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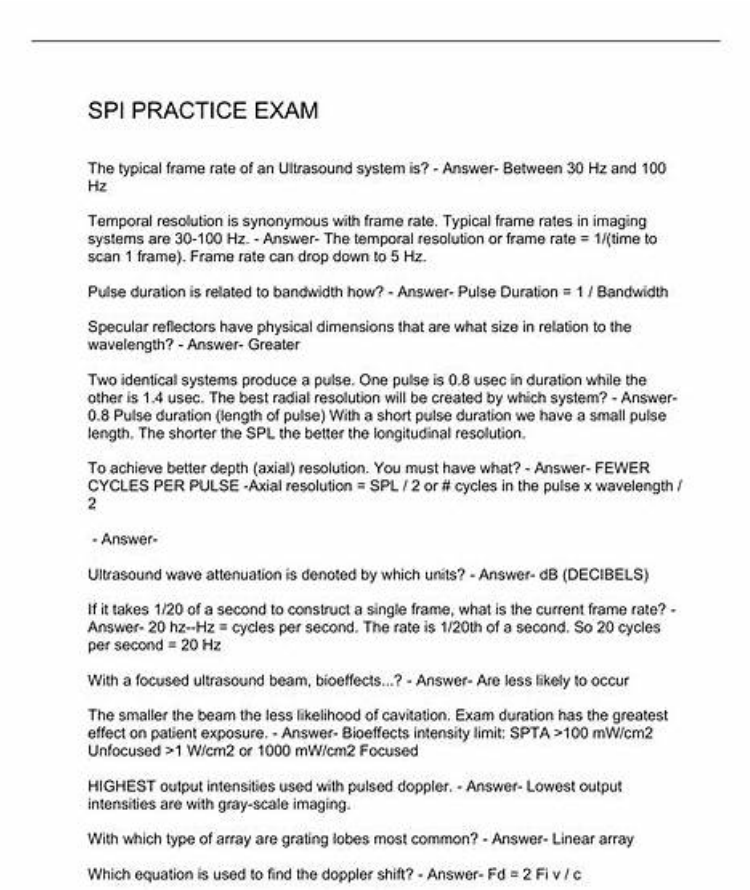

SPI PRACTICE EXAM

The typical frame rate of an Ultrasound system is? - Answer- Between 30 Hz and 100 Hz

Temporal resolution is synonymous with frame rate. Typical frame rates in imaging systems are 30-100 Hz. - Answer- The temporal resolution or frame rate = 1/(time to scan 1 frame). Frame rate can drop down to 5 Hz.

Pulse duration is related to bandwidth how? - Answer- Pulse Duration = 1 / Bandwidth

Specular reflectors have physical dimensions that are what size in relation to the wavelength? - Answer- Greater

Two identical systems produce a pulse. One pulse is 0.8 usec in duration while the other is 1.4 usec. The best radial resolution will be created by which system? - Answer- 0.8 Pulse duration (length of pulse) With a short pulse duration we have a small pulse length. The shorter the SPL the better the longitudinal resolution.

To achieve better depth (axial) resolution. You must have what? - Answer- FEWER CYCLES PER PULSE -Axial resolution = SPL / 2 or # cycles in the pulse x wavelength / 2

- Answer-

Ultrasound wave attenuation is denoted by which units? - Answer- dB (DECIBELS)

If it takes 1/20 of a second to construct a single frame, what is the current frame rate? - Answer- 20 hz--Hz = cycles per second. The rate is 1/20th of a second. So 20 cycles per second = 20 Hz

With a focused ultrasound beam, bioeffects...? - Answer- Are less likely to occur

The smaller the beam the less likelihood of cavitation. Exam duration has the greatest effect on patient exposure. - Answer- Bioeffects intensity limit: SPTA >100 mW/cm2 Unfocused >1 W/cm2 or 1000 mW/cm2 Focused

HIGHEST output intensities used with pulsed doppler. - Answer- Lowest output intensities are with gray-scale imaging.

With which type of array are grating lobes most common? - Answer- Linear array

Which equation is used to find the doppler shift? - Answer- Fd = 2 Fi v / c

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ARDMS SPI Exam Syllabus Topics:

Topic	Details
Topic 1	• Optimize Sonographic Images: This section of the exam measures skills of Diagnostic Medical Sonographers and assesses their ability to enhance image quality using advanced optimization techniques. It includes understanding axial, lateral, elevational, and temporal resolution, as well as manipulating gain, depth, magnification, and dynamic range. Examinees are expected to apply harmonic imaging, spatial compounding, and gray-scale techniques to produce clear, accurate diagnostic images.

Topic 2	• Provide Clinical Safety and Quality Assurance: This section of the exam measures skills of Clinical Ultrasound Supervisors and focuses on maintaining safety and quality standards in ultrasound practice. It includes infection control protocols, transducer and machine integrity checks, and quality assurance testing using tissue-mimicking phantoms. The section also requires familiarity with statistical parameters like sensitivity and specificity to evaluate diagnostic performance and ensure consistent, reliable imaging outcomes.
Topic 3	• Manage Ultrasound Transducers: This section of the exam measures skills of Ultrasound Technicians and focuses on the management and proper use of different types of transducers. It evaluates knowledge of transducer components, frequency selection, and application of various 2D, 3D, 4D, and nonimaging transducer concepts. Candidates must show they can choose the appropriate transducer for specific examinations and make necessary frequency adjustments to ensure image quality.
Topic 4	• Apply Doppler Concepts: This section of the exam measures skills of Vascular Sonographers and evaluates understanding and application of Doppler ultrasound principles. It includes knowledge of Doppler angle, flow dynamics, and color and spectral Doppler imaging. The section also covers eliminating aliasing, interpreting waveforms, applying continuous and pulsed wave Doppler, and optimizing Doppler gain and scale to accurately measure blood flow and velocity within vessels.
Topic 5	• Perform Ultrasound Examinations: This section of the exam measures skills of Sonographers and covers how to conduct ultrasound procedures while ensuring patient safety and diagnostic accuracy. It includes understanding of imaging protocols, ergonomics, patient care, and the interaction between sound and tissue. Candidates are expected to demonstrate abilities to manage patient encounters, apply 3D • 4D and contrast imaging concepts, identify and correct artifacts, and follow confidentiality and privacy standards throughout the scanning process.

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ARDMS Sonography Principles and Instrumentation Sample Questions (Q149-Q154):

NEW QUESTION # 149
What does changing the displayed depth control directly affect?

- A. Pulse duration
- B. Spatial pulse length
- C. Transducer transmit frequency
- D. Pulse repetition frequency

Answer: D

Explanation:
Changing the displayed depth control directly affects the pulse repetition frequency (PRF). When the depth setting is increased, the ultrasound system needs more time to send and receive echoes from deeper structures, resulting in a lower PRF. Conversely, decreasing the depth allows for a higher PRF since the time required for the sound waves to travel to and from the structures is shorter. PRF is crucial for determining the maximum detectable velocity in Doppler ultrasound without aliasing. Reference:
ARDMS Sonography Principles and Instrumentation guidelines
"Understanding Ultrasound Physics" by Sidney K. Edelman

NEW QUESTION # 150
Which component of a transducer lowers the acoustic impedance mismatch between the transducer and the patient?

- A. Piezoelectric Material
- B. Lens
- C. Matching Layer
- D. Backing Material

Answer: C

Explanation:
Comprehensive and Detailed Explanation From Exact Extract:
The matching layer is placed in front of the piezoelectric element and serves to reduce the difference in acoustic impedance between the transducer and human tissue, thereby improving sound transmission and minimizing reflection at the interface.
According to sonography instrumentation reference:
"The matching layer minimizes impedance mismatch between the transducer and soft tissue, allowing more efficient transmission of ultrasound energy into the patient." Therefore, the correct answer is D: Matching Layer.
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NEW QUESTION # 151
Which resolution is degraded when utilizing multiple transmit focal zones?

- A. Axial
- B. Elevational
- C. Lateral
- D. Temporal

Answer: D

Explanation:
When utilizing multiple transmit focal zones, the ultrasound system must perform multiple transmissions at each focal depth. This process requires more time for data acquisition, which in turn decreases the frame rate.
A lower frame rate directly impacts temporal resolution, which is the ability to accurately depict moving structures over time. Thus, using multiple focal zones improves lateral resolution but degrades temporal resolution.
References:
American Registry for Diagnostic Medical Sonography (ARDMS) Sonography Principles and Instrumentation guidelines.

NEW QUESTION # 152
Which component of a contrast agent causes a marked mismatch in impedance between the agent and blood?

- A. Serous liquid
- B. Solid
- C. Gas
- D. Viscous liquid

Answer: C

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.
Reference:
ARDMS Sonography Principles & Instrumentation Guidelines
Kremkau FW. Sonography Principles and Instruments. 9th ed. Philadelphia, PA: Elsevier; 2016.

NEW QUESTION # 153
Which resolution can be evaluated in the area indicated by the red oval in this image of a tissue-equivalent phantom?

- A. Axial
- B. Elevational
- C. Lateral
- D. Contrast

Answer: A

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.
Reference:
ARDMS Sonography Principles & Instrumentation Guidelines
Hedrick WR, Hykes DL, Starchman DE. Ultrasound Physics and Instrumentation. 4th ed. Philadelphia, PA: Elsevier Saunders; 2005.

NEW QUESTION # 154
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