Nuclear Medicine Practice Exam (Sample)

Study Guide

Everything you need from our exam experts!

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Table of Contents

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. **Which radiopharmaceutical should be prepared for a renal function study to determine the glomerular filtration rate?**
   - A. 99mTc gluceptate
   - B. 99mTc mertiatide
   - C. 99mTc pentetate
   - D. 99mTc sulfur colloid

2. **Why are two administrations of tracer required in stress-rest myocardial imaging with 99mTc sestamibi?**
   - A. It does not redistribute once it has been taken up by the myocardium
   - B. It rapidly washes out of the myocardium after administration
   - C. It has too short a half-life to permit delayed imaging
   - D. It must be administered immediately after its preparation

3. **Diaphragmatic attenuation may be reduced by:**
   - A. 360 degree acquisition
   - B. Supine acquisition
   - C. Prone acquisition
   - D. Delayed imaging

4. **What is the correct order of components to be added when labeling red blood cells with radiochromium?**
   - A. Radiochromium, ACD, patient blood, ascorbic acid
   - B. Patient blood, radiochromium, ascorbic acid
   - C. Radiochromium, patient blood, ascorbic acid
   - D. Ascorbic acid, radiochromium, patient blood

5. **Which radiopharmaceutical impurity must be assessed after elution from a 99Mo/99mTc generator?**
   - A. 99mTc
   - B. 99Mo
   - C. Aluminum ions
   - D. Thiosulfate ions

6. **During geometric variation testing of a dose calibrator, if the activity in a 1 mL syringe measures 253 uCi and the expected reading is 212 uCi, which correction factor should be applied?**
   - **A. 23.3**
   - **B. 4.1**
   - **C. 1.19**
   - **D. .84**

7. **An uptake probe would be used for which of the following studies?**
   - **A. Splenic sequestration**
   - **B. Red cell mass**
   - **C. Red cell survival**
   - **D. Plasma volume test**

8. **Which method is used to determine the concentration of 99Mo in a 99mTc eluate?**
   - **A. The eluate is assayed only for 99Mo**
   - **B. The lead shield is used to absorb high energy 99Mo photons**
   - **C. The unshielded eluate is assayed for both 99Mo and 99mTc**
   - **D. The eluate in the lead shield is measured with the dose calibrator set to assay 99Mo**

9. **To determine the patency of a LeVeen shunt, where is the radiopharmaceutical administered?**
   - **A. a vein**
   - **B. the circle of Willis**
   - **C. the shunt tubing**
   - **D. the peritoneal cavity**

10. **For a successful 99mTc radiolabeling, how much radiochemical purity is required according to industry standards?**
   - **A. At least 85%**
   - **B. At least 90%**
   - **C. At least 95%**
   - **D. At least 98%**

Answers

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

Explanations

1. **Which radiopharmaceutical should be prepared for a renal function study to determine the glomerular filtration rate?**

   A. 99mTc gluceptate

   B. 99mTc mertiatide

   C. 99mTc pentetate

   D. 99mTc sulfur colloid

For a renal function study aimed at determining the glomerular filtration rate (GFR), the appropriate radiopharmaceutical is 99mTc pentetate. This radiopharmaceutical is specifically designed for renal imaging and is a classic agent used for assessing renal function due to its ability to be filtered by the glomeruli. 99mTc pentetate is a technetium-labeled diethylenetriaminepentaacetic acid (DTPA) derivative, which closely mimics the behavior of creatinine in the body. It gets cleared from the bloodstream by the kidneys, and the rate at which this radioisotope is excreted allows for an accurate calculation of the GFR. The measurements obtained using 99mTc pentetate are reliable indicators of renal function and help in identifying potential dysfunction. The other options, while they may have various clinical purposes, do not serve as suitable agents for GFR determination. For example, 99mTc gluceptate and 99mTc mertiatide (also known as 99mTc MAG3) are used in renal imaging but are not the gold standard specifically for measuring GFR. 99mTc sulfur colloid is primarily used for different imaging purposes

2. **Why are two administrations of tracer required in stress-rest myocardial imaging with 99mTc sestamibi?**

   A. It does not redistribute once it has been taken up by the myocardium

   B. It rapidly washes out of the myocardium after administration

   C. It has too short a half-life to permit delayed imaging

   D. It must be administered immediately after its preparation

In stress-rest myocardial imaging using 99mTc sestamibi, the requirement for two administrations of the tracer stems primarily from the radiopharmaceutical's properties regarding retention in the myocardium. Specifically, 99mTc sestamibi does not redistribute once it has been taken up by the myocardial tissue. When this tracer is injected during the stress phase, it accumulates in the myocardium based on perfusion at that moment. However, the tracer remains fixed in the myocardial cells and does not wash out or redistribute when the stress is removed. When imaging is performed after rest, a second dose of the tracer is necessary to assess perfusion under resting conditions. This two-step process allows for a clear comparison between the increased demand during stress and the perfusion at rest, giving valuable insights into areas of ischemia or infarcts. This aspect of the tracer's behavior necessitates a different injection for the rest phase, allowing for an accurate evaluation of myocardial blood flow and identifying any perfusion defects effectively.

3. Diaphragmatic attenuation may be reduced by:

A. 360 degree acquisition

B. Supine acquisition

C. Prone acquisition

D. Delayed imaging

When considering how to reduce diaphragmatic attenuation during imaging, acquisition in a prone position is particularly effective. This positioning helps minimize the interference from the diaphragm in various imaging modalities, such as SPECT or PET. When the patient is in a prone position, the diaphragm moves away from the areas of interest, allowing for better visualization of the underlying structures and reducing the attenuation caused by overlying tissue. This is significant when imaging parts of the abdomen or thorax, as the diaphragm can often obscure important anatomical details or lead to lower-quality images due to its varied density and position, depending on the patient's posture. Other methods, such as 360-degree acquisition or supine acquisition, do not address the issue of diaphragmatic attenuation in the same targeted manner. Delayed imaging can sometimes help in clarifying certain aspects of a study but does not fundamentally alter the effect of the diaphragm's location on the imaging results in a way that a prone acquisition does. Thus, acquiring images while the patient is in a prone position stands out as the most effective method for reducing diaphragmatic attenuation.

4. What is the correct order of components to be added when labeling red blood cells with radiochromium?

A. Radiochromium, ACD, patient blood, ascorbic acid

B. Patient blood, radiochromium, ascorbic acid

C. Radiochromium, patient blood, ascorbic acid

D. Ascorbic acid, radiochromium, patient blood

When labeling red blood cells with radiochromium, the correct order of components ensures optimal labeling efficiency and integrity of the blood sample. The process typically begins with patient blood, which is collected into a suitable container. The next step is to add radiochromium to the patient blood. This sequence allows the radiochromium to effectively label the red blood cells as they are in the medium where the labeling reaction takes place. Following the addition of radiochromium, ascorbic acid is introduced. Ascorbic acid serves to enhance the labeling process by reducing oxidation, which can affect the efficiency of labeling and the viability of the red blood cells. This is critical as preserving the integrity of the red blood cells is necessary for the accuracy of subsequent imaging or diagnostic procedures. By understanding this sequence—starting with patient blood, then adding radiochromium, and finally incorporating ascorbic acid—professionals can ensure that the radiolabeling procedure is set up correctly, facilitating high-quality diagnostic imaging outputs.

5. Which radiopharmaceutical impurity must be assessed after elution from a 99Mo/99mTc generator?

A. 99mTc

B. 99Mo

C. Aluminum ions

D. Thiosulfate ions

When eluting a 99Mo/99mTc generator, it is essential to assess for the presence of aluminum ions as an impurity. During the elution process, aluminum impurities may leach into the technetium-99m solution from the generator's column. Aluminum can chemically alter the binding characteristics of radiopharmaceuticals and potentially affect diagnostic imaging quality. Therefore, measuring aluminum content is crucial to ensure that it remains below the acceptable limits to maintain the efficacy and safety of the administered radiopharmaceutical. While the presence of technetium-99m itself is expected in the elution, monitoring for molybdenum-99 is not necessary immediately after elution since the goal is to obtain technetium-99m for patient use. Thiosulfate ions are not typically a concern from this generator type; thus, they do not require assessment. By focusing on aluminum ions, healthcare professionals can help ensure patient safety and the integrity of nuclear medicine procedures.

6. During geometric variation testing of a dose calibrator, if the activity in a 1 mL syringe measures 253 uCi and the expected reading is 212 uCi, which correction factor should be applied?

A. 23.3

B. 4.1

C. 1.19

D. .84

To determine the appropriate correction factor during geometric variation testing of a dose calibrator, it is essential to compare the measured activity to the expected activity. In this scenario, the measured activity is 253 µCi, while the expected activity is 212 µCi. To find the correction factor, you divide the expected reading by the measured reading: Correction Factor = Expected Activity / Measured Activity In this case: Correction Factor = 212 µCi / 253 µCi ≈ 0.8387 This value rounds to approximately 0.84, which aligns with the correction factor identified in the answer choice. Applying this correction factor can help ensure that the dose calibrator provides accurate measurements by adjusting for geometric variations that may influence readings. In nuclear medicine practice, it is critical to account for such variations to maintain accuracy in dosimetry and dosing. Thus, applying a correction factor of 0.84 is the correct approach to adjust the measurements appropriately.

7. An uptake probe would be used for which of the following studies?

A. Splenic sequestration

B. Red cell mass

C. Red cell survival

D. Plasma volume test

An uptake probe is primarily utilized to measure the uptake of radiopharmaceuticals by specific organs, commonly employed in studies assessing thyroid function. In the context of the choices provided, the study most closely associated with the use of an uptake probe is splenic sequestration. When evaluating splenic function, measuring the uptake of radiolabeled blood elements or other tracers can provide insights into how effectively the spleen is filtering and sequestering components of blood, which is essential for diagnosing conditions related to splenic or hematological disorders. The other options involve specific blood component evaluations. Red cell mass and red cell survival studies typically require radiolabeled red blood cells and would use techniques such as blood sampling and radioactive decay measurements rather than an uptake probe. Plasma volume tests similarly do not rely on an uptake probe but rather on other methodologies, such as injecting a radiolabeled tracer and calculating the volume based on the dilution principle. Thus, the use of an uptake probe is indeed most appropriate for splenic sequestration assessments, allowing for direct measurement of radiopharmaceutical uptake related to spleen functionality.

8. Which method is used to determine the concentration of 99Mo in a 99mTc eluate?

A. The eluate is assayed only for 99Mo

B. The lead shield is used to absorb high energy 99Mo photons

C. The unshielded eluate is assayed for both 99Mo and 99mTc

D. The eluate in the lead shield is measured with the dose calibrator set to assay 99Mo

The correct answer involves measuring the eluate of 99mTc for 99Mo while utilizing a lead shield to ensure accurate readings. Specifically, when determining the concentration of 99Mo in a 99mTc eluate, the lead shield serves an important function by absorbing the high-energy photons that are emitted by 99Mo. This reduces the interference that these photons could create during the measurement, allowing for more precise determination of the 99Mo activity. Setting the dose calibrator specifically to assay for 99Mo ensures that it is tuned to detect the appropriate energy levels associated with the 99Mo without being influenced by the emissions of the 99mTc. This method is crucial since 99mTc is the primary radiopharmaceutical derived from the decay of 99Mo, and distinguishing between the two isotopes is necessary for ensuring patient safety and treatment effectiveness. In summary, using a lead shield combined with a dose calibrator adjusted for 99Mo allows for accurate assessment of its concentration in the eluate, which is vital when evaluating potential contamination and ensuring proper dosing in nuclear medicine applications.

9. To determine the patency of a LeVeen shunt, where is the radiopharmaceutical administered?

A. a vein

B. the circle of Willis

C. the shunt tubing

D. the peritoneal cavity

The patency of a LeVeen shunt is evaluated by administering a radiopharmaceutical directly into the peritoneal cavity. The LeVeen shunt is designed to divert fluid from the peritoneal cavity to the venous system to alleviate issues such as ascites. By placing the radiopharmaceutical within the peritoneal cavity, one can monitor its flow through the shunt to determine if it is functioning correctly and whether there are any blockages or malfunctions that prevent proper drainage. This assessment typically involves imaging to ensure that the radioactivity moves through the shunt to the intended venous location, confirming its patency. Other avenues of administration, such as into a vein or through the shunt tubing, would not effectively allow for the evaluation of the device's function, and targeting structures like the circle of Willis is unrelated to the shunt's operation, as it pertains to cerebral circulation rather than the drainage of abdominal fluid.

10. For a successful 99mTc radiolabeling, how much radiochemical purity is required according to industry standards?

A. At least 85%

B. At least 90%

C. At least 95%

D. At least 98%

The requirement for radiochemical purity in 99mTc radiolabeling is critical for ensuring the effectiveness and safety of the radiopharmaceutical. A radiochemical purity of at least 90% is established as an industry standard for 99mTc products. This level is essential because it ensures that a sufficient amount of the administered dose is in the desired radiolabeled form to provide accurate diagnostic imaging results. When the radiochemical purity is below this threshold, there is an increased risk of having free technetium or other impurities in the preparation, which could negatively affect both the quality of the imaging study and patient safety. A purity level of 90% ensures that the labeled compound predominates in the distribution and uptake processes in the body, thus optimizing the diagnostic information obtained from the imaging study. Higher purity levels, such as 95%, 98%, or beyond, though desirable in many scenarios, are not universally required for all applications. Therefore, the correct answer aligns with the practical and regulatory standards for 99mTc radiolabeling, confirming that at least 90% purity is sufficient for a successful and reliable diagnostic outcome.

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://nuclearmed.examzify.com

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