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. Name the organelle involved in translation.

A. Nucleus

B. Ribosome

C. Golgi apparatus

D. Lysosome

2. Which molecule contains an amino acid binding site?

A. tRNA

B. mRNA

C. rRNA

D. DNA

3. A piece of mRNA is 660 nucleotides long while the DNA coding strand from which it was transcribed is 870 nucleotides long. Why is the mRNA shorter?

A. DNA contains introns; mRNA is edited to remove introns and contain only exons.

B. mRNA length is shorter due to random degradation.

C. mRNA length is increased by processing.

D. DNA has introns that are spliced out of mRNA.

4. How does inhibiting acetylcholinesterase at neuromuscular junctions prevent breathing in the described toxin?

A. Acetylcholine not broken down / stays bound to receptor; Na+ ions continue to enter / depolarisation occurs; intercostal muscles stay contracted.

B. Acetylcholine is rapidly degraded, preventing receptor activation.

C. The toxin blocks Na+ channels, preventing action potentials.

D. The toxin prevents acetylcholine release from the neuron.

5. What is meant by an allele?

A. Different form of a gene

B. A type of protein

C. A segment of DNA

D. A chromosome

6. Oestrogen is a hormone that affects transcription. It forms a complex with a receptor in the cytoplasm of target cells. How does an activated oestrogen receptor influence transcription in the target cell?

A. It binds to the promoter and recruits RNA polymerase to initiate transcription.

B. It degrades the promoter and stops transcription.

C. It translates the mRNA into protein directly.

D. It blocks the promoter to prevent transcription.

7. During translation, which pairing occurs between tRNA and mRNA?

A. tRNA anticodon pairs with codon on tRNA.

B. mRNA anticodon pairs with anticodon.

C. tRNA anticodon pairs with codon on mRNA.

D. Ribosome anticodon matches amino acid.

8. The mRNA codon for the amino acid tyrosine is UAU. What is the corresponding DNA triplet for tyrosine?

A. TAT

B. ATA

C. ATT

D. UAU

9. 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

10. Which molecule carries amino acids to the ribosome during translation?

A. mRNA

B. rRNA

C. DNA

D. tRNA

Answers

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

Explanations

1. Name the organelle involved in translation.

A. Nucleus

B. Ribosome

C. Golgi apparatus

D. Lysosome

Translation is the process of turning mRNA into a protein, and the ribosome is the machine that does this. Ribosomes read the genetic code on mRNA and, with transfer RNA delivering amino acids, assemble them in the order dictated by the mRNA to form a polypeptide. They can be free-floating in the cytosol or attached to the rough endoplasmic reticulum in eukaryotes, depending on the protein being produced. The nucleus houses DNA and is where transcription occurs, not translation. The Golgi apparatus modifies and ships proteins, and lysosomes break down waste. So the organelle directly responsible for translation is the ribosome.

2. Which molecule contains an amino acid binding site?

A. tRNA

B. mRNA

C. rRNA

D. DNA

In translation, amino acids are delivered to the ribosome by transfer RNA, and the key feature is that tRNA has a site at its 3' end where the amino acid is covalently attached to the terminal adenosine of the CCA sequence. This aminoacyl-tRNA is formed by aminoacyl-tRNA synthetases, which activate the amino acid with ATP and then transfer it to the tRNA, creating an ester bond. The charged tRNA then brings the correct amino acid to coincide with its codon on the mRNA, ensuring accurate incorporation into the growing protein. The other molecules—mRNA, rRNA, and DNA—do not carry amino acids in this way: mRNA provides the code, rRNA forms the ribosome, and DNA stores genetic information. Hence, the molecule that contains an amino acid binding site is tRNA.

3. A piece of mRNA is 660 nucleotides long while the DNA coding strand from which it was transcribed is 870 nucleotides long. Why is the mRNA shorter?

A. DNA contains introns; mRNA is edited to remove introns and contain only exons.

B. mRNA length is shorter due to random degradation.

C. mRNA length is increased by processing.

D. DNA has introns that are spliced out of mRNA.

In gene expression, the initial transcript from a eukaryotic gene includes both exons (coding regions) and introns (noncoding interruptions). During RNA processing, introns are removed and the exons are joined together to form the mature mRNA. That means the mature mRNA contains only the exons and is shorter than the DNA coding region, which includes both exons and introns. So, a 660-nucleotide mRNA can arise from a gene whose DNA coding sequence is 870 nucleotides long because the introns are spliced out during processing. The other ideas don't fit because random degradation isn't a regulated, size-specific process, processing doesn't typically increase length, and intron removal happens in the RNA, not by removing introns from DNA.

4. How does inhibiting acetylcholinesterase at neuromuscular junctions prevent breathing in the described toxin?

A. Acetylcholine not broken down / stays bound to receptor; Na+ ions continue to enter / depolarisation occurs; intercostal muscles stay contracted.

B. Acetylcholine is rapidly degraded, preventing receptor activation.

C. The toxin blocks Na+ channels, preventing action potentials.

D. The toxin prevents acetylcholine release from the neuron.

The key idea is that stopping acetylcholinesterase leaves acetylcholine in the neuromuscular junction, so it keeps binding to nicotinic receptors and continuously activating them. That ongoing receptor activity keeps sodium channels open, causing ongoing depolarization of the muscle end plate. For respiratory muscles, this sustained depolarization means the muscles stay in a contracted state and can't properly relax or coordinate breathing, leading to paralysis of the intercostal muscles and diaphragm and, ultimately, failure to breathe. The other scenarios describe removing acetylcholine, blocking sodium channels, or stopping acetylcholine release, which would prevent contraction rather than cause the dangerous, sustained contraction that blocks breathing.

5. What is meant by an allele?

A. Different form of a gene

B. A type of protein

C. A segment of DNA

D. A chromosome

Alleles are different forms of the same gene that occupy the same position (locus) on homologous chromosomes. They arise by mutation and provide the genetic basis for variation in inherited traits. The best description is that an allele is a different form of a gene because it emphasizes that a single gene can exist in multiple versions, each potentially influencing a trait in its own way. An allele isn't a protein itself, even though the version of a gene it represents may determine which protein is produced. It isn't just any DNA segment, nor a chromosome, which is a much larger structure that contains many genes.

6. Oestrogen is a hormone that affects transcription. It forms a complex with a receptor in the cytoplasm of target cells. How does an activated oestrogen receptor influence transcription in the target cell?

A. It binds to the promoter and recruits RNA polymerase to initiate transcription.

B. It degrades the promoter and stops transcription.

C. It translates the mRNA into protein directly.

D. It blocks the promoter to prevent transcription.

Activation of the estrogen receptor turns it into a sequence-specific transcription factor. When the oestrogen-bound receptor complex enters the nucleus, it binds to estrogen response elements near target genes and recruits coactivators and the transcriptional machinery, including RNA polymerase II, to the promoter. This assembly enables initiation of transcription, turning on gene expression in response to estrogen. It doesn't degrade the promoter, translate mRNA directly, or block transcription; instead it promotes transcription by bringing in the machinery needed to start RNA synthesis.

7. During translation, which pairing occurs between tRNA and mRNA?

A. tRNA anticodon pairs with codon on tRNA.

B. mRNA anticodon pairs with anticodon.

C. tRNA anticodon pairs with codon on mRNA.

D. Ribosome anticodon matches amino acid.

During translation, the pairing that occurs is between the tRNA anticodon and the codon on the mRNA. The anticodon on each tRNA recognizes a specific three-nucleotide codon on the mRNA through base pairing, bringing the corresponding amino acid into the growing polypeptide chain inside the ribosome. This ensures the genetic code is read correctly and the right amino acid is added. Other statements don't fit because codons reside on mRNA, not on tRNA, and the ribosome itself doesn't carry an anticodon to match amino acids.

8. The mRNA codon for the amino acid tyrosine is UAU. What is the corresponding DNA triplet for tyrosine?

A. TAT

B. ATA

C. ATT

D. UAU

The main idea is that mRNA codons pair with a DNA template strand during transcription, so the DNA sequence that serves as the template is complementary to the mRNA codon. For the mRNA codon UAU, pair each base with its DNA template complement: U pairs with A, A pairs with T, and U again pairs with A. Reading that in the sequence of the template strand gives ATA. So the DNA triplet that would be used as the template to produce this mRNA codon is ATA. (If you were asked for the DNA coding strand, you would replace U with T to get TAT, but the template answer is ATA.) Tyrosine can also be coded by UAC in mRNA, which would correspond to a different template triplet, illustrating the same complementary principle.

9. 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.

10. Which molecule carries amino acids to the ribosome during translation?

A. mRNA

B. rRNA

C. DNA

D. tRNA

tRNA carries amino acids to the ribosome during translation. Each tRNA is matched to a specific amino acid by a charging enzyme, attaching the amino acid to the tRNA's end. It also carries an anticodon that pairs with the codon on mRNA, ensuring the correct amino acid is brought in at the right step of protein synthesis. The ribosome uses these charged tRNAs to form peptide bonds and extend the growing polypeptide chain. In contrast, mRNA provides the codon sequence that specifies which amino acids to add, rRNA forms and helps execute the ribosome's catalytic and structural roles, and DNA stores the genetic information that is transcribed into mRNA. So the carrier of amino acids to the ribosome is the tRNA, specifically the charged form that delivers the amino acid during translation.

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!