Nucleus – Structure and Function Practice Test (Sample)

Study Guide

Everything you need from our exam experts!

Sample study guide. For the full version with hundreds of questions, visit: https://nucleusstructurefunction.examzify.com

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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. **Nuclear export of mRNA is mediated by exportins and requires energy through which mechanism?**

   A. Passive diffusion.

   B. Exportins with GTP hydrolysis.

   C. ATP hydrolysis alone.

   D. Mitochondrial transport.

2. **Which statement about nucleoli is not true?**

   A. They become larger in actively transcribing cells.

   B. They can differ in morphology between cells.

   C. They disappear during mitosis.

   D. They are enclosed by a membrane.

3. **Which statement best describes the functions of chromatin?**

   A. To compact DNA to fit into the nucleus and regulate gene expression.

   B. To synthesize proteins.

   C. To degrade RNA.

   D. To transport DNA out of the nucleus.

4. **The inner membrane has what relationship to the outer membrane and NPCs?**

   A. It is continuous with the outer membrane at the nuclear pore complexes

   B. It is identical to the outer membrane

   C. It is not attached to NPCs

   D. It is separated from the nuclear material by the lamina

5. **What structure do coiled nucleosomes form?**

   A. Coiled nucleosomes form 30 nm-thick chromatin fibers.

   B. DNA condenses into 70 nm filaments.

   C. Chromatin remains as beads on a string at 2 nm.

   D. Chromatin forms lipid rafts.

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6. In the nucleus, which statement correctly describes the relative abundance of protein and DNA?

A. Two parts DNA to one part protein.

B. RNA is more abundant than both.

C. Two parts protein to one part DNA.

D. DNA and protein are equal in amount.

7. What is the perinuclear space?

A. Space between outer and inner nuclear membranes that is continuous with the lumen of the endoplasmic reticulum.

B. Space between outer and inner nuclear membranes.

C. Space inside the nucleolus.

D. Cytoplasmic space external to the nucleus.

8. Mitotic figures are images of dividing cells at which stage?

A. Prophase

B. Metaphase

C. Anaphase

D. Telophase

9. What role do ribosomes associated with the outer membrane serve?

A. They synthesize proteins for outer and inner nuclear membranes

B. They synthesize cytosolic proteins only

C. They modify proteins post-translationally

D. They synthesize rRNA

10. What is the basic structural unit of chromatin?

A. A lipid droplet.

B. A single RNA molecule.

C. A protein complex that binds membranes.

D. The basic structural unit of chromatin, consisting of proteins and DNA.

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Answers

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

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Explanations

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1. Nuclear export of mRNA is mediated by exportins and requires energy through which mechanism?

A. Passive diffusion.

B. Exportins with GTP hydrolysis.

C. ATP hydrolysis alone.

D. Mitochondrial transport.

Nuclear export uses exportins (karyopherins) and gets its energy from the Ran GTPase cycle, which provides directionality. In the nucleus, Ran bound to GTP forms a complex with the exportin and the mRNA cargo, allowing the entire assembly to move through the nuclear pore. Once in the cytoplasm, RanGAP hydrolyzes Ran-GTP to Ran-GDP, causing the complex to dissociate and releasing the mRNA. The energy and directionality come from this GTP hydrolysis on Ran, not from ATP directly and not from passive diffusion or mitochondrial transport.

2. Which statement about nucleoli is not true?

A. They become larger in actively transcribing cells.

B. They can differ in morphology between cells.

C. They disappear during mitosis.

D. They are enclosed by a membrane.

Think of the nucleolus as a membraneless hub inside the nucleus where ribosome production is organized. It forms around active rRNA gene clusters and assembles the early steps of ribosome biogenesis, without being enclosed by a membrane. This makes it a dynamic, phase-separated region rather than a membrane-bound organelle. That's why the statement about being enclosed by a membrane is not true. The nucleolus sits freely within the nucleoplasm, not inside a membrane-bound envelope. The other statements fit what we know about nucleoli: they grow larger when rRNA transcription is active because more raw material and assembly machinery accumulate there; they can vary in appearance between cells depending on their transcriptional activity and cell type; and they disassemble during mitosis as the cell divides and then reassemble in daughter nuclei as transcription resumes. So the not-true claim is that the nucleolus is enclosed by a membrane.

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3. Which statement best describes the functions of chromatin?

A. To compact DNA to fit into the nucleus and regulate gene expression.

B. To synthesize proteins.

C. To degrade RNA.

D. To transport DNA out of the nucleus.

Chromatin's main job is to package DNA and regulate access to genetic information. DNA is wrapped around histone proteins to form nucleosomes, which coil and fold to fit the long molecules into the tiny nucleus. But this packaging also controls which genes can be read. When chromatin is loosened (euchromatin), transcription machinery can access DNA and genes are active; when it's tightly packed (heterochromatin), gene activity is suppressed. Chemical changes to histones, such as acetylation or methylation, alter how tightly DNA is wound and influence the recruitment of transcription factors and RNA polymerase, guiding which genes are turned on or off. Synthesis of proteins happens at ribosomes, not through chromatin; RNA is degraded by specific enzymes; and moving DNA out of the nucleus involves nuclear transport mechanisms, not chromatin structure itself.

4. The inner membrane has what relationship to the outer membrane and NPCs?

A. It is continuous with the outer membrane at the nuclear pore complexes

B. It is identical to the outer membrane

C. It is not attached to NPCs

D. It is separated from the nuclear material by the lamina

Two lipid bilayers form the nuclear envelope, and nuclear pore complexes span both of them. At these pores, the inner and outer membranes are connected, so they are continuous through the pore. This means the inner membrane is continuous with the outer membrane specifically at the nuclear pore complexes. The outer membrane is also continuous with the endoplasmic reticulum, and the space between the two membranes (the perinuclear space) communicates with the ER lumen. The lamina lies on the inner surface of the inner membrane, providing structural support and interacting with chromatin, rather than acting as a barrier between the nucleus and its contents.

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5. What structure do coiled nucleosomes form?

A. Coiled nucleosomes form 30 nm-thick chromatin fibers.

B. DNA condenses into 70 nm filaments.

C. Chromatin remains as beads on a string at 2 nm.

D. Chromatin forms lipid rafts.

Nucleosomes coil into a 30 nm chromatin fiber. The basic unit—the nucleosome—shapes a 10 nm beads-on-a-string strand, with DNA wrapped around histone cores. When this 10 nm fiber is drawn together, histone interactions, aided by the linker histone H1, pack neighboring nucleosomes into a thicker, about 30 nm fiber. This higher-order structure lets the long DNA fit inside the nucleus while still allowing regulatory access through remodeling and partial unfolding. The other descriptions describe either the uncondensed form (the 2 nm DNA double helix beads-on-a-string) or unrelated concepts, so they don't match the organized 30 nm chromatin fiber formed by coiling nucleosomes.

6. In the nucleus, which statement correctly describes the relative abundance of protein and DNA?

A. Two parts DNA to one part protein.

B. RNA is more abundant than both.

C. Two parts protein to one part DNA.

D. DNA and protein are equal in amount.

In the nucleus, proteins greatly outnumber DNA in terms of mass because DNA is long but comparatively light, and it is wrapped and organized by a large amount of protein, especially histones, to form chromatin. This protein scaffold plus many other nuclear proteins (like transcription factors and enzymes) means there's roughly twice as much protein as DNA by weight. That's why the statement describing two parts protein to one part DNA best captures their relative abundance. RNA does exist in the nucleus, but it isn't present in greater mass than protein, and the amounts of DNA and protein aren't equal either.

7. What is the perinuclear space?

A. Space between outer and inner nuclear membranes that is continuous with the lumen of the endoplasmic reticulum.

B. Space between outer and inner nuclear membranes.

C. Space inside the nucleolus.

D. Cytoplasmic space external to the nucleus.

The perinuclear space is the region between the inner and outer nuclear membranes. Because the outer nuclear membrane is continuous with the membrane system of the endoplasmic reticulum, this space is continuous with the lumen of the ER. That connection explains why it's considered part of the ER lumen. It's not the space inside the nucleolus, which is a subregion within the nucleus, nor is it the cytoplasmic space outside the nucleus. So, the perinuclear space = space between the two nuclear membranes, continuous with the ER lumen.

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8. Mitotic figures are images of dividing cells at which stage?

A. Prophase

B. Metaphase

C. Anaphase

D. Telophase

Recognizing mitotic figures relies on how chromosomes are organized during cell division. The most diagnostic image is metaphase, where chromosomes are highly condensed and line up along the metaphase plate in the center of the cell, with spindle fibers attached to kinetochores. This orderly alignment makes the chromosomes clearly visible and distinct, which is why images of dividing cells are most commonly shown at this stage. In prophase, chromosomes condense but the nucleus is breaking down and they aren't yet lined up; in anaphase, sister chromatids separate and move toward opposite poles; in telophase, chromosomes arrive at the poles and the nucleus begins to reform. These latter stages don't present the same stable, aligned configuration that makes a mitotic figure in histology easy to recognize, so metaphase is the best match for images of dividing cells.

9. What role do ribosomes associated with the outer membrane serve?

A. They synthesize proteins for outer and inner nuclear membranes

B. They synthesize cytosolic proteins only

C. They modify proteins post-translationally

D. They synthesize rRNA

Ribosomes attached to the outer membrane are part of the rough endoplasmic reticulum, and they translate proteins that are destined for membranes or secretion. Because the outer nuclear membrane is continuous with the ER, these ribosomes synthesize proteins that become components of the nuclear envelope as well as other membranes. Some of these proteins are incorporated into the outer nuclear membrane, while others are routed to the inner nuclear membrane via cellular trafficking pathways after translation. This is why their main role is to produce membrane- and secretory-protein cargo, not cytosolic proteins or rRNA. Cytosolic proteins come from free ribosomes, and rRNA is synthesized in the nucleolus by RNA polymerases, not by ribosomes.

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10. What is the basic structural unit of chromatin?

A. A lipid droplet.

B. A single RNA molecule.

C. A protein complex that binds membranes.

D. The basic structural unit of chromatin, consisting of proteins and DNA.

The basic unit of chromatin is the nucleosome, formed when about 147 base pairs of DNA wrap around a core of histone proteins (an octamer made up of two copies of each of H2A, H2B, H3, and H4). This packaging allows long DNA molecules to be compacted inside the nucleus and, through further folding, into higher-order structures that regulate access to genetic information. The presence of DNA with histones distinguishes chromatin from other cellular components, and this arrangement influences which genes can be transcribed. The other options describe components unrelated to chromatin structure: lipid droplets store fats, a single RNA molecule is a gene product, and a protein complex that binds membranes relates to membranes rather than chromatin.

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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://nucleusstructurefunction.examzify.com

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

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