A2 Genetic Control of Proteins and Control of Gene Expression 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. Frameshift mutations near the start of a gene typically cause what kind of effect on the resulting protein?

A. They often produce a completely unchanged protein.

B. They cause only a single amino acid change with minimal effect.

C. They produce a protein with a small, localized change.

D. They yield a drastically altered amino acid sequence downstream of the mutation.

2. RNA polymerase synthesizes RNA in which direction?

A. 3' to 5'

B. 5' to 3'

C. 5' to 3' on the template strand

D. 3' to 5' on the template strand

3. What are introns?

A. Non-coding sequences removed during mRNA processing.

B. Sequences coding for tRNA.

C. Protein-coding sequences.

D. Regions that code for rRNA.

4. If one tRNA has anticodon AGC and another has UUC, which amino acids are they carrying?

A. Proline and Lysine

B. Valine and Isoleucine

C. Serine and Glutamic acid

D. Methionine and Phenylalanine

5. During DNA replication, which statement is correct?

A. Hydrogen bonds are broken during replication

B. Semi-conservative replication with both strands used as templates

C. Nucleotides line up randomly

D. DNA polymerase is not involved in replication

6. Which of the following would NOT be considered a mutagen or factor increasing mutation frequency?

A. Ultraviolet light

B. High energy radiation

C. High energy particles

D. Pure water

7. Which molecule carries genetic information from the DNA to the ribosome for protein synthesis?

A. tRNA

B. mRNA

C. rRNA

D. DNA

8. Which component catalyzes peptide bond formation during translation?

A. tRNA

B. rRNA

C. mRNA

D. DNA polymerase

9. After transcription, mature mRNA is transported to the cytoplasm. Which option correctly states this process?

A. mRNA leaves the nucleus for the cytoplasm.

B. mRNA remains in the nucleus.

C. mRNA is degraded immediately.

D. mRNA binds to DNA.

10. During translation, which statement correctly describes the bond that links amino acids to form the growing protein?

A. Peptide bonds form between the amino acids.

B. Hydrogen bonds.

C. Disulfide bonds.

D. Ionic bonds.

Answers

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

Explanations

1. Frameshift mutations near the start of a gene typically cause what kind of effect on the resulting protein?

A. They often produce a completely unchanged protein.

B. They cause only a single amino acid change with minimal effect.

C. They produce a protein with a small, localized change.

D. They yield a drastically altered amino acid sequence downstream of the mutation.

Frameshift mutations shift the reading frame of the genetic code. When this happens near the start of a gene, every codon downstream is read in a new frame, so the amino acids added after the mutation are almost completely different from the original sequence. This usually yields a protein with a drastic change in its amino acid sequence downstream, often accompanied by a premature stop codon that creates a truncated, nonfunctional product. That's why the outcome is a drastically altered amino acid sequence downstream of the mutation. In contrast, a single amino acid change or a small localized change would come from point mutations or in-frame indels, not from a frameshift.

2. RNA polymerase synthesizes RNA in which direction?

A. 3' to 5'

B. 5' to 3'

C. 5' to 3' on the template strand

D. 3' to 5' on the template strand

RNA polymerase adds nucleotides to the 3' end of the growing RNA, so the RNA chain is built in the 5' to 3' direction. It reads the DNA template strand in the opposite orientation (3' to 5'), producing an RNA that is antiparallel to the template. Describing this as RNA synthesis occurring in the 5' to 3' direction on the template strand captures that the product grows 5' to 3' while the template guides the process in its 3' to 5' direction. In short, the enzyme moves along the template strand in one direction, and the RNA product extends in the opposite orientation, ending up with 5' and 3' ends on the RNA.

3. What are introns?

A. Non-coding sequences removed during mRNA processing.

B. Sequences coding for tRNA.

C. Protein-coding sequences.

D. Regions that code for rRNA.

Introns are non-coding segments within a gene that are transcribed into RNA but not translated into a protein. In the initial RNA transcript, introns lie between coding portions called exons. The cell's splicing machinery—the spliceosome—removes these introns and joins the exons together to form mature mRNA, which then carries the instructions to make a protein. This processing step, along with adding a 5' cap and a poly-A tail, prepares the transcript for export and translation. Introns also enable alternative splicing, producing multiple protein variants from a single gene. Sequences that code for tRNA, rRNA, or protein-coding regions describe different kinds of transcripts, so those options aren't what introns are.

4. If one tRNA has anticodon AGC and another has UUC, which amino acids are they carrying?

A. Proline and Lysine

B. Valine and Isoleucine

C. Serine and Glutamic acid

D. Methionine and Phenylalanine

The key idea is that tRNA anticodons pair with mRNA codons in an antiparallel, complementary way to determine which amino acid is brought to the growing peptide. An anticodon of AGC pairs with a codon of UCG, and UCG is one of the Serine codons, so that tRNA carries Serine. The other anticodon, UUC, pairs with the codon AAG, which codes for Lysine, so that tRNA carries Lysine. Glutamic acid is encoded by GAA and GAG, whose codons pair with anticodons CUU and CUC, not UUC. So the two tRNAs would carry Serine and Lysine. If the provided answer lists Serine and Glutamic acid, it doesn't align with the standard genetic code.

5. During DNA replication, which statement is correct?

A. Hydrogen bonds are broken during replication

B. Semi-conservative replication with both strands used as templates

C. Nucleotides line up randomly

D. DNA polymerase is not involved in replication

DNA replication preserves genetic information by producing two daughter molecules, each containing one original (parental) strand and one newly synthesized strand. This semi-conservative mechanism happens because each original strand serves as a template for its complementary partner, guided by specific base-pairing rules and carried out by DNA polymerase, which extends the new strand in the 5′ to 3′ direction. Hydrogen bonds must be broken to separate the strands, but that step describes separation rather than how the information is copied, nucleotides do not line up randomly but pair specifically (A with T, G with C), and DNA polymerase is essential for synthesis. Thus, the described semi-conservative replication with both strands used as templates best explains how replication works.

6. Which of the following would NOT be considered a mutagen or factor increasing mutation frequency?

A. Ultraviolet light

B. High energy radiation

C. High energy particles

D. Pure water

Mutagens are agents that raise the rate of genetic mutations by damaging DNA or interfering with replication and repair. Ultraviolet light causes pyrimidine dimers in DNA, which can lead to mispairing during replication if not fixed. High-energy radiation and high-energy particles disrupt DNA through ionization and breaks, increasing the chance of mutations. Pure water, by contrast, does not damage DNA or affect replication on its own, so it does not increase mutation frequency. Therefore, pure water would not be considered a mutagen.

7. Which molecule carries genetic information from the DNA to the ribosome for protein synthesis?

A. tRNA

B. mRNA

C. rRNA

D. DNA

The essential idea is that genetic information is carried from DNA to the ribosome by a messenger that translates the code into a readable template for building protein. This role belongs to messenger RNA (mRNA). During transcription, a DNA gene is copied into mRNA, which then exits the nucleus and travels to the ribosome. There, the sequence of codons in mRNA directs the assembly of amino acids into a polypeptide, with rRNA and tRNA supporting the process. tRNA brings each amino acid to match its codon on the mRNA, while rRNA forms part of the ribosome and helps catalyze peptide bond formation. DNA itself serves as the original blueprint inside the nucleus and does not serve as the direct messenger to the ribosome.

8. Which component catalyzes peptide bond formation during translation?

A. tRNA

B. rRNA

C. mRNA

D. DNA polymerase

Peptide bond formation during translation is carried out by the ribosome's RNA component. The ribosome is a complex of RNA and protein, but the chemical step that links amino acids—moving the growing polypeptide from the tRNA in the P site to the aminoacyl-tRNA in the A site—is driven by the large-subunit ribosomal RNA. This rRNA forms the peptidyl transferase center and acts as a ribozyme, stabilizing the transition state and enabling the nucleophilic attack that creates the new peptide bond. The substrates come from the tRNAs and the template from the mRNA, while DNA polymerase handles DNA replication, not translation. So the key catalytic player is the ribosomal RNA.

9. After transcription, mature mRNA is transported to the cytoplasm. Which option correctly states this process?

A. mRNA leaves the nucleus for the cytoplasm.

B. mRNA remains in the nucleus.

C. mRNA is degraded immediately.

D. mRNA binds to DNA.

After transcription in the nucleus, the RNA is processed to become mature mRNA, then packaged with proteins to form an mRNP and exported through the nuclear pore into the cytoplasm. Translation happens there, so the mature message must leave the nucleus to be used. If it stayed in the nucleus, translation wouldn't occur; if it were degraded right away, no protein could be made; and binding to DNA would imply a transcriptional role, not translation. Thus, the correct statement is that mRNA leaves the nucleus for the cytoplasm.

10. During translation, which statement correctly describes the bond that links amino acids to form the growing protein?

A. Peptide bonds form between the amino acids.

B. Hydrogen bonds.

C. Disulfide bonds.

D. Ionic bonds.

The bond that links amino acids to form the growing protein is a peptide bond. During translation, the amino group of the incoming amino acid attacks the carbonyl carbon of the growing polypeptide, forming a covalent amide (peptide) bond and releasing water. This reaction is catalyzed by the ribosome's peptidyl transferase activity, creating a continuous chain of amino acids. Peptide bonds are covalent and provide the main linkage in the primary sequence. Hydrogen bonds, on the other hand, help stabilize folded structures like alpha helices and beta sheets but do not join amino acids in the growing chain. Disulfide bonds stabilize final protein structure by linking cysteine residues, and ionic bonds are electrostatic interactions between charged side chains or molecules—not the bonds that polymerize the amino acids together.

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://a2genecontofproteinsandgeneexpression.examzify.com

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