ULTRASONIC TESTING LEVEL 2 PRACTICE TEST (SAMPLE)

STUDY GUIDE

SAMPLE STUDY GUIDE WITH LIMITED QUESTIONS

Notice: Examzify makes every reasonable effort to obtain accurate, complete, and timely information about this product from reliable sources.

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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 type of wave travels along the surface and is commonly used for surface inspection in metals?**
   A. P-wave
   B. S-wave
   C. Rayleigh wave
   D. Lamb wave

2. **Distance Amplitude Correction (DAC) is used to compensate echo height variations due to depth.**
   A. Transfer
   B. Distance amplitude correction
   C. Attenuation
   D. Interpretation

3. **As frequency increases for a given diameter crystal, the angle of beam divergence:**
   A. Decreases
   B. Remains unchanged
   C. Increases
   D. Varies uniformly through each wavelength

4. **Energy distribution at an interface with impedance mismatch results in which of the following?**
   A. All energy reflected
   B. No energy transmitted
   C. Division of sound energy into transmitted and reflected modes
   D. Energy is absorbed completely

5. **What is the term for the speed at which ultrasonic waves travel through a material?**
   A. Pulse repetition rate
   B. Ultrasonic response
   C. Velocity
   D. Pulse recovery rate

6. Which of the following is a reference reflector that is not dependent on beam angle?

A. A flat bottom hole

B. A vee notch

C. A side drilled hole which is parallel to the plate surface and perpendicular to the sound path

D. A disc shaped laminar reflector

7. In immersion shear wave testing, waves are generated by angulating the transducer beyond the first critical angle. What is the direction of the material's particle motion?

A. Perpendicular to the direction of wave propagation

B. The same as the wave propagation

C. Normal to the material surface

D. Parallel to the direction of wave propagation

8. Low frequency sound waves are not generally used to test thin materials because of which limitation?

A. The rapid attenuation of low frequency sound

B. Incompatible wavelengths

C. Poor near surface resolution

D. None of the above will actually limit such a test

9. What is a typical observation when a metallic specimen has large grains?

A. All of the above

B. Decrease in back surface reflection

C. Hash/noise indications

D. Decrease in penetration

10. Which depth corresponds to the depth at which surface waves energy is reduced to approximately 1/25 of the original power?

A. 1 inch

B. 4 inches

C. 1 wavelength

D. 4 wavelengths

Answers

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

Explanations

1. **Which type of wave travels along the surface and is commonly used for surface inspection in metals?**

   A. P-wave

   B. S-wave

   C. Rayleigh wave

   D. Lamb wave

Rayleigh waves are surface waves that travel along the surface of a solid. Their particle motion is elliptical and stays near the surface, so most of the energy is confined to a shallow region (roughly within one wavelength). This makes them exceptionally sensitive to defects at or very close to the surface, which is why they're commonly used for surface inspection in metals. P- and S-waves are body waves that move through the material's interior, not confined to the surface, so they're not as well suited for surface-specific flaw detection. Lamb waves are plate waves that propagate in thin sections of material and involve multiple modes with energy spread through thickness; they're used more for assessing plate thickness or through-thickness flaws rather than surface defects.

2. **Distance Amplitude Correction (DAC) is used to compensate echo height variations due to depth.**

   A. Transfer

   B. Distance amplitude correction

   C. Attenuation

   D. Interpretation

Distance Amplitude Correction addresses how echo height changes with depth by applying a depth-based gain to the received signal. In ultrasonic testing, deeper reflectors naturally produce smaller echoes because the sound loses energy as it travels through the material (attenuation) and because the beam spreads over distance. If you relied on raw echo amplitudes, deeper flaws would look weaker simply due to their location, making it hard to compare flaw sizes across depths. DAC uses a compensation curve that increases the displayed amplitude of echoes as depth increases, so a reflector of a given size produces a more uniform, comparable height on the display regardless of how deep it is. This normalization helps you detect and size flaws consistently from near to far, rather than being biased by depth. The other terms describe related ideas but not the specific corrective technique. Attenuation is the general loss of signal strength with distance, which causes the depth-related variation DAC corrects. Transfer and interpretation refer to different parts of data handling or evaluative steps and do not denote the depth-based amplitude correction itself.

3. **As frequency increases for a given diameter crystal, the angle of beam divergence:**

   A. Decreases

   B. Remains unchanged

   C. Increases

   D. Varies uniformly through each wavelength

When a finite transmitting aperture emits ultrasound, diffraction from the aperture determines how wide the main beam is. The angular width of that beam is roughly proportional to the wavelength divided by the aperture diameter. For a given crystal diameter, increasing frequency shortens the wavelength (since wavelength is inversely related to frequency in the same medium). A shorter wavelength diffracts less, so the main beam becomes narrower. Hence the angle of beam divergence decreases as frequency increases.

4. Energy distribution at an interface with impedance mismatch results in which of the following?

A. All energy reflected

B. No energy transmitted

C. Division of sound energy into transmitted and reflected modes

D. Energy is absorbed completely

When a ultrasonic wave encounters an interface between two materials with different acoustic impedances, part of the energy is reflected back into the first medium and part is transmitted into the second. The impedance mismatch causes this split because the boundary conditions require the pressure and particle velocity to satisfy continuity across the boundary, so the wave must partly reflect and partly continue forward. Energy conservation (ignoring losses) means the incident energy equals the sum of the reflected and transmitted energies. At normal incidence, the fraction reflected is $R = ((Z2 - Z1)/(Z2 + Z1))^2$ and the transmitted fraction is $T = 1 - R$ (or $T = 4Z1Z2/(Z1 + Z2)^2$). If the impedances match, all energy transmits; with mismatch, some energy is reflected in addition to what is transmitted. In real materials, a small portion can also be absorbed at the boundary, but the fundamental outcome is that energy divides into transmitted and reflected waves.

5. What is the term for the speed at which ultrasonic waves travel through a material?

A. Pulse repetition rate

B. Ultrasonic response

C. Velocity

D. Pulse recovery rate

The speed of ultrasonic waves through a material is called velocity. It represents how fast the wavefront travels, typically measured in meters per second, and is essential for time-of-flight calculations used in flaw sizing and material characterization. The other terms refer to how often pulses are emitted (pulse repetition rate) or are not standard descriptors of wave speed, so they don't describe the actual travel speed.

6. Which of the following is a reference reflector that is not dependent on beam angle?

A. A flat bottom hole

B. A vee notch

C. A side drilled hole which is parallel to the plate surface and perpendicular to the sound path

D. A disc shaped laminar reflector

The idea being tested is that a reference reflector should give a stable echo regardless of the probe's beam angle. A disc-shaped laminar reflector is designed to do just that. Its laminated, disc-like structure scatters ultrasonic energy in many directions rather than relying on a single, precise reflection path. This makes the back-wall echo relatively insensitive to the incidence angle, so the echo amplitude stays fairly constant as you tilt or rotate the beam. That angle independence is why it's preferred as a reference standard for calibrating gain and sensitivity across different probe orientations. In contrast, other reflectors rely on specific geometries that produce strong reflections only at particular angles. A flat-bottom hole gives a strong echo mainly when the beam is near normal to the bottom surface, decreasing as the angle changes. A side-drilled hole aligned with the sound path or a vee notch produces echoes that vary with orientation and angle, making them less reliable as angle-insensitive references.

7. In immersion shear wave testing, waves are generated by angulating the transducer beyond the first critical angle. What is the direction of the material's particle motion?

A. Perpendicular to the direction of wave propagation

B. The same as the wave propagation

C. Normal to the material surface

D. Parallel to the direction of wave propagation

In immersion shear wave testing, angulating the transducer beyond the first critical angle generates a shear (S) wave in the material. Shear waves are transverse, meaning the particle displacement is perpendicular to the direction the wave is traveling. So the material's particles move in a direction that is orthogonal to the wave's propagation path. This distinguishes them from compressional (P) waves, where particle motion is parallel to propagation.

8. Low frequency sound waves are not generally used to test thin materials because of which limitation?

A. The rapid attenuation of low frequency sound

B. Incompatible wavelengths

C. Poor near surface resolution

D. None of the above will actually limit such a test

Low frequency ultrasonic waves have long wavelengths, which reduces spatial resolution. When testing thin materials, you need to clearly separate echoes coming from the surface, any near-surface flaws, and the far (back) surface. With long wavelengths, those echoes blur together and the near-surface region cannot be resolved accurately, making it difficult to detect small flaws or accurately measure thin sections. Using higher frequency signals provides shorter wavelengths and much better near-surface resolution, so the echoes can be distinguished and interpreted correctly. Attenuation is actually lower at low frequency, so that isn't the limiting factor here, and the issue isn't a general mismatch of wavelengths but the inability to resolve features near the surface.

9. What is a typical observation when a metallic specimen has large grains?

A. All of the above

B. Decrease in back surface reflection

C. Hash/noise indications

D. Decrease in penetration

When grains in a metal are large compared to the ultrasonic wavelength, scattering at grain boundaries becomes strong and energy is not transmitted cleanly. This causes several observable effects in UT. First, energy that would travel to the back wall is partially scattered away, so the back surface reflection is weaker. Second, the wave attenuates more as it propagates, reducing penetration and making deeper features harder to detect. Third, the scattering from many grain boundaries creates random, fluctuating signals—grain noise or hash—which degrades the clarity of the indication. Because these three behaviors—weaker back-wall echoes, reduced penetration, and grain noise—often occur together when grain size is large, the most accurate conclusion is that all of these effects can be observed.

10. Which depth corresponds to the depth at which surface waves energy is reduced to approximately 1/25 of the original power?

A. 1 inch

B. 4 inches

C. 1 wavelength

D. 4 wavelengths

Surface waves lose energy quickly with depth, concentrating near the surface. The decay is close to exponential with depth, so the amplitude at depth z can be described as $A(z) \approx A0\ e^{-kz}$, where $k = 2\pi/\lambda$ and λ is the surface wavelength. Since power is proportional to amplitude squared, the power at depth z follows $P(z) \approx P0\ e^{-2kz} = P0\ e^{-4\pi z/\lambda}$. To get about 1/25 of the original power, set $e^{-4\pi z/\lambda} \approx 1/25$. Solving gives $z/\lambda \approx (\ln 25)/(4\pi) \approx 0.26$, i.e., roughly a quarter of a wavelength. So the depth at which the surface-wave energy is reduced to about 1/25 of its surface value is about one-quarter of the wavelength. In practical terms, if your wavelength in the material is four inches, that depth is about one inch. The deeper depths (a full wavelength or more) would reduce energy far more than 1/25, while shallower depths would not reach that level of attenuation.

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://ultrasonictesting2.examzify.com

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