Free Questions for SPI by dumpshq

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Question 1

Question Type: MultipleChoice

What is the primary factor that improves lateral resolution?

Options:

A- Propagation speed

B- Beamwidth

C- Frequency

D- Frame rate

Answer:

B

Explanation:

Lateral resolution refers to the ability of the ultrasound system to distinguish two structures that are side by side, perpendicular to the direction of the sound beam. This resolution is primarily improved by reducing the beamwidth. A narrower beamwidth allows for better differentiation between adjacent structures, enhancing the lateral resolution. Higher frequency transducers can also help achieve a narrower beamwidth, but beamwidth is the primary factor.

ARDMS Sonography Principles & Instrumentation Guidelines

Hagen-Ansert SL. Textbook of Diagnostic Ultrasonography. 8th ed. St. Louis, MO: Mosby; 2017.

Question 2

Question Type: MultipleChoice

Which component of a contrast agent causes a marked mismatch in impedance between the agent and blood?

Options:

A- Viscous liquid

B- Serous liquid

C- Solid

D- Gas

Answer:

D

Explanation:

Contrast agents used in ultrasound imaging typically consist of microbubbles filled with gas. The significant mismatch in acoustic impedance between the gas in the microbubbles and the surrounding blood creates strong reflectors of the ultrasound waves, enhancing the echogenicity of blood and improving the visibility of blood flow and tissue perfusion. The high contrast provided by the gas-filled microbubbles makes them particularly effective as ultrasound contrast agents.

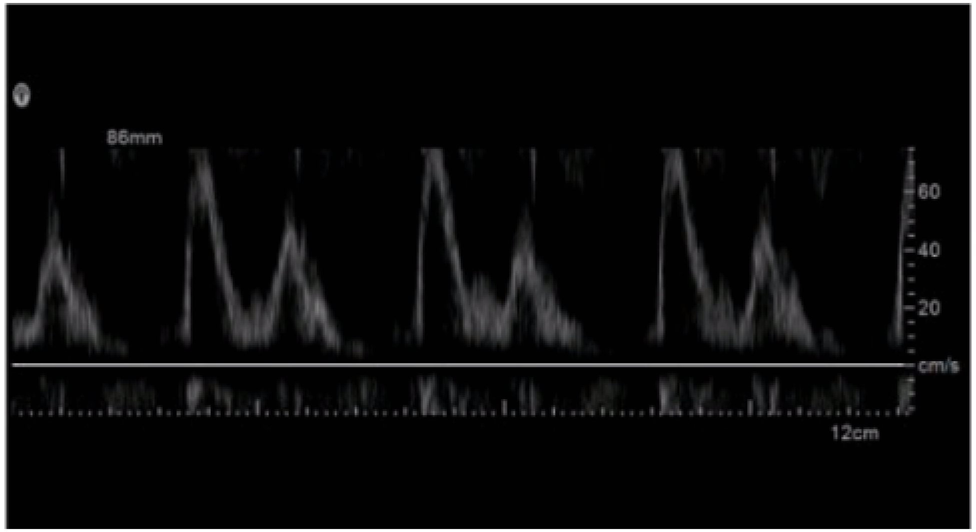
ARDMS Sonography Principles & Instrumentation Guidelines

Kremkau FW. Sonography Principles and Instruments. 9th ed. Philadelphia, PA: Elsevier; 2016.

Question 3

Question Type: MultipleChoice

Which adjustment is needed to optimize the waveform below?



Options:

A- Lower baseline

B- Decrease gain

C- Increase wall filter

D- Increase pulse repetition frequency

Answer:

A

Explanation:

The waveform in the image shows spectral Doppler signals that are pushed against the upper limit of the display, indicating that the baseline is too high. Lowering the baseline allows for a better visual representation of the entire Doppler signal within the available display range. This adjustment prevents the waveform from being cut off and helps in accurately interpreting the blood flow characteristics.

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Kremkau FW. Sonography Principles and Instruments. 9th ed. Philadelphia, PA: Elsevier; 2016.

Question 4

Question Type: MultipleChoice

Which resolution can be evaluated in the area indicated by the red oval in this image of a tissue-equivalent phantom?

Options:

A- Elevational

B- Contrast

C- Lateral

D- Axial

Answer:

D

Explanation:

The tissue-equivalent phantom image with the red oval indicates an area where axial resolution can be evaluated. Axial resolution refers to the ability to distinguish between two structures that are close together along the axis of the ultrasound beam. It is determined by the spatial pulse length (SPL) of the ultrasound wave. In phantoms, this is typically tested by observing the ability to separate closely spaced targets along the beam's path.

ARDMS Sonography Principles & Instrumentation Guidelines

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

Question 5

Question Type: MultipleChoice

Which action would increase the frame rate?

Options:

A- Increasing the sector width

B- Increasing the number of lines per frame

C- Decreasing the logarithmic compression

D- Decreasing the number of focal zones

Answer:

D

Explanation:

The frame rate in ultrasound imaging is influenced by several factors, including the number of focal zones. Each focal zone requires additional transmission and reception cycles, thus decreasing the frame rate. By decreasing the number of focal zones, the system requires fewer cycles per frame, which increases the frame rate. This enhances the temporal resolution, making it easier to capture fast-moving structures in real-time imaging.

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Hagen-Ansert SL. Textbook of Diagnostic Ultrasonography. 8th ed. St. Louis, MO: Mosby; 2017.

Question 6

Question Type: **MultipleChoice**

What information does the ultrasound system calculate to display color flow?

Options:

A- Peak Doppler frequency

B- Mean Doppler frequency

C- Peak velocity of flow

D- Minimum velocity of flow

Answer:

B

Explanation:

Color flow Doppler imaging displays the mean Doppler frequency shift, which represents the average velocity of blood flow within a sample volume. The ultrasound system uses autocorrelation to process Doppler signals and compute the mean frequency shift. This provides a color-coded map of blood flow velocities, allowing for visualization of flow direction and speed. The mean Doppler frequency is displayed as different colors, with each color representing a range of velocities.

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Kremkau FW. Sonography Principles and Instruments. 9th ed. Philadelphia, PA: Elsevier; 2016.

Question 7

Question Type: MultipleChoice

Which control should a sonographer use to change contrast resolution?

Options:

A- Reject

B- Output power

C- Gain

D- Dynamic range

Answer:

D

Explanation:

Reject: This control eliminates low-level noise and weak signals, affecting image quality but not primarily used for contrast resolution.

Output Power: This adjusts the intensity of the transmitted ultrasound waves but does not directly change contrast resolution.

Gain: This control amplifies all signals equally, affecting brightness but not specifically the contrast resolution.

Dynamic Range: Adjusting the dynamic range changes the range of grayscale that the ultrasound system displays, which directly affects the contrast resolution by altering how many shades of gray are visible between the black and white extremes.

'Understanding Ultrasound Physics' by Sidney K. Edelman

ARDMS Sonography Principles and Instrumentation study materials

Question 8

Question Type: MultipleChoice

Which factor causes posterior acoustic enhancement?

Options:

A- High-frequency transducer

B- Low-frequency transducer

C- Strongly attenuating structure

D- Weakly attenuating structure

Answer:

D

Explanation:

High-Frequency Transducer: These provide better resolution but do not directly cause posterior enhancement.

Low-Frequency Transducer: These provide better penetration but are not the cause of posterior enhancement.

Strongly Attenuating Structure: This would cause acoustic shadowing rather than enhancement.

Weakly Attenuating Structure: Structures that attenuate the ultrasound beam less than the surrounding tissues allow more sound waves to pass through, resulting in increased brightness or 'enhancement' behind the structure.

'Ultrasound Physics and Instrumentation' by Frank Miele

ARDMS Sonography Principles and Instrumentation study materials

Question 9

Question Type: MultipleChoice

Which machine setting could cause aliasing to occur?

Options:

A- Doppler scale too high

B- Doppler scale too low

C- Doppler gain too high

D- Doppler gain too low

Answer:

B

Explanation:

Doppler Scale Too High: This would prevent aliasing but could result in loss of low-velocity signals.

Doppler Scale Too Low: When the scale is set too low, velocities exceed the Nyquist limit, resulting in aliasing where the Doppler signal wraps around the baseline.

Doppler Gain Too High: High gain may result in noise and overamplified signals but does not directly cause aliasing.

Doppler Gain Too Low: Low gain results in weak signal detection but does not cause aliasing.

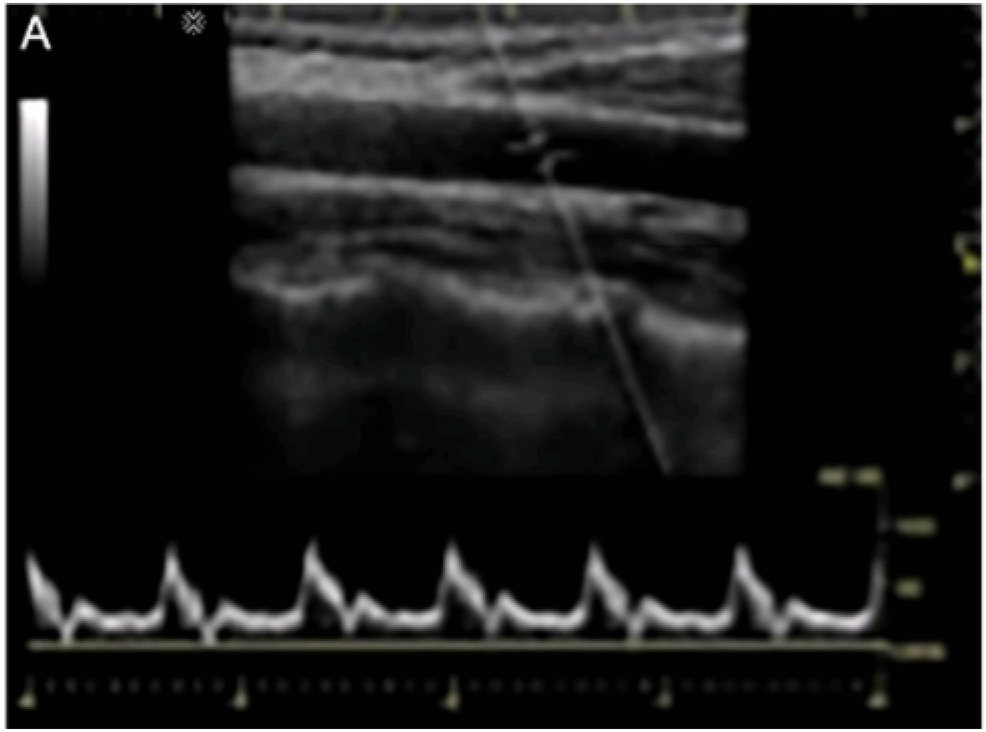
'Diagnostic Ultrasound: Principles and Instruments' by Frederick W. Kremkau

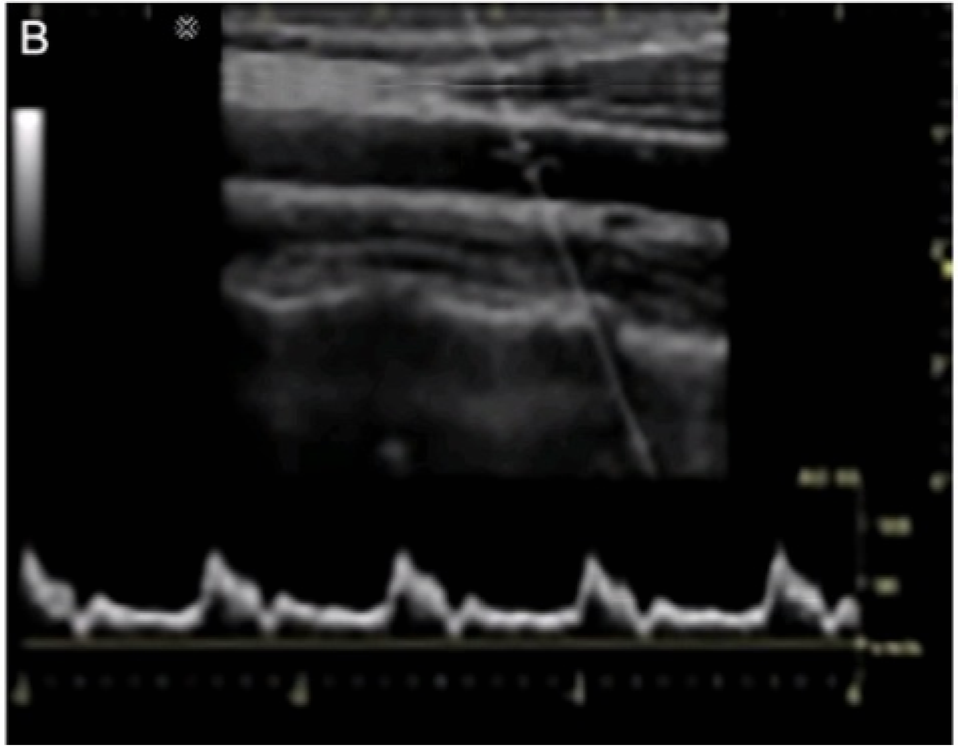
ARDMS Sonography Principles and Instrumentation study materials

Question 10

Question Type: **MultipleChoice**

Which change was made after acquiring image A to produce image B?


A



Options:

A- Increased sweep speed

B- Decreased pulse repetition frequency

C- Decreased wall filter

D- Increased spectral gain

Answer:

B

Explanation:

Increased Sweep Speed: This affects the display of the waveform over time but does not impact the appearance of the spectral Doppler signal in the way shown.

Decreased Pulse Repetition Frequency (PRF): Lowering the PRF can lead to aliasing, which is evident as the waveform wrapping around in the spectral display from image A to image B. This makes the velocity appear higher than it actually is.

Decreased Wall Filter: This adjustment primarily affects the elimination of low-frequency Doppler signals but does not typically cause the kind of changes seen in the images.

Increased Spectral Gain: Increasing the gain would result in a brighter spectral display but not the wrapping of the signal as seen.

'Understanding Ultrasound Physics' by Sidney K. Edelman

ARDMS Sonography Principles and Instrumentation study materials

Question 11

Question Type: **MultipleChoice**

What are two types of cavitation in tissue?

Options:

A- Heat and transient

B- Thermal and mechanical

C- Stable and transient

D- Thermal and stable

Answer:

C

Explanation:

Heat and Transient: Heat and transient are not classifications of cavitation.

Thermal and Mechanical: These terms refer to different bioeffects of ultrasound but are not types of cavitation.

Stable and Transient: These are the two types of cavitation observed in tissues during ultrasound. Stable cavitation involves the oscillation of gas bubbles without collapse, while transient cavitation involves the violent collapse of gas bubbles, which can generate high temperatures and shock waves.

Thermal and Stable: Thermal effects are a different concept related to tissue heating, not a type of cavitation.

'Diagnostic Ultrasound: Principles and Instruments' by Frederick W. Kremkau

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