



Mathematics	
	Prefixes, unit conversion, simple equations, measurements (length, width, height, area, volume), scientific notation
	Statistics
Physics of sound and diagnostic ultrasound	
	Acoustic impedance
	Acoustic interfaces
	Acoustic variables
	Amplitude, power, and intensity
	Attenuation and the attenuation coefficient
	Basic principles of sound (frequency, period, wavelength, propagation speed)
	Decibels
	Differentiation of pulsed ultrasound from continuous wave
	Pulsed ultrasound principles (pulse repetition period, pulse repetition frequency, pulse duration, duty factor, spatial pulse length)
	Range equation
	Refraction
	Scattering
	Spatial intensities
	Specular reflection
	Temporal intensities
	Total internal reflection
	Ultrasound terminology
	Wave interference
Ultrasound transducers	
	Crystal stimulation (spike voltage vs. burst voltage)
	Curie temperature
	Frequency bandwidth
	Frequency definitions (resonant vs. operating)
	Piezoelectric crystals
	Piezoelectric effect
	Quality factor
	Transducer construction (damping block, matching layer)
	Types of ultrasound transducers (mechanical, array)
Soundbeam characteristics	
	Beam area
	Beam diameter
	Beam focusing
	Beam profile
	Diffraction
	Grating lobes
	Huygen's principle
	Main beam



	Scanning gel
	Side lobes
	Sound field
	Spatial resolution (axial, lateral, slice thickness)
	Stand-off pad
Real-time (timing)	
	Range ambiguity
	Scanning frame rate (lines per frame, frame rate, scan line density)
	Temporal resolution
Instrumentation	
	3-D display
	B-colour
	B-flow
	Cine-loop
	Computer terminology and definitions
	Contrast resolution
	Digital memory
	Digital storage media
	Display formats
	Display modes (A-mode, B-Mode, M-Mode)
	Dynamic range
	Echo Rf signal
	Electronic beamformer (steering, aperture, apodization, etc)
	Extended-field-of-view
	Film processing
	Frame averaging
	Memory resolution
	Output power control
	Pulser circuitry
	Raster display
	Receiver functions (amplification, compensation, compression, demodulation, rejection)
	Recording devices (cameras, video printers, videocassette recorders, picture archiving and communication systems, other digital media)
	Signal processing (analog-to-digital and digital-to-analog conversions, pre processing, postprocessing)
	Zoom (read, write)
Fluid dynamics	
	Bernoulli theorem
	Continuity theory
	Flow equation: $Q=P/R$
	Laminar flow
	Poiseuille's law
	Rouleaux effect



	Starling's law
	Stenosis (non-hemodynamically significant vs. hemodynamically significant)
	Turbulence
Doppler physics	
	Doppler angle
	Doppler effect
	Doppler equation
	Doppler shift frequency
Doppler instrumentation	
	Colour Doppler
	Multigating
	Autocorrelation
	Colour maps
	Colour box
	Colour aliasing
	Colour display (interpretation and optimization)
	Continuous wave Doppler (advantages and disadvantages)
	Doppler signal analysis (audio vs. spectral analysis)
	Doppler transducers
	Duplex ultrasound
	Quadrature phase detection
	Power Doppler
	Pulsed Doppler
	Receiver gating
	Sample volume
	Nyquist limit
	Aliasing
	High PRF Doppler
	Spectral display (optimization, and qualitative and quantitative assessment)
	Spectral display measurements: peak and mean velocity, resistive index, pulsatility index, S/D ratio, acceleration time, acceleration index
	Triplex ultrasound
Contrast and harmonic imaging	
	Contrast harmonics
	Harmonic principles
	Tissue harmonics
	Ultrasound contrast
Image characteristics and artifacts	
	2D ultrasound artifacts (cause, appearance, significance)
	Colour Doppler artifacts
	Miscellaneous artifacts (electronic noise, camera artifacts, processor artifacts)



	Power Doppler artifacts
	Spectral Doppler artifacts
Quality assurance	
	Performance tests (sensitivity, uniformity, dead zone, axial resolution, lateral resolution, slice thickness, range accuracy, horizontal accuracy, lesion detection, beam profile)
	Preventative maintenance
	Quality assurance
	Sophisticated testing devices
	Test objects vs. tissue equivalent phantoms
Bioeffects and safety	
	ALARA principle
	Bioeffects statements
	Bioeffects studies
	Bioeffects: definition, clinical significance
	Mechanisms: thermal, cavitation, mechanical
	Output display standard
	Ultrasound output intensities