Mosby Digital Image Acquisition Practice Test (Sample)

Study Guide

Everything you need from our exam experts!

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. **How do kVp and mAs collectively influence detector exposure, image contrast, and patient dose?**
   - A. kVp controls the number of photons produced, while mAs adjusts the beam's energy.
   - B. kVp determines the grayscale brightness; mAs sets the image sharpness.
   - C. kVp and mAs individually affect only patient dose, not image quality.
   - D. kVp affects beam energy and contrast; mAs controls photon quantity; together they determine detector signal and the dose needed.

2. **Nyquist frequency and detector sampling: what is it and why is it relevant?**
   - A. It is half the sampling rate, and it determines the highest spatial frequency that can be accurately represented to avoid aliasing.
   - B. It is the full sampling rate.
   - C. It is unrelated to sampling.
   - D. It is twice the sampling rate.

3. **The space from the center of a pixel to the center of the adjacent pixel is called:**
   - A. Pixel Density
   - B. Bit Depth
   - C. Pixel Pitch
   - D. Matrix Depth

4. **The expression of image quality provided by a detector is called:**
   - A. Modulation Transfer Function
   - B. Matrix Size
   - C. Signal-to-Noise Ratio
   - D. Nyquist Frequency

5. **Undesirable fluctuations in image brightness are called?**
   - A. MTF
   - B. Image Noise
   - C. Quantization
   - D. Scintillation

6. **Which single factor listed will increase spatial resolution?**
   - A. Long SID
   - B. Short SID
   - C. Large focal spot
   - D. High kVp

7. **If SID is doubled, what may be said about receptor exposure?**
   - A. Receptor exposure doubles
   - B. Receptor exposure is reduced by one half
   - C. Receptor exposure is reduced by new mAs^2
   - D. Receptor exposure is reduced to one fourth

8. **Grid selectivity is defined as the ratio of primary radiation transmitted through the grid to secondary radiation transmitted through the grid.**
   - A. The ratio of primary radiation transmitted through the grid to secondary radiation transmitted through the grid
   - B. The ratio of primary to scattered radiation transmitted through the grid
   - C. The ratio of transmitted photons to absorbed photons in the grid
   - D. The ratio of grid thickness to interspace width

9. **Which statement describes the effect of beam restriction on radiographic contrast?**
   - A. Decreases contrast by focusing the x-ray beam
   - B. Decreases contrast due to higher kVp used
   - C. Increases contrast by focusing the x-ray beam
   - D. Increases contrast because of reduction in the number of Compton interactions that occur

10. Which term describes the highest spatial frequency that can be recorded by a digital detector?

- **A. Spatial Resolution**
- **B. Contrast Resolution**
- **C. Modulation Transfer Function**
- **D. Nyquist Frequency**

Answers

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

Explanations

1. **How do kVp and mAs collectively influence detector exposure, image contrast, and patient dose?**

    A. **kVp controls the number of photons produced, while mAs adjusts the beam's energy.**

    B. **kVp determines the grayscale brightness; mAs sets the image sharpness.**

    C. **kVp and mAs individually affect only patient dose, not image quality.**

    D. **kVp affects beam energy and contrast; mAs controls photon quantity; together they determine detector signal and the dose needed.**

Understanding how kVp and mAs shape the x-ray beam helps explain image quality and dose. kVp sets the energy of the photons, which determines how penetrating the beam is and how tissues attenuate it—this directly influences image contrast. mAs determines how many photons are produced, controlling the amount of signal reaching the detector and, crucially, the dose the patient receives. Because the detector signal comes from both the photon energy and the photon count, their combination sets the overall exposure seen at the detector. A higher kVp makes the beam more penetrating and tends to lower contrast, while a higher mAs increases photon quantity, boosting detector exposure and raising patient dose. The statement that kVp affects beam energy and contrast; mAs controls photon quantity; together they determine detector signal and the dose needed captures this relationship accurately.

2. **Nyquist frequency and detector sampling: what is it and why is it relevant?**

    A. **It is half the sampling rate, and it determines the highest spatial frequency that can be accurately represented to avoid aliasing.**

    B. **It is the full sampling rate.**

    C. **It is unrelated to sampling.**

    D. **It is twice the sampling rate.**

The Nyquist frequency is the highest spatial frequency you can faithfully represent when you sample an image. It equals half the sampling rate. In a detector, the sampling rate corresponds to how many samples (pixels) you take per unit length, so the Nyquist limit becomes 1 divided by twice the pixel pitch. This limit matters because patterns finer than Nyquist will be misrepresented due to aliasing, creating artifacts. To preserve details, you either increase the sampling rate (smaller pixels) or remove higher frequencies before sampling with an anti-aliasing filter. That's why this answer is correct: it ties half the sampling rate to the maximum accurately representable spatial frequency and the need to avoid aliasing.

3. The space from the center of a pixel to the center of the adjacent pixel is called:

A. Pixel Density

B. Bit Depth

C. Pixel Pitch

D. Matrix Depth

Pixel pitch is the distance from the center of one pixel to the center of the adjacent pixel. This spacing determines how finely the image is sampled: a smaller pitch means more detector elements per area and thus higher spatial resolution, allowing you to resolve finer detail. Pixel density (pixels per unit length) is essentially the inverse of pitch—when pitch gets smaller, density goes up. Bit depth, on the other hand, is about how many gray levels a pixel can show, not how far apart pixels are. Matrix depth (or the size of the image matrix) refers to the number of pixels in the image array, not the physical spacing between pixels. So the center-to-center spacing is correctly described as pixel pitch.

4. The expression of image quality provided by a detector is called:

A. Modulation Transfer Function

B. Matrix Size

C. Signal-to-Noise Ratio

D. Nyquist Frequency

Focus here is on how well a detector preserves image detail across different sizes of patterns. The Modulation Transfer Function is the measure that captures this directly. It describes how much contrast the detector can reproduce at various spatial frequencies, which correspond to the fineness of detail in the image. A detector with a higher MTF maintains more of the original contrast as details get finer, so the image appears sharper. As spatial frequency increases, the MTF typically falls off, indicating the limit where fine details blur. Other terms relate to different aspects of image formation but not this direct transfer of detail. Matrix size affects how many pixels are used to sample the image, not how well the detector transfers contrast. Signal-to-Noise Ratio concerns the level of noise relative to signal, impacting perceived quality but not the intrinsic contrast-transfer performance. Nyquist frequency is about the sampling limit set by pixel size, defining the highest frequency that can be represented, rather than the detector's actual ability to transfer contrast across frequencies. So the detector's expression of image quality is described by the Modulation Transfer Function.

5. Undesirable fluctuations in image brightness are called?

A. MTF

B. Image Noise

C. Quantization

D. Scintillation

Desirable to notice is that the random, grainy variations in brightness you see across an image are called image noise. Noise shows up as speckled or patchy areas where pixel values wander around the true scene brightness, which lowers the signal-to-noise ratio and can hide fine details. It comes from the inherent randomness of photon arrival (especially when exposure is low) and from electronic noise in the imaging system. MTF is about how well the system preserves detail at different spatial frequencies, i.e., sharpness, not random brightness fluctuations. Quantization refers to converting continuous gray levels into discrete steps, which can cause banding but isn't about random brightness variation. Scintillation describes fluctuations in light output from the detector material itself, which can contribute to variability but the standard term for the general random brightness fluctuations across an image is image noise.

6. Which single factor listed will increase spatial resolution?

A. Long SID

B. Short SID

C. Large focal spot

D. High kVp

Spatial resolution improves when the distance between the X-ray source and the image receptor increases. This is because the geometric blur, or penumbra, created by the finite size of the focal spot becomes smaller on the receptor as the source-to-image distance grows. In other words, moving the source farther away reduces the projection of the focal spot onto the image, making edges crisper and details more distinct. The other factors do not increase resolution in the same way: a shorter source-to-image distance increases magnification and blur, a larger focal spot expands the penumbra and lowers sharpness, and higher kVp affects image contrast and exposure rather than edge sharpness directly.

7. If SID is doubled, what may be said about receptor exposure?

A. Receptor exposure doubles

B. Receptor exposure is reduced by one half

C. Receptor exposure is reduced by new mAs^2

D. Receptor exposure is reduced to one fourth

The key idea is the inverse square law for X-ray exposure: receptor exposure is proportional to the incident intensity, which varies as 1 over the SID squared. Doubling the source-to-image distance makes the distance four times larger when you square it, so the exposure at the receptor drops to 1/4 of its original value. Therefore, receptor exposure is reduced to one fourth. If you wanted to keep the same exposure with a doubled SID, you'd need to increase the mAs by a factor of 4 (since exposure ≈ mAs / SID^2).

8. **Grid selectivity is defined as the ratio of primary radiation transmitted through the grid to secondary radiation transmitted through the grid.**

   A. **The ratio of primary radiation transmitted through the grid to secondary radiation transmitted through the grid**

   B. **The ratio of primary to scattered radiation transmitted through the grid**

   C. **The ratio of transmitted photons to absorbed photons in the grid**

   D. **The ratio of grid thickness to interspace width**

Grid selectivity shows how well a grid discriminates between the useful primary photons and the unwanted scatter that pass through it. It's defined as the ratio of primary radiation transmitted through the grid to secondary (scatter) radiation transmitted through the grid. When a grid allows more primary photons to reach the image receptor while absorbing most of the scattered photons, this ratio is high, leading to better image contrast. The concept highlights why grids are used: to reduce scatter reaching the image receptor without excessively attenuating the primary beam. In practice, increasing grid ratio or proper alignment tends to improve selectivity because more scatter is absorbed relative to primary transmission, though overall primary transmission may drop and require exposure adjustments.

9. **Which statement describes the effect of beam restriction on radiographic contrast?**

   A. **Decreases contrast by focusing the x-ray beam**

   B. **Decreases contrast due to higher kVp used**

   C. **Increases contrast by focusing the x-ray beam**

   D. **Increases contrast because of reduction in the number of Compton interactions that occur**

Beam restriction improves radiographic contrast by cutting down the amount of tissue irradiated, which reduces scatter produced inside the patient. Compton scatter is the main contributor to fog in the image; scattered photons add a uniform gray veil that lowers contrast. By using a smaller field, fewer photons interact in the body, so fewer Compton events occur and fewer scattered photons reach the detector. That reduction in scatter sharpens the image, increasing contrast. It's not about "focusing" the beam, and contrast changes aren't driven by kVp changes inherent to beam restriction—kVp is a separate technique factor.

10. Which term describes the highest spatial frequency that can be recorded by a digital detector?

A. Spatial Resolution

B. Contrast Resolution

C. Modulation Transfer Function

D. Nyquist Frequency

The key idea is the sampling limit set by the detector's pixel size. In digital imaging, what you can represent without distortion is governed by how finely you sample the image. The Nyquist frequency is exactly half of the sampling rate, so it defines the highest spatial frequency that can be recorded without aliasing. In practical terms, if your detector has pixel pitch p, the Nyquist frequency is 1/(2p) cycles per unit length (for example, cycles per millimeter). Frequencies higher than this fold back and create artifacts, so this limit tells you the maximum detail you can rely on from the image. Other terms describe related aspects but don't specify this hard cutoff: spatial resolution describes the ability to distinguish details, contrast resolution refers to gray-scale discrimination, and the modulation transfer function describes how accurately those frequencies are transmitted across the system rather than the cutoff itself.

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://mosbydigiimageacquisition.examzify.com

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