ULTRASONIC TESTING LEVEL 2 PRACTICE TEST (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.

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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!

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Questions

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1. During an A-scan test, strong indications that move across the screen horizontally and cannot be repeated by rescanning are most likely caused by:

A. Porosity

B. Crack

C. Blow hole

D. Electrical interference

2. If an ultrasonic wave is transmitted through an interface where the first material has a higher acoustic impedance but the same velocity as the second material, the angle of refraction will be

A. Greater than the angle of incidence

B. Less than the angle of incidence

C. The same as the angle of incidence

D. Beyond the critical angle

3. Which statement best describes area amplitude standards?

A. They vary the size of calibration reflectors while keeping geometry constant.

B. They vary the geometry and dimensions of calibration reflectors.

C. They use different materials.

D. They measure beam spread.

4. In contact testing, shear waves can be induced in the test material by

A. Placing a spherical acoustic lens on the face of the transducer

B. Using two transducers on opposite sides of the test specimen

C. Placing an X cut crystal directly on the surface of the material, and coupling through a film of oil

D. Using a transducer mounted on a plastic wedge so that sound enters the part at an angle

5. Which term specifically names the device that provides the timing signal to coordinate all instrument actions?

A. Display unit or CRT

B. Marker circuit

C. Pulser

D. Synchronizer, clock, or timer

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6. Which ultrasonic test frequency would probably provide the best penetration in a 12 inch thick specimen of coarse-grained steel?

A. 1 MHz

B. 2.25 MHz

C. 5 MHz

D. 10 MHz

7. The factor determining the amount of reflection at the interface of two dissimilar materials is:

A. The acoustic impedance

B. The index of rarefaction

C. The frequency of the ultrasonic wave

D. Young's modulus

8. One of the most common applications of ultrasonic tests employing shear waves is:

A. Detection of discontinuities in welds, tube, and pipe

B. Determination of elastic properties of metallic products

C. Detection of laminar discontinuities in heavy plate

D. Measurement of thickness of thin plate

9. Which combination of material properties primarily determines the acoustic velocity?

A. Density only

B. Elasticity only

C. Acoustic impedance

D. Density and elasticity

10. When a longitudinal wave refracts and a transverse (shear) wave is produced in the second medium, the refracted angle of the transverse wave is:

A. Greater than the refracted angle of the longitudinal wave

B. Less than the refracted angle of the longitudinal wave

C. Not present at all

D. Equal to the refracted angle of the longitudinal wave

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Answers

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

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Explanations

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1. During an A-scan test, strong indications that move across the screen horizontally and cannot be repeated by rescanning are most likely caused by:

A. Porosity

B. Crack

C. Blow hole

D. Electrical interference

Electrical interference shows up as unpredictable, non-repeatable signals in an A-scan. Real flaws create reflections at a specific depth, so when you rescan the same area with the same setup, those reflections reappear in the same place. If strong indications drift horizontally across the display and cannot be reproduced on rescans, they're most likely electronic noise rather than actual material discontinuities. To verify, check grounding, shielding, connections, and equipment settings, and retest with stable setup; genuine flaws should remain consistent in position across scans.

2. If an ultrasonic wave is transmitted through an interface where the first material has a higher acoustic impedance but the same velocity as the second material, the angle of refraction will be

A. Greater than the angle of incidence

B. Less than the angle of incidence

C. The same as the angle of incidence

D. Beyond the critical angle

When an ultrasonic wave crosses into another medium, the bend of its path is set by how fast the wave travels in each material, not by the impedance alone. The boundary condition requires the tangential component of the wavevector to be continuous, which gives sin(incident angle) divided by the wave speed in the first medium equals sin(refracted angle) divided by the wave speed in the second. If the speeds are the same, those sines are equal, so the refracted angle equals the incident angle. Impedance differences change how much of the wave is transmitted versus reflected, but they do not change the direction when the speeds are equal. The idea of a critical angle or a refracted angle becoming larger or smaller arises from a speed difference, which isn't the case here. Therefore, the angle of refraction is the same as the angle of incidence.

3. Which statement best describes area amplitude standards?

A. They vary the size of calibration reflectors while keeping geometry constant.

B. They vary the geometry and dimensions of calibration reflectors.

C. They use different materials.

D. They measure beam spread.

Area amplitude standards are about how the reflected signal changes with the size of the reflector while keeping its shape the same. By varying only the size of calibration reflectors and keeping the geometry constant, the measured echo amplitude changes in a predictable way that is directly related to the reflector's area. This creates a reliable calibration curve: larger areas produce larger reflections, allowing you to relate signal amplitude to defect size in real tests. If you altered the geometry or shape of the reflectors, edge effects or directional characteristics would also affect amplitude, making it harder to isolate the effect of area. Using different materials would change attenuation and coupling, again confounding the area relationship. Measuring beam spread tackles a different aspect of the beam, not the area amplitude relationship.

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4. In contact testing, shear waves can be induced in the test material by

A. Placing a spherical acoustic lens on the face of the transducer

B. Using two transducers on opposite sides of the test specimen

C. Placing an X cut crystal directly on the surface of the material, and coupling through a film of oil

D. Using a transducer mounted on a plastic wedge so that sound enters the part at an angle

In contact testing, shear waves are generated by mode conversion that occurs when a longitudinal wave hits the test surface at an oblique angle. Mounting the transducer on a plastic wedge sets up that controlled oblique incidence, so part of the energy converts to a shear wave in the material as the wave enters. This angle-beam arrangement is specifically designed to produce the shear mode, which travels with a different velocity and can reveal flaws that longitudinal waves might miss. Other approaches don't reliably create the required angle and boundary conditions for this mode conversion. A spherical lens changes beam shape but not the necessary oblique incidence to trigger shear generation. Using two transducers on opposite sides mainly transmits energy straight through and doesn't rely on conversion to shear waves. Directly placing an X-cut crystal on the surface with an oil film would still favor the transducer's primary mode rather than consistently producing a shear wave in the material.

5. Which term specifically names the device that provides the timing signal to coordinate all instrument actions?

A. Display unit or CRT

B. Marker circuit

C. Pulser

D. Synchronizer, clock, or timer

The key idea is that there is a master timing reference in the instrument that coordinates when every part acts. The device that provides this timing signal is the synchronizer, clock, or timer. It generates precise trigger pulses that synchronize when the pulser fires, when the receiver gates open to listen for echoes, and when data are sampled and displayed. The pulser itself creates the ultrasonic pulse, but it does so in response to the timing signal from the synchronizer. The display unit shows the results, and marker circuits place indicators based on timing, yet they don't establish the timing reference themselves.

6. Which ultrasonic test frequency would probably provide the best penetration in a 12 inch thick specimen of coarse-grained steel?

A. 1 MHz

B. 2.25 MHz

C. 5 MHz

D. 10 MHz

In coarse-grained steel, penetration through a thick section is best achieved with the lowest frequency among the options. Lower ultrasonic frequency has a longer wavelength, which reduces scattering from grain boundaries and lowers attenuation, allowing waves to travel deeper before their signal diminishes. For a 12-inch-thick specimen, you want that deeper reach, so the lowest frequency provided would be most effective. Among the given choices, that is one megahertz. Keep in mind, using a lower frequency trades off with reduced resolution and sensitivity to smaller flaws, but it maximizes penetration in this scenario.

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7. The factor determining the amount of reflection at the interface of two dissimilar materials is:

A. The acoustic impedance

B. The index of rarefaction

C. The frequency of the ultrasonic wave

D. Young's modulus

The amount of reflection at a boundary between two different materials is governed by the acoustic impedance mismatch. Acoustic impedance is Z = ρc, the product of the material's density (ρ) and the wave speed (c) in that material. When an ultrasonic wave encounters the interface, part of its energy reflects and part transmits, and the proportion reflected depends on how different the impedances are. The amplitude reflection coefficient is (Z2 − Z1)/(Z2 + Z1); a larger difference yields a stronger reflected signal, while equal impedances produce almost no reflection. The frequency of the wave doesn't determine the reflection amount at a simple planar interface; it mainly affects wavelength and resolution. Young's modulus shapes wave speed, but the key factor is the impedance difference, which already combines density and speed. The index of rarefaction isn't a factor in this context.

8. One of the most common applications of ultrasonic tests employing shear waves is:

A. Detection of discontinuities in welds, tube, and pipe

B. Determination of elastic properties of metallic products

C. Detection of laminar discontinuities in heavy plate

D. Measurement of thickness of thin plate

Shear waves in ultrasonic testing are transverse waves that travel through solids and are especially effective for spotting flaws that lie in the welds and tubular regions. When you use shear-wave testing, flaws such as lack of fusion, cracks, or other discontinuities in welded joints or in tubes and pipes produce strong reflections that are easy to interpret, making this approach a go-to method for inspecting these geometries. That's why detecting discontinuities in welds, tubes, and pipes is the most common application. Welded joints and tubular components have many potential planar flaws, and the shear-wave angle-beam setup is well suited to interrogate the weld region and reveal these defects with clear echoes. Other options lean toward different objectives or require different wave modes. Measuring elastic properties or shear modulus is a more specialized use and not the everyday goal of routine UT. Detecting laminar discontinuities in heavy plate is possible but less central to typical UT practice with shear waves, and measuring thickness of thin plate is usually done with other wave modes or configurations focused on through-thickness measurements.

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9. Which combination of material properties primarily determines the acoustic velocity?

A. Density only

B. Elasticity only

C. Acoustic impedance

D. Density and elasticity

The speed of a sound wave in a material is set by how stiff the material is and how much mass there is per unit volume. For longitudinal waves in solids, the velocity roughly follows the stiffness-to-density ratio: increasing stiffness (elastic modulus) raises velocity, while increasing density lowers it. This means both density and elasticity together determine how fast the wave travels through the material. Acoustic impedance, while related, is the product of density and velocity (Z = ρv). It depends on both properties and reflects how a material will reflect or transmit sound at an interface, but it does not by itself set the wave speed. So the combination of density and elasticity best explains the acoustic velocity.

10. When a longitudinal wave refracts and a transverse (shear) wave is produced in the second medium, the refracted angle of the transverse wave is:

A. Greater than the refracted angle of the longitudinal wave

B. Less than the refracted angle of the longitudinal wave

C. Not present at all

D. Equal to the refracted angle of the longitudinal wave

When a longitudinal (P) wave hits a boundary and a shear (S) wave is produced in the second medium, each wave mode follows Snell's law with its own velocity in the second medium. The transmitted P-wave angle follows sin(theta_p2) = (v_p2 / v_p1) sin(theta_i), while the transmitted S-wave angle follows sin(theta_s2) = (v_s2 / v_p1) sin(theta_i). Here v_p2 is the longitudinal (P) velocity in the second medium and v_s2 is the shear (S) velocity in the second medium. In most solids, the P-wave speed is greater than the S-wave speed, so v_p2 > v_s2. Because both angles start from the same incident angle, a larger multiplier for the P-wave and a smaller multiplier for the S-wave result in theta_s2 being smaller than theta_p2. Therefore, the refracted angle of the transverse wave is less than the refracted angle of the longitudinal wave, with the caveat that if the S-wave cannot propagate (sin(theta_s2) would exceed 1), it becomes evanescent.

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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:

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

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