Ultrasound Physics Test 1 Practice (Sample)

Study Guide

BY EXAMZIFY

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. **What type of wave is sound?**

   A. Transverse

   B. Circular

   C. Surface

   D. Longitudinal

2. **What is the effect of constructive interference on the amplitude of the resultant wave?**

   A. The resultant wave is larger.

   B. The resultant wave is smaller.

   C. There is no change in the resultant wave.

   D. The frequency doubles.

3. **Which unit is used for intensity?**

   A. Watts per square meter

   B. Joules

   C. Watts per square centimeter

   D. Decibels

4. **In soft tissue, what is the approximate wavelength of sound at 1 MHz?**

   A. 0.77 mm

   B. 1.54 mm

   C. 3.08 mm

   D. 7.7 mm

5. **Approximately how long is the round-trip travel time for 1 cm depth in soft tissue?**

   A. 6 microseconds

   B. 13 microseconds

   C. 26 microseconds

   D. 52 microseconds

6. **What distance does sound cover in one microsecond if its speed is 1.54 mm/µs?**

   A. 0.77 mm

   B. 1.54 mm

   C. 3.08 mm

   D. 0.154 mm

7. **Using the soft tissue rule (1.54 mm divided by frequency in MHz), what is the wavelength at 2 MHz?**

   A. 1.54 mm

   B. 3.08 mm

   C. 0.77 mm

   D. 7.7 mm

8. **What is the wavelength at 0.5 MHz given a speed of sound of 1540 m/s?**

   A. 0.77 mm

   B. 3.08 mm

   C. 0.077 mm

   D. 77 mm

9. **Which arrangement correctly classifies 16 kHz and 20 kHz frequencies?**

   A. 16 kHz is ultrasound; 20 kHz is audible.

   B. 16 kHz is audible; 20 kHz is ultrasound.

   C. Both are audible.

   D. Both are ultrasound.

10. **What is Fraunhofer zone also known as, and what region does it describe?**

    A. Near field: region just beyond transducer surface.

    B. The region where wave fronts are curved.

    C. Boundary layer where reflections occur.

    D. Far zone: region starting at focal point and extending deeper.

Answers

SAMPLE

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

Explanations

1. What type of wave is sound?

A. Transverse

B. Circular

C. Surface

D. Longitudinal

Sound is a longitudinal wave, meaning the particles of the medium oscillate in the same direction as the wave travels. As the wave moves, it creates regions of compression where particles are pushed closer together and rarefaction where they spread apart. This back-and-forth motion along the travel direction is why sound propagates as a compressional wave in air, liquids, and tissues. In contrast, a transverse wave has particle motion perpendicular to the direction of travel, which isn't how sound behaves. Circular or surface descriptors refer more to wavefront shape or motion at boundaries rather than the fundamental particle motion of the wave, so they don't describe sound's propagation.

2. What is the effect of constructive interference on the amplitude of the resultant wave?

A. The resultant wave is larger.

B. The resultant wave is smaller.

C. There is no change in the resultant wave.

D. The frequency doubles.

Constructive interference happens when two waves meet in phase, so their displacements add together. The peaks line up with peaks and the troughs with troughs, making the resulting wave's amplitude equal to the sum of the two amplitudes at each point. That means the resultant amplitude is larger than either wave alone—potentially as large as the sum of their amplitudes if they have the same phase and similar sizes. The frequency, however, comes from the source waves and does not change just because the waves interfere. So the correct idea is that the amplitude increases due to in-phase addition, while the frequency remains the same.

3. Which unit is used for intensity?

A. Watts per square meter

B. Joules

C. Watts per square centimeter

D. Decibels

Intense energy crossing tissue is described by how much power arrives per unit area. That means intensity is power divided by area. In ultrasound practice, this is expressed as watts per square centimeter because clinicians measure the beam over centimeter-scale areas and care about how much power is delivered to each square centimeter of tissue. Joules is energy, not a rate—so it doesn't describe how concentrated the beam is at a location. Decibels are a logarithmic ratio used to compare levels, not a direct unit of intensity. Watts per square meter is technically the SI unit for intensity, but the conventional clinical unit used for ultrasound is watts per square centimeter, which is why this option best matches typical practice. For a quick example: if the probe emits 4 watts over an area of 0.5 cm^2, the intensity is 4 W / 0.5 cm^2 = 8 W/cm^2.

4. In soft tissue, what is the approximate wavelength of sound at 1 MHz?

A. 0.77 mm

B. 1.54 mm

C. 3.08 mm

D. 7.7 mm

Wavelength in a medium is determined by the speed of sound in that medium and the frequency: λ = c / f. In soft tissue, the speed is about c = 1540 m/s. At a frequency of 1 MHz (1,000,000 Hz), the wavelength is 1540 / 1,000,000 ≈ 0.00154 meters, which is 1.54 millimeters. So the approximate wavelength at 1 MHz in soft tissue is about 1.54 mm. (Doubling the frequency would halve the wavelength, illustrating how higher frequencies yield shorter wavelengths and finer detail.)

5. Approximately how long is the round-trip travel time for 1 cm depth in soft tissue?

A. 6 microseconds

B. 13 microseconds

C. 26 microseconds

D. 52 microseconds

Sound travels in soft tissue at about 1,540 meters per second. For a reflector 1 centimeter away, the one-way travel time is 0.01 meters divided by 1,540 meters per second, which is about 6.5 microseconds. Since the signal must go there and back, the round-trip time is twice that, roughly 13 microseconds. So the approximate round-trip travel time for 1 cm depth in soft tissue is about 13 microseconds.

6. What distance does sound cover in one microsecond if its speed is 1.54 mm/μs?

A. 0.77 mm

B. 1.54 mm

C. 3.08 mm

D. 0.154 mm

Sound travels distance equal to speed times time. With a speed of 1.54 mm per microsecond, in one microsecond the distance is 1.54 mm × 1 μs = 1.54 mm. The microsecond units cancel, leaving millimeters. This mirrors the common ultrasound reference that sound in soft tissue moves about 1.54 mm every microsecond (≈1540 m/s). If time were different, the distance would scale accordingly (for example, 2 μs would be 3.08 mm).

7. Using the soft tissue rule (1.54 mm divided by frequency in MHz), what is the wavelength at 2 MHz?

    A. 1.54 mm

    B. 3.08 mm

    C. 0.77 mm

    D. 7.7 mm

Wavelength in a medium comes from $\lambda = c / f$, where c is the speed of sound in the medium. In soft tissue, c is about 1540 m/s, so the practical shortcut is λ (mm) ≈ 1.54 / f (MHz). At 2 MHz, this gives λ ≈ 1.54 / 2 = 0.77 mm. The other numbers would correspond to different frequencies: 1.54 mm for 1 MHz, 3.08 mm for 0.5 MHz, and 7.7 mm for about 0.2 MHz.

8. What is the wavelength at 0.5 MHz given a speed of sound of 1540 m/s?

    A. 0.77 mm

    B. 3.08 mm

    C. 0.077 mm

    D. 77 mm

Wavelength in a medium is found from the relation $\lambda = c / f$, where c is the speed of sound and f is the frequency. With c = 1540 m/s and f = 0.5 MHz = 5×10^5 Hz, the wavelength is λ = 1540 / 500,000 = 0.00308 m, which is 3.08 mm. This matches the provided value. The other numbers would correspond to different frequencies (for example, about 2 MHz gives ~0.77 mm, about 20 MHz gives ~0.077 mm, and about 20 kHz gives ~77 mm), highlighting that wavelength is inversely related to frequency.

9. Which arrangement correctly classifies 16 kHz and 20 kHz frequencies?

    A. 16 kHz is ultrasound; 20 kHz is audible.

    B. 16 kHz is audible; 20 kHz is ultrasound.

    C. Both are audible.

    D. Both are ultrasound.

Frequencies up to about 20 kHz are audible to humans, while ultrasound is defined as frequencies above that threshold. So 16 kHz lies within the audible range and would be heard, whereas 20 kHz sits at the upper limit and is treated here as ultrasound. That's why the correct arrangement is: 16 kHz is audible; 20 kHz is ultrasound.

10. What is Fraunhofer zone also known as, and what region does it describe?

   A. Near field: region just beyond transducer surface.

   B. The region where wave fronts are curved.

   C. Boundary layer where reflections occur.

   D. Far zone: region starting at focal point and extending deeper.

The Fraunhofer zone is the far-field region of the ultrasound beam. Beyond the near field, the wavefronts become essentially planar as they propagate, and the beam pattern is governed by diffraction from the transducer aperture. This is why it's called the far zone—the region deeper from the transducer where the beam has settled into a more predictable, plane-front form. The starting point is often described using the approximate distance $2D^2/\lambda$ (with D being the aperture diameter and λ the wavelength); the focal point is not the defining boundary, though the far field occurs after the beam has passed the near field and its curvature has diminished. The region near the transducer, where fronts are still strongly curved and the pattern is changing, is not the Fraunhofer zone.

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://ultrasoundphysics1.examzify.com

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