the cell or incorporation into membranes. The other processes listed don't occur in the rough ER: DNA replication takes place in the nucleus, lipid beta-oxidation happens mainly in mitochondria (and peroxisomes), and sugar fermentation occurs in the cytosol.

9. Which statement correctly describes the basic atomic structure?

A. Protons and neutrons in the nucleus, electrons orbit in shells

B. Protons orbit the nucleus, electrons reside in the nucleus

C. Neutrons orbit the nucleus, protons orbit electrons

D. Electrons orbit the nucleus, protons and neutrons orbit electrons

Atoms have a dense nucleus that contains protons and neutrons, with electrons arranged around the nucleus in shells or orbitals. This configuration reflects the basic charge distribution: positively charged protons and neutral neutrons cluster in the center, while negatively charged electrons occupy the surrounding space held by attraction to the nucleus. In the simplest description, electrons "orbit" the nucleus in shells or occupy orbitals around it. This is why the statement pairing protons and neutrons in the nucleus with electrons orbiting the nucleus is correct. The other ideas mix up locations: the nucleus does not host electrons, and protons or neutrons do not orbit electrons or orbit the nucleus in the way described by the other options.

10. Which statement about fats is true?

A. Saturated fats are liquid at room temperature

B. Used as a long term energy storage

C. Plant fats contain only saturated lipids

D. Unsaturated fats pack more tightly than saturated fats

Fats are used as long-term energy storage because they pack a lot of energy into a small amount of material. A triglyceride, the main form of fat, stores about 9 kcal per gram, more than carbohydrates or proteins, which makes fats ideal for providing sustained energy during periods without food. They're hydrophobic and stored in adipose tissue, where they can be mobilized when energy is needed between meals or during fasting. This explains why the statement about fats being used for long-term energy storage is true. In contrast, saturated fats are typically solid at room temperature, not liquid; plant fats are not exclusively saturated and contain many unsaturated fats; and unsaturated fats have kinks from double bonds that prevent tight packing, so they are usually liquid at room temperature rather than packed more tightly.

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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:

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

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