



**Sonography Principles and Instrumentation Examination Content Outline  
(Detailed Outline)**

Clinical Safety, Patient Care, and Quality Assurance 10%	Knowledge and/or Skills of Safety Issues in a Medical Environment
<b>Clinical Safety</b>	
Apply generally accepted infection control precautions and disinfectant techniques	Apply generally-accepted, infection control precautions and disinfectant techniques Knowledge of sterile technique
Apply ergonomic techniques throughout the workday	Modify output power following ALARA principles
Modify output power following ALARA principle	Knowledge of bioeffects and ALARA
Identify potential bioeffects	Identify potential bioeffects
<b>Patient Care</b>	Modify the exam based on the displayed mechanical index
Demonstrate appropriate patient care and communication skills	Modify the exam based on the displayed thermal index
Analyze clinical history and prior imaging studies	Knowledge of mechanical index and thermal index
<b>Quality Assurance</b>	Apply ergonomic techniques throughout the workday
Apply concepts for conducting performance tests with Doppler flow phantoms and tissue-mimicking phantoms	Ability to perform appropriate patient care
Apply concepts for evaluation of statistical parameters	Ability to communicate with the patient and physician
<b>New Technologies</b>	Knowledge of when and how to communicate through a patient representative
Identify tissue Doppler	Ability to acquire information from other imaging findings (e.g., computed tomography, magnetic resonance imaging, x-ray, etc.)
Evaluate applicable uses of ultrasound contrast agents	Knowledge of parameters for measuring image accuracy
Apply concepts related to elastography imaging	Knowledge of gold standards (e.g., sensitivity and specificity standards)
Identify ultrasound hybrid imaging, i.e., fusion imaging	Knowledge of parameters for transducer element integrity tests
	Knowledge of damage that contributes to degradation of image
	Knowledge of Doppler flow phantoms and tissue-mimicking phantoms
	Apply concepts related to elastography imaging
	Knowledge of tissue Doppler
	Knowledge of ultrasound hybrid imaging
	Evaluate applicable uses of ultrasound contrast agents
Physical Principles 15%	Knowledge and/or Skills of Physical Principles
<b>Physical Principles</b>	
Modify the exam based on gray-scale artifacts	Ability to distinguish gray-scale artifacts and reflectors
Differentiate the various interactions of sound and matter	Knowledge of the interaction between sound and matter (e.g., attenuation, reflection, refraction)
Modify technique based on knowledge of reflectors	Ability to integrate concepts related to all types of resolution
Integrate concepts related to optimization of axial resolution	Knowledge of axial resolution
Integrate concepts related to optimization of lateral resolution	Knowledge of lateral resolution
Integrate concepts related to optimization of temporal resolution	Knowledge of temporal resolution
Integrate concepts related to optimization of elevational resolution	Knowledge of elevational resolution
Apply concepts related to duty factor	Knowledge of duty factor
	Knowledge of frame rate

Ultrasound Transducers 16%	Knowledge and/or Skills of Ultrasound Transducers
<b>Transducers</b>	
Select a specific transducer type based on the area being scanned	Ability to select the appropriate transducer frequency for a given situation
Evaluate and adjust transducer frequency based on the area being scanned	Knowledge of transducers, use and limitation
Evaluate transducer integrity	Ability to evaluate transducer integrity
Apply concepts related to the use of curvilinear array transducers	Knowledge of damage that contributes to degradation of image
Apply concepts related to the use of linear array transducers	Knowledge of curvilinear transducers
Apply concepts related to the use of sector transducers (phased array)	Knowledge of linear transducers
Apply concepts related to the use of endocavity transducers	Knowledge of sector transducers (phased array)
Apply concepts related to the use of two-dimensional array transducers	Knowledge of endocavity transducers
Distinguish components of the transducer	Knowledge of two-dimensional array transducers
Apply concepts related to the use of nonimaging transducers	Knowledge of transducer components
Apply concepts related to the use of 1.5-dimensional array transducers	Knowledge of nonimaging transducers
	Knowledge of 1.5-dimensional array transducers
Imaging Principles and Instrumentation 28%	Knowledge and/or Skills of Imaging Principles and Instrumentation
<b>Instrumentation</b>	
Demonstrate ability to perform accurate measurements	Knowledge of instrumentation and controls
Apply concepts related to imaging depth	Knowledge of two-dimensional measurements
Apply concepts related to overall gain	Ability to recognize and measure anatomic structures
Apply concepts related to focusing	Knowledge of imaging depth
Apply concepts related to gray scale	Knowledge of overall gain
Apply concepts related to time gain compensation	Knowledge of focusing
Apply concepts related to zoom	Knowledge of two-dimensional real-time, gray-scale imaging (B-mode)
Apply concepts related to M-mode	Knowledge of time gain compensation
Apply concepts related to harmonic imaging	Knowledge of zoom
Apply concepts related to dynamic range, e.g. compression	Knowledge of M-mode imaging
Apply concepts related to edge enhancement	Knowledge of harmonic imaging
Apply concepts related to persistence	Knowledge of dynamic range
Apply concepts related to frequency compounding	Knowledge of edge enhancement
Apply concepts related to extended field of view, e.g., panoramic imaging	Knowledge of persistence
Apply concepts related to spatial compounding	Knowledge of frequency compounding
Apply concepts related to coded excitation	Knowledge of extended field of view
Apply concepts related to the use of three-dimensional/four-dimensional imaging	Knowledge of compound imaging
	Knowledge of coded excitation
Apply concepts related to imaging systems and storage	Knowledge of three-dimensional/four-dimensional imaging
	Knowledge of storage systems and devices
	Knowledge of appropriate documentation of findings
Doppler Imaging Concepts 31%	Knowledge and/or Skills of Doppler Imaging Concepts
<b>Hemodynamics</b>	
Obtain measurements of blood flow velocities	Knowledge of proper measurement of blood flow velocities
Apply concepts related to pulse repetition frequency	Knowledge of pulsed wave Doppler
Apply concepts related to wall filter	Application of proper Doppler scale adjustment (spectral and color)
Apply concepts related to pulsed wave Doppler	Knowledge of pulse repetition frequency (spectral and color)
Evaluate spectral Doppler waveforms	Knowledge of spectral Doppler gain
Apply concepts related to continuous wave Doppler	Knowledge of spectral Doppler waveforms
Apply concepts related to spectral Doppler angle to flow	Knowledge of wall filter applications (spectral and color)
Apply concepts related to Doppler scale	Knowledge of continuous wave Doppler
Apply concepts related to spectral Doppler gain	Knowledge of Doppler controls and instrumentation (spectral and color)
Modify the exam based on spectral Doppler artifacts	Knowledge of spectral Doppler angle to flow
Adjust sample size (volume)	Knowledge of Doppler artifacts (spectral and color)
Apply concepts related to color gain	Knowledge of Doppler reject (spectral and color)
Apply concepts related to color angle to flow	Application of proper sample size (volume) adjustment (spectral and color)
Apply concepts related to color scale	Knowledge of color flow imaging
Modify the exam based on color artifacts	Knowledge of concepts related to color packet size
Apply concepts related to color maps	Knowledge of power Doppler imaging
Apply concepts related to color packet size	
Apply concepts related to power Doppler imaging	