

TEXAS A&M UNIVERSITY (TAMU) BIOL 351 FUNDAMENTALS OF MICROBIOLOGY EXAM 1 PRACTICE (SAMPLE)

STUDY GUIDE



SAMPLE STUDY GUIDE WITH LIMITED QUESTIONS

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THE FULL VERSION STUDY GUIDE

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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. Which prefix corresponds to 10^{-2} ?
 - A. Milli
 - B. Centi
 - C. Micro
 - D. Nano
2. Which statement about the periplasmic space in Gram-negative bacteria is true?
 - A. It lies outside the cell wall
 - B. It lies within the cytoplasm
 - C. It lies between the plasma membrane and the outer membrane
 - D. It is identical to the cell wall
3. Which molecules are free to cross the plasma membrane without transport proteins?
 - A. Water, oxygen, nitrogen, carbon dioxide
 - B. Glucose, amino acids, ions, nucleotides
 - C. Large proteins
 - D. Lipids
4. Which list contains the ten macroelements commonly required by cells?
 - A. C, H, O, N, S, P, K, Na, Mg, Ca
 - B. C, H, O, N, S, P, K, Fe, Mg, Ca
 - C. C, H, O, N, S, P, K, Fe, Mg, Na
 - D. C, H, O, N, S, P, K, Fe, Mg, Ca
5. Which protein is tubulin-like and localizes to the center of the cell to aid in division?
 - A. MreB
 - B. FtsZ
 - C. Crescentin
 - D. MamK

6. Chemotrophs obtain energy from which source?

- A. from light
- B. from carbon fixation
- C. from oxidizing organic or inorganic material
- D. from fermentation

7. What is the effect of flagella rotating counterclockwise?

- A. Bundled and going in one direction
- B. Pushed out and apart, moves in different directions
- C. Spinning in place
- D. Moving in circles

8. Where is the flagellum located in a bacterial cell?

- A. Outside of the plasma membrane, anchored in the cell wall
- B. Inside the nucleus
- C. Floating in cytoplasm
- D. Embedded in the plasma membrane only

9. Which macroelements are contained in lipids?

- A. C, H, O
- B. C, H, O, N
- C. C, H, O, P
- D. C, H, O, S

10. Which prefix corresponds to 10^{-9} ?

- A. Milli
- B. Micro
- C. Pico
- D. Nano

Answers

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

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Explanations

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1. Which prefix corresponds to 10^{-2} ?

- A. Milli
- B. Centi**
- C. Micro
- D. Nano

Powers of ten scale the size of units in the metric system. A prefix that means 10^{-2} is centi, which makes the base unit one hundredth of its size. For example, 1 centimeter is 0.01 meter, and 1 centigram is 0.01 gram. Other prefixes listed correspond to different scales: milli is 10^{-3} (one thousandth), micro is 10^{-6} (one millionth), and nano is 10^{-9} (one billionth). So, 10^{-2} matches centi.

2. Which statement about the periplasmic space in Gram-negative bacteria is true?

- A. It lies outside the cell wall
- B. It lies within the cytoplasm
- C. It lies between the plasma membrane and the outer membrane**
- D. It is identical to the cell wall

The periplasmic space in Gram-negative bacteria is the region between the inner (plasma) membrane and the outer membrane. This space contains a thin layer of peptidoglycan and various enzymes and transport proteins that function in processing, transport, and sensing signals. It is part of the cell envelope, not outside the cell wall, and it is distinct from the cytoplasm (which lies inside the inner membrane). It is also not the same as the cell wall, which refers to the peptidoglycan layer that resides within this space. Therefore, the statement describing it as lying between the plasma membrane and the outer membrane is correct.

3. Which molecules are free to cross the plasma membrane without transport proteins?

- A. Water, oxygen, nitrogen, carbon dioxide**
- B. Glucose, amino acids, ions, nucleotides
- C. Large proteins
- D. Lipids

Small, nonpolar molecules cross the plasma membrane by simple diffusion, moving through the lipid bilayer without help from transport proteins. Oxygen and carbon dioxide are classic examples: they are small and nonpolar, so they diffuse readily. Nitrogen gas is also a tiny, nonpolar molecule that diffuses across the membrane this way. Water, while polar, is very small and can diffuse across the bilayer as well (even though channels can speed it up in many cells). In contrast, molecules like glucose, amino acids, ions, and nucleotides are either charged or too large to pass through the hydrophobic core without help, so they require transport proteins. Large proteins clearly cannot cross, and lipids themselves are membrane components rather than typical cargo needing transport.

4. Which list contains the ten macroelements commonly required by cells?

- A. C, H, O, N, S, P, K, Na, Mg, Ca
- B. C, H, O, N, S, P, K, Fe, Mg, Ca
- C. C, H, O, N, S, P, K, Fe, Mg, Na
- D. C, H, O, N, S, P, K, Fe, Mg, Ca**

Macroelements are the nutrients needed in relatively large amounts because they form structural components and act as essential cofactors in metabolism. The big six—carbon, hydrogen, oxygen, nitrogen, sulfur, and phosphorus—make up most organic molecules and nucleic acids. In addition, certain metal ions serve crucial roles as enzyme cofactors and in stabilizing structures: potassium helps with osmotic balance and enzyme activity, magnesium stabilizes ribosomes and ATP complexes, and calcium supports cell walls, signaling, and enzyme function. Iron is included here because many enzymes rely on iron-containing cofactors (like iron–sulfur clusters and heme groups) for electron transfer and catalysis, so it's required in substantial enough amounts for growth in many organisms. Sodium is not universally required in large amounts across all cells, so it's not considered a universal macronutrient. Therefore, the ten macroelements commonly required by cells are carbon, hydrogen, oxygen, nitrogen, sulfur, phosphorus, potassium, iron, magnesium, and calcium.

5. Which protein is tubulin-like and localizes to the center of the cell to aid in division?

- A. MreB
- B. FtsZ**
- C. Crescentin
- D. MamK

Proteins that steer bacterial cell division include tubulin-like GTPases that assemble where the cell will split. The tubulin-like protein that localizes at the center to drive division is FtsZ. It binds GTP and polymerizes into filaments to form the Z-ring right at midcell, creating a scaffold that recruits other division proteins and powers constriction as cytokinesis proceeds. This central-midcell role distinguishes it from others: MreB is actin-like and stretches along the cell, helping maintain shape and coordinate wall synthesis; Crescentin is involved in curved-cell shape in certain bacteria; MamK forms filaments that organize magnetosome chains. So, the midcell tubulin-like facilitator of division is FtsZ.

6. Chemotrophs obtain energy from which source?

- A. from light
- B. from carbon fixation
- C. from oxidizing organic or inorganic material**
- D. from fermentation

Chemotrophs derive their energy from chemical reactions, specifically by oxidizing chemical compounds. This means they harvest energy from the redox energy released when electrons are transferred from a donor (organic or inorganic) to an electron acceptor, often through an electron transport chain that drives ATP production. That makes the best choice: energy comes from oxidizing organic or inorganic material, which covers both chemoorganotrophs (organic donors) and chemolithotrophs (inorganic donors). Light is the source for phototrophs, not chemotrophs, and carbon fixation describes how cells build biomass from CO₂ rather than how they obtain energy. Fermentation may yield energy via substrate-level phosphorylation but its mention as a source of energy does not define the chemotrophic energy source in the same way oxidation of chemical donors does.

7. What is the effect of flagella rotating counterclockwise?

- A. Bundled and going in one direction**
- B. Pushed out and apart, moves in different directions
- C. Spinning in place
- D. Moving in circles

Counterclockwise rotation makes the flagella come together into a tight bundle behind the cell, so they act like a single propeller and push the cell forward in a straight line. This coordinated bundle produces a smooth run, which is how many bacteria move when they're not tumbling. If the rotation switched to clockwise, the bundle would loosen and the cell would tumble, reorienting its direction. So the best description of counterclockwise rotation is bundled flagella pushing the cell in one direction.

8. Where is the flagellum located in a bacterial cell?

- A. Outside of the plasma membrane, anchored in the cell wall**
- B. Inside the nucleus
- C. Floating in cytoplasm
- D. Embedded in the plasma membrane only

Bacterial flagella are external motility structures that extend outside the cell and are anchored by a basal body that spans the cell envelope. The filament runs outside the plasma membrane and is supported by connections through the cell wall, so the flagellum sits outside the membrane rather than inside the cytoplasm. Bacteria don't have a nucleus, so options invoking a nucleus aren't applicable, and the flagellum isn't just embedded in the plasma membrane or floating in the cytoplasm. This broader placement—outside the membrane and anchored in the cell wall—is why the best description is that the flagellum is outside the plasma membrane, anchored in the cell wall.

9. Which macroelements are contained in lipids?

- A. C, H, O**
- B. C, H, O, N
- C. C, H, O, P
- D. C, H, O, S

Lipids are built mainly from carbon and hydrogen, with oxygen present mostly in ester-linked functional groups. This makes their overall composition dominated by C and H, with O in smaller amounts. Nitrogen, phosphorus, and sulfur are not universal components of lipids; they appear only in certain specialized lipid types (for example, some phospholipids contain phosphorus, and a few lipids may have N or S in specific structures), but they are not the defining elements for lipids as a group. Therefore the typical, broad elemental composition of lipids is carbon, hydrogen, and oxygen. This is why the option listing C, H, and O is the best answer.

10. Which prefix corresponds to 10^{-9} ?

- A. Milli
- B. Micro
- C. Pico
- D. Nano**

Understanding SI prefixes helps you read measurements in the metric system. Each prefix represents a power of ten: milli is 10^{-3} , micro is 10^{-6} , nano is 10^{-9} , and pico is 10^{-12} . Because 10^{-9} means one billionth, the prefix that fits is nano. Nano is why we talk about nanometers for molecular-scale distances and nanoscale materials. For example, a nanometer is 1×10^{-9} meters, while a cell is typically measured in micrometers (10^{-6} m), so nano sits between molecular and cellular scales.

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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:

<https://tamu-biol351exam1.examzify.com>

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

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