



## Fundamentals Learning Modules Curriculum Outline

Domains	Description	Percentage	Resources and References
Principles of Ultrasound Physics	Describe and comprehend the following: <ul style="list-style-type: none"> <li>Principles of Ultrasound Physics</li> <li>Physics of Sound</li> <li>Wave Characteristics</li> <li>Ultrasound machine basics</li> <li>Common Calculations of Sound</li> <li>Pulse Repetition Frequency</li> <li>Pulse Repetition Period</li> <li>Distance</li> </ul>	12.5%	<ul style="list-style-type: none"> <li>Edelman, S.K. (2007). Understanding Ultrasound Physics, 3rd. Ed. ESP, Inc. Woodlands, Texas.</li> </ul>
Echogenicity and Attenuation	Describe and understand the following: <ul style="list-style-type: none"> <li>Echogenicity</li> <li>Homogeneous vs. Heterogeneous</li> <li>Propagation Speed</li> <li>Intensity, Power and Amplitude of Sound</li> <li>Normal Incidence</li> <li>Attenuation of Sound Waves</li> <li>Attenuation Types</li> </ul>	12.5%	<ul style="list-style-type: none"> <li>Hagen-Ansert, S. (2006). Textbook of Diagnostic Ultrasonography, 6th edition. Mosby: Saint Louis.</li> </ul>
Machine Modes	Describe and comprehend the following: <ul style="list-style-type: none"> <li>Ultrasound Modes</li> <li>Color Doppler</li> <li>Color Doppler: Power Doppler</li> <li>Other Doppler Types</li> <li>M-Mode</li> </ul>	12.5%	<ul style="list-style-type: none"> <li>Hagen-Ansert, S. (2006). Textbook of Diagnostic Ultrasonography, 6th edition. Mosby: Saint Louis.</li> </ul>
Instrumentation	Describe and comprehend the following: <ul style="list-style-type: none"> <li>Ultrasound Machine Settings</li> <li>Gain Settings (B-Mode)</li> <li>Gain Settings (Doppler)</li> <li>Depth Settings</li> <li>Time Gain Compensation (TGC)</li> <li>Frame Rate</li> <li>Focal Zones</li> <li>Resolution</li> </ul>	12.5%	<ul style="list-style-type: none"> <li>Curry, R.A. &amp; Tempkin, B.B. (2004). Sonography: Introduction to Normal Structure and Function, 2nd Ed. Saunders: Philadelphia, Pennsylvania.</li> <li>Hagen-Ansert, S. (2006). Textbook of Diagnostic Ultrasonography, 6th edition. Mosby: Saint Louis.</li> <li>Gill, K.A. (2001). Abdominal Ultrasound: A Practitioner's Guide. W.B. Saunders Company: Philadelphia, Pennsylvania.</li> </ul>
Transducers	Describe and comprehend the following: <ul style="list-style-type: none"> <li>Transducer Types</li> <li>Pulse Bandwidth &amp; Varying Frequencies</li> <li>Anatomy of a Transducer</li> <li>Body Habitus and Transducer Choice</li> <li>Hand Positioning</li> <li>Acoustic Windows</li> </ul>	12.5%	<ul style="list-style-type: none"> <li>Hedrick, W. &amp; Wagner, P. (2013). Technology for Diagnostic Sonography: Study Guide and Laboratory Exercises. Elsevier Mosby: St. Louis, Missouri.</li> </ul>



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Image Orientation	Describe and comprehend the following: <ul style="list-style-type: none"> <li>• Body Sections and Scanning</li> <li>• Image Orientations</li> <li>• Transducer Manipulation</li> <li>• Tips for Scanning</li> </ul>	12.5%	<ul style="list-style-type: none"> <li>• Gill, K.A. (2001). <i>Abdominal Ultrasound: A Practitioner's Guide</i>. W.B. Saunders Company: Philadelphia, Pennsylvania.</li> </ul>
Ultrasound Artifacts	Describe and comprehend the following: <ul style="list-style-type: none"> <li>• What Are Artifacts, And Why Are They Important?</li> <li>• Types of Artifacts</li> </ul>	12.5%	<ul style="list-style-type: none"> <li>• Hedrick, W. &amp; Wagner, P. (2013). <i>Technology for Diagnostic Sonography: Study Guide and Laboratory Exercises</i>. Elsevier Mosby: St. Louis, Missouri.</li> <li>• American Institute of Ultrasound in Medicine. (1999). <i>Standard Presentation and Labeling of Ultrasound Images: A Stage 2 Standard</i>.</li> <li>• Curry, R.A. &amp; Tempkin, B.B. (2004). <i>Sonography: Introduction to Normal Structure and Function</i>, 2nd Ed. Saunders: Philadelphia, Pennsylvania.</li> <li>• Erez, Y., Schechner, Y.Y., &amp; Adams, D. (2008). Space variant ultrasound frequency compounding based on noise characteristics. <i>Ultrasound in Med. &amp; Biol.</i>, 34 (6), 981-1000.</li> <li>• Gil, K.A. (2001). <i>Abdominal Ultrasound: A Practitioner's Guide</i>. W.B. Saunders Company: Philadelphia, Pennsylvania.</li> <li>• Hagen-Ansert, S. (2006). <i>Textbook of Diagnostic Ultrasonography</i>, 6th edition. Mosby: Saint Louis.</li> </ul>
Safety and Bioeffects	Describe and comprehend the following: <ul style="list-style-type: none"> <li>• Ultrasound in a Sterile Field</li> <li>• Potential Bioeffects of Ultrasound</li> <li>• Heat as a Potential Risk</li> <li>• Parameters for Energy</li> <li>• Keep It Simple</li> </ul>	12.5%	<ul style="list-style-type: none"> <li>• Craig, M. (2013). <i>Essentials of Sonography and Patient Care</i>, 3rd Ed. Saunders: St. Louis, MO.</li> <li>• Ellis, J. R., &amp; Bentz, P. M. (2007). <i>Modules for basic nursing skills</i> (7th ed.). Philadelphia: Lippincott Williams &amp; Wilkins. pp. 488-491.</li> <li>• Hagen-Ansert, S.L. (2012). <i>Textbook of Diagnostic Medical Sonography</i>, 7th Ed. Elsevier: St. Louis, Missouri.</li> <li>• Perry, A. G., &amp; Potter, P. A. (2006). <i>Clinical nursing skills and techniques</i> (6th ed.). St. Louis, MO: Elsevier Mosby. pp. 1222-1225.</li> <li>• American Institute of Ultrasound in Medicine. (2015). <i>Official Statement on Prudent Use and Clinical Safety</i>.</li> <li>• American Institute of Ultrasound in Medicine. (2015). <i>Official Statement on Mammalian Biological Effects of Heat</i>.</li> <li>• Edelman, S.K. (2007). <i>Understanding Ultrasound Physics</i>, 3rd. Ed. ESP, Inc. Woodlands, Texas.</li> </ul>

## Fundamentals Assessment Content Outline

Domains	Description	Percentage	Resources and References
Instrumentation	<ul style="list-style-type: none"> <li>Describe the appropriate use of gain settings</li> <li>Understand the factors that determine transducer selection</li> <li>Describe the appropriate use of depth settings</li> <li>Describe the conventional image orientations</li> </ul>	37%	<ul style="list-style-type: none"> <li>Hedrick, W. &amp; Wagner, P. (2013). <i>Technology for Diagnostic Sonography: Study Guide and Laboratory Exercises</i>. Elsevier Mosby: St. Louis, Missouri.</li> <li>Gill, K.A. (2001). <i>Abdominal Ultrasound: A Practitioner's Guide</i>. W.B. Saunders Company: Philadelphia, Pennsylvania.</li> </ul>
Basic Principles of Ultrasound	<ul style="list-style-type: none"> <li>Understand the basic principles &amp; terminology of US physics</li> <li>Describe the variables that affect the echogenicity of tissue &amp; structures</li> <li>Describe the variables that affect ultrasonic signal attenuation</li> <li>Describe the variables that affect ultrasonic signal reflection</li> <li>Understand the effect of different media on sound propagation</li> <li>Describe the fundamental differences between Doppler US &amp; B-mode US</li> </ul>	27%	<ul style="list-style-type: none"> <li>Hedrick, W. &amp; Wagner, P. (2013). <i>Technology for Diagnostic Sonography: Study Guide and Laboratory Exercises</i>. Elsevier Mosby: St. Louis, Missouri.</li> <li>Gill, K.A. (2001). <i>Abdominal Ultrasound: A Practitioner's Guide</i>. W.B. Saunders Company: Philadelphia, Pennsylvania.</li> <li>Hagen-Ansert, S. (2006). <i>Textbook of Diagnostic Ultrasonography</i>, 6th edition. Mosby: Saint Louis.</li> </ul>
Ultrasound Artifacts	<ul style="list-style-type: none"> <li>Recognize &amp; understand the cause of common US artifacts</li> </ul>	22%	<ul style="list-style-type: none"> <li>Hedrick, W. &amp; Wagner, P. (2013). <i>Technology for Diagnostic Sonography: Study Guide and Laboratory Exercises</i>. Elsevier Mosby: St. Louis, Missouri.</li> <li>American Institute of Ultrasound in Medicine. (1999). <i>Standard Presentation and Labeling of Ultrasound Images: A Stage 2 Standard</i>.</li> <li>Curry, R.A. &amp; Tempkin, B.B. (2004). <i>Sonography: Introduction to Normal Structure and Function</i>, 2nd Ed. Saunders: Philadelphia, Pennsylvania.</li> <li>Erez, Y., Schechner, Y.Y., &amp; Adams, D. (2008). Space variant ultrasound frequency compounding based on noise characteristics. <i>Ultrasound in Med. &amp; Biol.</i>, 34 (6), 981-1000.</li> <li>Gil, K.A. (2001). <i>Abdominal Ultrasound: A Practitioner's Guide</i>. W.B. Saunders Company: Philadelphia, Pennsylvania.</li> <li>Hagen-Ansert, S. (2006). <i>Textbook of Diagnostic Ultrasonography</i>, 6th edition. Mosby: Saint Louis.</li> </ul>
Safety and Bioeffects	<ul style="list-style-type: none"> <li>Describe precautions used to prevent cross-contamination</li> <li>Describe the potential bioeffects of US</li> </ul>	14%	<ul style="list-style-type: none"> <li>American Institute of Ultrasound in Medicine. (2015). <i>Official Statement on Prudent Use and Clinical Safety</i>.</li> <li>American Institute of Ultrasound in Medicine. (2015). <i>Official Statement on Mammalian Biological Effects of Heat</i>.</li> <li>Edelman, S.K. (2007). <i>Understanding Ultrasound Physics</i>, 3rd. Ed. ESP, Inc. Woodlands, Texas.</li> </ul>