

Ultrasound Physics Vocabulary Quiz

Part 3: Doppler, Artifacts, Quality Assurance & Bioeffects

Chapters 19–22 | Edelman, *Understanding Ultrasound Physics*, 4th Ed.

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Student Name: _____

Date: _____

Instructions: Read each definition or description carefully. Select the **one best answer** (A, B, C, or D) that matches the term described. Write your answer in the space provided after each question.

Chapter 19: Doppler

1. The change in frequency of sound that results from relative motion between the sound source and the receiver. A positive value indicates flow toward the transducer; a negative value indicates flow away.

- A. Doppler Angle
- B. Nyquist Limit
- C. Doppler Shift
- D. Aliasing

Answer: _____

2. The maximum Doppler frequency shift that a pulsed system can accurately measure without aliasing. It equals PRF divided by 2.

- A. Doppler Shift
- B. Aliasing
- C. Wall Filter
- D. Nyquist Limit

Answer: _____

3. An artifact unique to pulsed wave Doppler in which high blood velocities exceed the system's sampling rate and are incorrectly displayed as flowing in the opposite direction, appearing as "wraparound" on the spectral display.

- A. Crosstalk
- B. Nyquist Limit
- C. Spectral Broadening
- D. Aliasing

Answer: _____

4. The small region of interrogation in a pulsed wave Doppler exam. The sonographer positions it on a 2D image at the desired depth, and only Doppler shifts from blood cells within this region are measured.

- A. Doppler Packet
- B. Wall Filter
- C. Spectral Window
- D. Sample Volume

Answer: _____

5. A Doppler technique using a single crystal that alternates between transmitting and receiving. It provides range resolution (depth specificity) but is subject to aliasing at high velocities.

- A. Continuous Wave Doppler
- B. Duplex Imaging
- C. Color Flow Doppler
- D. Pulsed Wave Doppler

Answer: _____

6. A form of two-dimensional Doppler that assigns colors to represent the direction and velocity of blood flow, superimposed on a grayscale anatomic image. It uses pulsed ultrasound and is subject to aliasing.

- A. Power Doppler
- B. Velocity Mode
- C. Color Flow Doppler
- D. Variance Mode

Answer: _____

7. A Doppler display that only identifies the presence of a Doppler shift without evaluating speed or direction. It is nondirectional and more sensitive to low-velocity flow than conventional color Doppler.

- A. Color Flow Doppler
- B. Variance Mode
- C. Velocity Mode
- D. Power Doppler

Answer: _____

8. An electronic filter that eliminates low-frequency Doppler shifts caused by moving tissue (vessel walls, heart muscle) rather than blood flow. On a spectral display, these unwanted signals are called clutter.

- A. Reject
- B. Compression
- C. Wall Filter
- D. Doppler Packet

Answer: _____

9. A quantitative Doppler measurement of downstream vascular resistance calculated as (peak systolic velocity minus end diastolic velocity) divided by peak systolic velocity. Values range from 0 to 1.

- A. Pulsatility Index
- B. Doppler Shift
- C. Reynolds Number
- D. Resistivity Index

Answer: _____

10. An increase in the range of velocities displayed on a Doppler spectrum, resulting in "filling in" of the spectral window. It can be caused by turbulent flow or by technical factors such as a large sample volume.

- A. Spectral Window
- B. Crosstalk
- C. Aliasing
- D. Spectral Broadening

Answer: _____

Chapter 20: Artifacts

11. An artifact appearing as multiple, equally spaced echoes caused by sound bouncing back and forth between two strong, parallel reflectors. Each successive echo is weaker and placed deeper on the image.

- A. Comet Tail
- B. Mirror Image
- C. Reverberation
- D. Multipath

Answer: _____

12. A hypoechoic or anechoic region extending downward from a structure with very high attenuation, preventing the display of true structures located deeper. Gallstones and bones commonly produce this artifact.

- A. Enhancement
- B. Edge Shadow
- C. Shadowing
- D. Reverberation

Answer: _____

13. A hyperechoic (brighter than expected) region appearing beneath structures with abnormally low attenuation, such as fluid-filled cysts. The correct number of reflectors is displayed, but some appear overly bright.

- A. Shadowing
- B. Focal Enhancement
- C. Enhancement
- D. Reverberation

Answer: _____

14. An artifact created when sound reflects off a strong reflector (the "mirror"), then redirects toward a second structure, causing a duplicate copy to appear on the opposite side of the mirror. Common near the diaphragm.

- A. Reverberation
- B. Multipath
- C. Mirror Image Artifact
- D. Crosstalk

Answer: _____

15. An artifact created when sound propagates through a medium at a speed other than the assumed 1,540 m/s. Structures appear at incorrect depths: too shallow if the actual speed is faster, too deep if slower.

- A. Multipath
- B. Reverberation
- C. Range Equation
- D. Speed Error

Answer: _____

16. An extreme form of hypoechoic, meaning entirely without echoes. It appears completely black on the image. Simple fluid (urine, bile) typically has this appearance.

- A. Hypoechoic
- B. Isoechoic
- C. Hyperechoic
- D. Anechoic

Answer: _____

17. A special form of reverberation where closely spaced reverberations merge into a solid, hyperechoic line directed downward from a small, highly reflective structure. Often seen with metallic objects or gas bubbles.

- A. Reverberation
- B. Shadowing
- C. Comet Tail
- D. Edge Shadow

Answer: _____

Chapter 21: Quality Assurance

18. A test device that mimics the acoustic properties of soft tissue (propagation speed of 1,540 m/s, attenuation, scattering, and echogenicity). It contains pin groups, cyst-like structures, and solid masses for evaluating system performance.

- A. AIUM 100 mm Test Object
- B. Hydrophone
- C. Dead Zone
- D. Tissue-Equivalent Phantom

Answer: _____

19. The region closest to the transducer where images are inaccurate and diagnostically unreliable. It is caused by transducer ringing and the time required to switch from transmit to receive mode.

- A. Near Field
- B. Far Field
- C. Dead Zone
- D. Focal Zone

Answer: _____

20. The ability of a system to detect and display weak (low-level) echoes. It is evaluated at minimum, normal, and maximum settings.

- A. Registration Accuracy
- B. Range Accuracy
- C. Uniformity
- D. Sensitivity

Answer: _____

21. The ability of the system to place reflections in their proper positions while imaging from different orientations. Tested by scanning a phantom from multiple angles and verifying that pin positions remain consistent.

- A. Range Accuracy
- B. Sensitivity
- C. Registration Accuracy
- D. Uniformity

Answer: _____

Chapter 22: Bioeffects & Safety

22. "As Low As Reasonably Achievable." The guiding safety policy that ultrasound exposure should be kept to the minimum level necessary to obtain diagnostic information.

- A. Output Display Standard
- B. Thermal Index
- C. Mechanical Index
- D. ALARA Principle

Answer: _____

23. A calculated, unitless number displayed on the ultrasound screen that indicates the likelihood of harmful bioeffects from cavitation. It is the best indicator of mechanical bioeffects and increases with higher peak negative pressure and lower frequency.

- A. Thermal Index
- B. ALARA Principle
- C. Pulsatility Index
- D. Mechanical Index

Answer: _____

24. A calculated, unitless number displayed on the ultrasound screen that estimates the potential for tissue temperature rise. Three subtypes exist: TIS (soft tissue), TIB (bone at focus), and TIC (cranial bone).

- A. Mechanical Index
- B. ALARA Principle
- C. Output Power
- D. Thermal Index

Answer: _____

25. A mechanical bioeffect involving the interaction of ultrasound with microscopic gas bubbles in tissue. It has two forms: stable (bubbles oscillate) and transient (bubbles violently collapse).

- A. Thermal Bioeffect
- B. Bioeffects
- C. Cavitation
- D. Mechanical Index

Answer: _____

Score:

/ 25 **Percentage:**

%

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