

# SPI PDF study guide & ARDMS SPI test-king

## ARDMS SPI Study Guide

**Continuous wave Doppler has a duty factor of**  
100%

CW Doppler is always transmitting sound making its duty factor 100%

**The spatial pulse length is defined as:**  
the product of the wavelength and the number of cycles in a pulse?

$SPL = \text{wavelength} \times \text{cycles}$

**What term and philosophy relates the amount of exposure time for the sonographer and patient during a diagnostic ultrasound examination?**  
ALARA - As Low As Reasonably Achievable

**What term is defined as the body's pathologic response to illness, trauma or severe physiologic or emotional stress?**  
Shock

**The inertia of the medium describes its:**  
Density.

Inertia is described by Newton's principle - an object at rest will stay at rest. An object in motion stays in motion, unless acted on by an outside force.

**Greatest attenuation would occur at:**  
long distance with high frequency

**A 3MHz sound beam travels through two media. It attenuates 5 dB in medium A and 6 dB in medium B.**  
Total attenuation is 11 dB

Attenuation simply adds up as sound travels.

**What would you do to create a wave with the highest possible intensity?**  
Highest intensity would occur with a short distance and low frequency.

**Lowest Attenuation is found at**  
lowest frequency, with the shortest path length.

**What results in the most attenuation?**  
most attenuation occurs at the high frequency and long distance.

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## ARDMS SPI Exam Syllabus Topics:

Topic	Details
Topic 1	<ul style="list-style-type: none"> <li>• <b>Provide Clinical Safety and Quality Assurance:</b> 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.</li> </ul>

Topic 2	<ul style="list-style-type: none"> <li>• <b>Optimize Sonographic Images:</b> 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.</li> </ul>
Topic 3	<ul style="list-style-type: none"> <li>• <b>Perform Ultrasound Examinations:</b> 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</li> <li>• 4D and contrast imaging concepts, identify and correct artifacts, and follow confidentiality and privacy standards throughout the scanning process.</li> </ul>
Topic 4	<ul style="list-style-type: none"> <li>• <b>Apply Doppler Concepts:</b> 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.</li> </ul>
Topic 5	<ul style="list-style-type: none"> <li>• <b>Manage Ultrasound Transducers:</b> 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.</li> </ul>

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### ARDMS Sonography Principles and Instrumentation Sample Questions (Q136-Q141):

#### NEW QUESTION # 136

During a color Doppler scan, which angle to flow would most likely result in no color being visualized?

- A. 175 degrees
- B. 88 degrees
- C. 3 degrees
- D. 45 degrees

**Answer: B**

Explanation:

Color Doppler imaging is most effective when the angle between the ultrasound beam and the flow of blood is small.

At an angle of 88 degrees, the flow of blood is nearly perpendicular to the ultrasound beam.

When the angle is close to 90 degrees, the Doppler shift (frequency change) approaches zero, resulting in little to no color being visualized on the Doppler image.

Thus, to obtain a color signal, the angle should be optimized to be as close to 0 degrees as possible, with 60 degrees being the practical limit for accurate Doppler measurements. Reference:

ARDMS Sonography Principles and Instrumentation guidelines on Doppler angle and its effect on Doppler imaging.

### NEW QUESTION # 137

What determines the resonant frequency of a pulsed wave transducer?

- A. Element thickness and pulse repetition frequency
- **B. Element thickness and speed of sound in element**
- C. Element diameter and element thickness
- D. Element diameter and speed of sound in element

**Answer: B**

Explanation:

The resonant frequency of a pulsed wave transducer is determined by the thickness of the piezoelectric element and the speed of sound within that element. The resonant frequency is inversely proportional to the element thickness and directly proportional to the speed of sound in the material. Thinner elements and higher sound speeds result in higher resonant frequencies, while thicker elements and lower sound speeds result in lower resonant frequencies.

Reference:

ARDMS Sonography Principles and Instrumentation guidelines

Krenkau, F. W. (2015). Diagnostic Ultrasound: Principles and Instruments. Elsevier.

### NEW QUESTION # 138

Which factor affects lateral resolution in ultrasound?

- **A. Beam width**
- B. Propagation speed
- C. Wavelength
- D. Depth of penetration

**Answer: A**

Explanation:

Comprehensive and Detailed Explanation From Exact Extract:

Lateral resolution is the system's ability to distinguish two structures side-by-side. It is directly determined by the beam width - the narrower the beam, the better the lateral resolution.

Principles and Instrumentation:

"Lateral resolution depends on beam width at a given depth. Narrower beams provide better lateral resolution."

\* Depth of penetration influences maximum imaging depth.

\* Propagation speed is largely constant in soft tissue.

\* Wavelength affects axial resolution.

Therefore, the correct answer is A: Beam width.

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### NEW QUESTION # 139

What does compression affect in the ultrasound image?

- A. The number of lines displayed
- **B. The shades of gray displayed**
- C. The temporal resolution
- D. The elevational resolution

**Answer: B**

Explanation:

Comprehensive and Detailed Explanation From Exact Extract:

Compression reduces the dynamic range of the returning echoes, which alters how many shades of gray are displayed. It compresses the range of signal amplitudes to fit into the grayscale display range.

According to sonography instrumentation reference:

"Compression alters the dynamic range, adjusting how many shades of gray are displayed to optimize image contrast." Therefore, the correct answer is B: The shades of gray displayed.

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### NEW QUESTION # 140

Which statement characterizes the primary difference between image A and image B?

- A. Image A demonstrates a shallower field of view.
- B. Image A demonstrates a better axial resolution.
- **C. Image A demonstrates a lower overall gain setting.**
- D. Image A demonstrates a wider scale of contrast.

**Answer: C**

Explanation:

Comprehensive and Detailed Explanation From Exact Extract:

In image A, the structures appear darker with less overall brightness compared to image B. This indicates that the overall gain (receiver amplification) is set lower in image A, resulting in a dimmer image. Gain controls how much the returning echoes are amplified after detection.

According to Principles and Instrumentation:

"Overall gain amplifies all returning echoes equally. A lower gain setting results in a darker image, while higher gain brightens the display." Axial resolution (A) is primarily dependent on frequency and pulse length, not visible here.

Field of view (C) appears similar between both images.

Contrast scale (D) refers to dynamic range, not directly indicated here.

Therefore, the correct answer is B: Image A demonstrates a lower overall gain setting.

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### NEW QUESTION # 141

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