



Free Questions for SPI

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Question 1

Question Type: MultipleChoice

Decreasing which parameter will improve axial resolution?

Options:

- A- Frequency
- B- Bandwidth
- C- Pulse length
- D- Focal depth

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Answer:

C

Explanation:

Comprehensive and Detailed Explanation From Exact Extract:

Axial resolution is primarily determined by the spatial pulse length (SPL), which depends on both wavelength and the number of cycles per pulse. A shorter pulse length provides better axial resolution. The Principles and Instrumentation documents state:

'Axial resolution = $SPL/2$. To improve axial resolution, the pulse duration must be shortened --- achieved by decreasing the pulse length.'

Note: While increasing frequency also improves axial resolution (because it shortens wavelength), in this question, decreasing pulse length directly targets SPL, making it the most precise answer.

Therefore, the correct answer is C: Pulse length.

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Question 2

Question Type: MultipleChoice

Penetration can be improved by decreasing which setting?

Options:

- A- Output power
- B- Frequency
- C- Gain
- D- Sector width

Answer:

B

Explanation:

In ultrasound imaging, penetration refers to the ability of the ultrasound beam to travel deeper into the tissue. Lower frequency transducers produce sound waves with longer wavelengths, which are less attenuated by the tissues and therefore can penetrate deeper into the body. Conversely, higher frequency transducers produce sound waves with shorter wavelengths that provide better resolution but are more quickly attenuated, resulting in less penetration. Therefore, decreasing the frequency of the transducer improves penetration, allowing for better visualization of deeper structures.

American Registry for Diagnostic Medical Sonography (ARDMS). Sonography Principles and Instrumentation (SPI) Examination Review Guide.

Question 3

Question Type: MultipleChoice

What affects lateral resolution?

Options:

- A- Frame rate
- B- Focal zone
- C- Duty factor
- D- Spatial pulse length

Answer:

B

Explanation:

Comprehensive and Detailed Explanation From Exact Extract:

Lateral resolution depends on beam width, which is narrowest at the focal zone. Therefore, positioning the focal zone at the area of interest improves lateral resolution.

According to sonography instrumentation reference:

"Lateral resolution is primarily determined by beam width, which is narrowest at the focus. Optimal lateral resolution occurs at the focal zone."

Therefore, the correct answer is B: Focal zone.

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Question 4

Question Type: MultipleChoice

Which is a method to reduce noise?

Options:

- A- Increase frequency
- B- Decrease beam width
- C- Decrease depth
- D- Increase persistence

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Answer:

D

Explanation:

Persistence is a form of temporal averaging where consecutive frames are averaged to reduce random noise, resulting in a smoother image. Increasing persistence effectively reduces noise by averaging out transient noise artifacts while preserving the true signal. This improves image quality, although it may also reduce the temporal resolution, making it less suitable for rapidly moving structures.

Hedrick WR, Hykes DL, Starchman DE. Ultrasound Physics and Instrumentation. 4th ed. Philadelphia, PA: Elsevier Saunders; 2005.

Question 5

Question Type: MultipleChoice

What is the effect of increasing the sample volume on the spectral Doppler signal tracing?

Options:

- A- Decreased sweep speed
- B- Increased noise
- C- Increased velocity sensitivity
- D- Decreased aliasing

Answer:

B

Explanation:

Comprehensive and Detailed Explanation From Exact Extract:

A larger sample volume collects Doppler signals from a wider region, which can include multiple velocities and noise. This leads to a broader spectrum (spectral broadening) and may introduce additional noise into the signal.

According to sonography instrumentation reference:

"Increasing the sample volume size increases the likelihood of including multiple velocity components and noise, resulting in spectral broadening and reduced spectral clarity."

Therefore, the correct answer is B: Increased noise.

Question 6

Question Type: MultipleChoice

What is the result of increased transducer damping?

Options:

- A- Longer pulse length
- B- Increased sensitivity
- C- Narrow beam width
- D- Improved axial resolution

Answer:

D

Explanation:

Comprehensive and Detailed Explanation From Exact Extract:

Damping material is applied to the back of the piezoelectric crystal to absorb energy and shorten the pulse duration. Shorter pulse durations reduce spatial pulse length, which directly improves axial resolution by enabling better separation of structures along the beam path.

According to sonography instrumentation reference:

"Greater transducer damping results in shorter pulse duration and improved axial resolution but reduces sensitivity."

Therefore, the correct answer is D: Improved axial resolution.



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