



ARDMS SPI Practice Questions

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Question 1

Question Type: MultipleChoice

Which structure can be evaluated using M-mode?

Options:

- A- Heart
- B- Liver
- C- Kidneys
- D- Pancreas

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Answer:

A

Explanation:

Comprehensive and Detailed Explanation From Exact Extract:

M-mode (motion mode) ultrasound records the movement of structures along a single scan line over time. It is particularly valuable in cardiac imaging where precise motion of heart valves and walls is evaluated.

Principles and Instrumentation reference:

'M-mode is primarily used in echocardiography to evaluate the motion of cardiac structures with high temporal resolution.'

Liver, kidneys, and pancreas are evaluated using B-mode, not M-mode.

Therefore, the correct answer is A: Heart.

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Question 2

Question Type: MultipleChoice

What reduces speckle and increases visualization of specular reflectors and attenuated structures?

Options:

- A- Elastography
- B- Extended field of view
- C- Pixel interpolation
- D- Spatial compounding

Answer:

D

Explanation:

Spatial compounding involves acquiring multiple frames from different angles and averaging them. This technique reduces speckle noise, which is a granular interference pattern, and enhances the visualization of specular reflectors (smooth surfaces that reflect sound in a single direction) and attenuated structures (structures that reduce the intensity of the sound beam). By averaging frames from different angles, spatial compounding improves image quality and contrast resolution.

ARDMS Sonography Principles and Instrumentation guidelines

Hedrick, W. R., Hykes, D. L., & Starchman, D. E. (2005). Ultrasound Physics and Instrumentation.

Question 3

Question Type: MultipleChoice

What is the primary determining factor of the fundamental frequency for pulsed wave transducers?

Options:

- A- Element thickness
- B- Crystal diameter
- C- Transducer type
- D- Propagation speed

Answer:

A

Explanation:

The fundamental frequency of a pulsed wave transducer is primarily determined by the thickness of the piezoelectric element. The frequency is inversely proportional to the thickness of the element -- thinner elements produce higher frequencies, while thicker elements produce lower frequencies. This relationship is derived from the formula $f = \frac{v}{2d}$, where f is the frequency, v is the propagation speed of sound in the piezoelectric material, and d is the thickness of the element. Reference: ARDMS Sonography Principles and Instrumentation, Chapter on Transducer Technology.

Question 4

Question Type: MultipleChoice

What is assessed with power Doppler?

Options:

- A- Laminar flow
- B- Presence of flow
- C- Velocity of flow
- D- Viscosity

Answer:

B

Explanation:

Comprehensive and Detailed Explanation From Exact Extract:

Power Doppler detects the strength (amplitude) of returning Doppler signals, which reflects the presence of flow regardless of direction or velocity. It is more sensitive to low-velocity flow and is less angle-dependent than conventional color Doppler.

Principles and Instrumentation state:

'Power Doppler displays the amplitude of Doppler shifts, representing the presence of flow. It does not display direction or velocity.'

Laminar flow (A) and velocity (C) are not specifically measured by power Doppler.

Viscosity (D) cannot be assessed by Doppler ultrasound.

Therefore, the correct answer is B: Presence of flow.

Question 5

Question Type: MultipleChoice

Which setting improves temporal resolution?

Options:

- A- Wide sector size
- B- Increased depth
- C- Multiple focal zones
- D- Low line density

Answer:

D

Explanation:

Comprehensive and Detailed Explanation From Exact Extract:

Temporal resolution reflects how quickly frames are updated (frame rate). Reducing the number of scan lines per frame (low line density) decreases acquisition time, thus increasing frame rate and improving temporal resolution.

According to sonography instrumentation reference:

"Lower line density allows for faster frame rates, improving temporal resolution at the expense of spatial resolution."

Therefore, the correct answer is D: Low line density.

Question 6

Question Type: MultipleChoice

Which setting can be increased to correct for clutter artifact when using pulsed-wave Doppler?

Options:

- A- Sample volume
- B- Doppler gain
- C- Wall filter
- D- Pulse repetition frequency (PRF)

Answer:

C

Explanation:

The wall filter, also known as the high-pass filter, is used in Doppler ultrasound to remove low-frequency signals, which are typically associated with clutter artifacts. Clutter artifacts can be caused by tissue motion or vessel wall movement, and they appear as low-frequency signals that can obscure the desired blood flow signals. By increasing the wall filter setting, these low-frequency signals are filtered out, thus reducing the clutter artifact and providing a clearer depiction of the blood flow.

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

Question 7

Question Type: MultipleChoice

What does damping in a pulsed-wave transducer affect?

Options:

- A- Pulse duration
- B- Pulse repetition frequency

- C- Beam focus
- D- Beam penetration

Answer:

A

Explanation:

Damping in a pulsed-wave transducer primarily affects the pulse duration. Damping refers to the process of reducing the vibration of the transducer crystal after the initial excitation. When damping is applied, it shortens the length of the ultrasound pulse by quickly reducing the vibration. This results in a shorter pulse duration, which is important for improving axial resolution. Damping does not directly affect the pulse repetition frequency, beam focus, or beam penetration, although it can have indirect effects on image quality and resolution.

Reference:

ARDMS Sonography Principles and Instrumentation guidelines

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



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