MRI PHYSICS AND CLINICAL APPLICATIONS PRACTICE EXAM (SAMPLE)

STUDY GUIDE

SAMPLE STUDY GUIDE WITH LIMITED QUESTIONS

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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. Which artifact is most common in MRI?

A. Ghosting from motion
B. Chemical shift artifact
C. Aliasing artifact
D. Zipper artifact

2. Per the ACR, a pregnant patient may safely undergo MRI at which stage of gestation?

A. Only the second trimester
B. Any stage
C. Only the third trimester
D. Never — MRI is contraindicated in pregnancy

3. In a spin echo pulse sequence, which eliminates T2 effects by rephasing transverse magnetization?

A. 180 degree RF pulse
B. 90 degree RF pulse
C. Frequency encoding gradient
D. Slice select gradient

4. Increasing TR results in which effect on scan time?

A. Lengthens
B. Shortens
C. No Effect on Scan Time
D. Only Affects T1 Weighting

5. To increase spatial resolution without affecting scan time, an MRI tech can do?

A. Decrease FOV
B. Increase NEX
C. Decrease Matrix
D. Increase TR

6. The center of k-space corresponds to gradient amplitude value of zero. Which option accurately states this gradient amplitude?

A. 0 milli Tesla/meter

B. Maximum gradient amplitude

C. Half the peak gradient amplitude

D. Negative gradient

7. The Larmor equation is:

A. w0 = gamma x B0

B. w0 = B0 / gamma

C. w0 = gamma + B0

D. w0 = gamma x TE

8. Which is the primary MR signal resulting from a 90 degree excitation RF pulse?

A. Stimulated echo

B. Gradient echo

C. Free Induction Decay (FID)

D. Spin echo

9. Which anatomical term describes the extension of breast tissue into the armpit area?

A. Axillary tail

B. Suspensory ligament

C. Cooper's ligament

D. Pectoralis minor

10. What effect does increasing TR have on SNR?

A. Decreases SNR

B. No effect on SNR

C. Increases SNR

D. Only affects T2 weighting

Answers

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

Explanations

1. Which artifact is most common in MRI?

A. Ghosting from motion

B. Chemical shift artifact

C. Aliasing artifact

D. Zipper artifact

Motion-related ghosting is the most common MRI artifact because patient movement during data acquisition introduces phase errors that do not cancel out between successive line acquisitions. MRI collects data over several seconds, so even small movements from breathing, swallowing, or restlessness create inconsistencies that manifest as duplicate, ghost-like copies of anatomy shifted along the phase-encode direction. This type of artifact routinely appears across many sequences and body regions, making it the most frequent issue seen in clinical practice. Chemical shift artifact, while common near fat–water interfaces, arises from separate resonance frequencies of fat and water and shows up as misregistration or a bright band at fat boundaries—not as universally encountered as motion ghosts. Aliasing occurs when the field of view is too small and wraps anatomy into the opposite side of the image; it's sequence- and setup-dependent rather than universally pervasive. Zipper artifact results from hardware or external interference and tends to be localized and intermittent.

2. Per the ACR, a pregnant patient may safely undergo MRI at which stage of gestation?

A. Only the second trimester

B. Any stage

C. Only the third trimester

D. Never — MRI is contraindicated in pregnancy

MRI does not use ionizing radiation, so there isn't a gestational stage that inherently makes it unsafe. The main factor is clinical necessity and applying standard safety precautions. Therefore, MRI can be performed at any stage of pregnancy when it's clearly indicated, with the exam planned to minimize any risk—using non-contrast imaging when possible and adhering to safety limits for SAR and acoustic exposure. If contrast (gadolinium) is considered, it's generally avoided in pregnancy because of potential fetal risks, and would only be used if the diagnostic information is essential and benefits clearly outweigh risks, with informed consent and the lowest reasonable dose.

3. In a spin echo pulse sequence, which eliminates T2 effects by rephasing transverse magnetization?

A. 180 degree RF pulse

B. 90 degree RF pulse

C. Frequency encoding gradient

D. Slice select gradient

The key idea is that rephasing transverse magnetization recovers signal that would otherwise be lost to dephasing. After the initial 90-degree flip, spins in slightly different local magnetic fields begin to accumulate phase at different rates, causing the transverse signal to decay faster than true T2 due to field inhomogeneities (T2 effects). Introducing a 180-degree RF pulse flips the spins in the transverse plane, so their subsequent phase evolution proceeds in the opposite direction. At a later time, the spins come back into phase, producing a spin echo. This refocusing cancels the dephasing caused by static field inhomogeneities, so the remaining signal decay reflects true T2 relaxation rather than T2*. The frequency-encoding and slice-select gradients mainly govern spatial encoding and selection and do not cause this rephasing.*

4. Increasing TR results in which effect on scan time?

A. Lengthens

B. Shortens

C. No Effect on Scan Time

D. Only Affects T1 Weighting

Increasing TR means each repetition takes longer, so the total acquisition time grows. Scan time is roughly TR multiplied by the number of repetitions (and other factors like phase-encoding steps and averages remain constant), so lengthening TR lengthens the overall scan time. It wouldn't shorten it, and while TR also influences image contrast (T1 effects), the question focuses on timing, which shows the increase in scan time.

5. To increase spatial resolution without affecting scan time, an MRI tech can do?

A. Decrease FOV

B. Increase NEX

C. Decrease Matrix

D. Increase TR

Spatial resolution comes from the size of the voxels, which is basically the field of view divided by how many phase-encoding samples you acquire. If you want finer detail without making the scan take longer, shrink the field of view while keeping the matrix size the same. That makes each voxel smaller, so you see more detail, but the total number of phase-encoding steps—and thus the time to acquire them—stays the same, so the scan time isn't increased. Just be mindful that a smaller FOV can cause aliasing if anatomy extends outside the FOV, so coverage must match the region of interest or you need anti-aliasing strategies. Rationale for not selecting the other options: increasing the number of excitations boosts signal-to-noise ratio but also increases scan time and does not improve spatial resolution per unit time; decreasing the matrix size enlarges voxels and reduces resolution; increasing the repetition time lengthens the scan, again not improving resolution without changing time.

6. The center of k-space corresponds to gradient amplitude value of zero. Which option accurately states this gradient amplitude?

A. 0 milli Tesla/meter

B. Maximum gradient amplitude

C. Half the peak gradient amplitude

D. Negative gradient

In MRI, the location in k-space is set by the gradient waveform: k is proportional to the time integral of the applied gradients. The center of k-space, k = 0, represents the lowest spatial frequency component and corresponds to zero net gradient moment at the sampling moment. If the gradient amplitude is zero at that moment, there is no additional phase accrual across the imaging field, placing you at the origin of k-space. The gradient amplitude units are milliTesla per meter, so zero milliTesla per meter means no gradient is applied. This is why the center of k-space aligns with zero gradient. Nonzero gradients—whether positive, negative, or a portion of the peak—would drive you away from the center to higher-k regions, so they do not describe the center position.

7. The Larmor equation is:

A. w0 = gamma x B0

B. w0 = B0 / gamma

C. w0 = gamma + B0

D. w0 = gamma x TE

The Larmor equation describes how fast nuclear spins precess around the main magnetic field, with the angular precession frequency being directly proportional to the field strength. The constant of proportionality is the gyromagnetic ratio γ. So the angular frequency is $\omega_0 = \gamma B_0$. This means stronger fields make spins precess faster. For protons, $\gamma/2\pi$ is about 42.58 MHz per tesla, so at 1.5 T the precession frequency is $f_0 \approx 63.9$ MHz, and the angular frequency is $\omega_0 \approx 2\pi \times 63.9e6 \approx 4.01\times10^8$ rad/s. The other forms don't fit: dividing by γ would not give the correct units for frequency, adding γ and B_0 mixes quantities with different units, and γ times TE uses a time parameter (TE) rather than the magnetic field, which isn't how the precession frequency is determined.

8. Which is the primary MR signal resulting from a 90 degree excitation RF pulse?

A. Stimulated echo

B. Gradient echo

C. Free Induction Decay (FID)

D. Spin echo

After a single 90° RF pulse, the net magnetization is flipped into the transverse plane and begins to precess, inducing a current in the receive coil. This transverse magnetization dephases due to local field inhomogeneities and T2 relaxation, producing a decaying signal known as the free induction decay. Unless a 180° refocusing pulse is applied (to create a spin echo) or a gradient is used to rephase spins (to form a gradient echo), there is no distinct echo formed. Stimulated echoes require multiple pulses. So the primary signal from that 90° excitation is the free induction decay.

9. Which anatomical term describes the extension of breast tissue into the armpit area?

A. Axillary tail

B. Suspensory ligament

C. Cooper's ligament

D. Pectoralis minor

Breast tissue can extend beyond the main gland into the armpit region, forming an axillary tail. This portion, known as the axillary tail or tail of Spence, arises from the lateral edge of the breast and projects toward the axilla. Its variable size means some individuals have a more prominent extension into the armpit, which is why this term specifically describes that anatomical feature. Clinically, it's important because tumors or palpable nodes can occur in this area and affect breast examination and staging. The other terms describe structures that aren't an extension of breast tissue. Suspensory ligaments (Cooper's ligaments) are fibrous bands that support and anchor the breast to the skin and chest wall. Pectoralis minor is a chest-wall muscle beneath the pectoralis major. Neither describes tissue extending into the armpit.

10. What effect does increasing TR have on SNR?

A. Decreases SNR

B. No effect on SNR

C. Increases SNR

D. Only affects T2 weighting

Longer repetition time allows more longitudinal magnetization to recover between excitations. When TR is increased, the magnetization along the z-axis approaches its maximum value before each RF pulse, so the transverse signal produced after excitation is larger. Since the signal level rises while the noise per image remains roughly similar, the overall SNR improves with longer TR. The gain continues until the magnetization is nearly fully recovered, after which SNR plateaus. Keep in mind this comes with the trade-off of longer scan time. This effect isn't limited to T2 weighting; TR also controls how much T1 relaxation influences the signal, so higher TR reduces saturation and boosts signal across tissues.

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://mriphysicsclinapplications.examzify.com

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