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50 Ultrasound Physics Practice Questions

- 1. What is the average velocity of ultrasound in soft tissue at 5.0 MHz ?**
(A) 1540 meters per millisecond
(B) 2200 miles per hour
(C) 1087 meters per second
(D) 1540 meters per second

- 2. Red blood cells are an example of a**
(A) rayleigh reflector
(B) non-specular reflector
(C) strong reflector
(D) mirror reflector

- 3. Which has a higher acoustic impedance coefficient ?**
(A) solid
(B) liquid
(C) gas
(D) all the above

- 4. A hyperechoic region is**
(A) low amplitude
(B) anechoic
(C) echo free
(D) echogenic

- 5. The angle of refraction is described by**
(A) Snell's law
(B) Curie's principle
(C) Huygen's principle
(D) speed differences

- 6. What is reflection in multiple directions from a reflector that is small relative to the wavelength**
(A) multipath artifact
(B) Snell's scattering
(C) Hguyens principle
(D) Rayleigh scattering

7. Receiver demodulation can not be controlled by the sonographer

- (A) True
- (B) False

8. Reflection at a tissue interface depends primarily on

- (A) impedance
- (B) bandwidth
- (C) beam profile
- (D) velocity differences

9. Azimuthal resolution is also known as

- (A) lateral resolution
- (B) range resolution
- (C) axial resolution
- (D) none of the above

10. What is the Doppler shift frequency in soft tissue if the transmitted frequency is 3 MHz and the velocity of a reflector is 20 cm/s ?

- (A) 195 Hz
- (B) 390 Hz
- (C) 780 Hz
- (D) 3.07 MHz
- (E) 3.14 MHz

11. Intensity of the ultrasound beam is proportional to the square root of the acoustic pressure

- (A) True
- (B) False

12. Aliasing is not a problem with color flow imaging.

- (A) True
- (B) False

13. Density is an acoustic variable

- (A) True
- (B) False

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- 14. If the PRF increases, duty factor _____**
- (A) Increases**
 - (B) decreases**
 - (C) remains the same**
 - (D) is unrelated**
- 15. A-Mode is mainly used to measure distance**
- (A) True**
 - (B) False**
- 16. Period is**
- (A) the amplitude of a wave**
 - (B) the speed of a wave**
 - (C) the time it takes to complete a single cycle**
 - (D) the length it takes to complete a single cycle**
- 17. Spatial pulse length is determined by the**
- (A) oscillator**
 - (B) pulser**
 - (C) pulse oscillator**
 - (D) all of the above**
- 18. Transmission angle is less than the incident angle if the propagation speed of**
- (A) medium 2 is less than that of medium 1**
 - (B) medium 1 is higher than that of medium 2**
 - (C) two media are the same**
 - (D) none of the above**
- 19. Diffraction is the**
- (A) spreading out of an ultrasound beam**
 - (B) bending of the sound beam**
 - (C) dissipation of heat**
 - (D) reverse refraction**

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20. Annular array transducers steer the beam

- (A) axially**
- (B) electronically**
- (C) mechanically**
- (D) none of the above**

21. _____ is a Rayleigh scatterer

- (A) lung**
- (B) liver**
- (C) red cell**
- (D) diaphragm**

22. A bit is the smallest part of a digital "word"

- (A) True**
- (B) False**

23. Velocity times density equals

- (A) intensity**
- (B) duty factor**
- (C) quality factor**
- (D) impedance**

24. What is the pulse duration for five cycles of 5 MHz ultrasound ?

- (A) 0.5 microsecond**
- (B) 1.0 microsecond**
- (C) 0.25 microsecond**
- (D) 5.0 microsecond**

25. Aliasing artifacts are unique to

- (A) power doppler**
- (B) pulsed Doppler**
- (C) continuous wave Doppler**
- (D) none of the above**

26. The intensity reflection coefficient depends on acoustic impedance mismatch

- (A) True**
- (B) False**

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27. Velocity of sound in a medium is constant regardless of frequency.

- (A) True**
- (B) False**

28. Density is not an acoustic variable

- (A) True**
- (B) False**

29. If the PRP increases, duty factor _____

- (A) Increases**
- (B) decreases**
- (C) remains the same**
- (D) is unrelated**

30. A high PRF is needed to image deep structures

- (A) True**
- (B) False**

31. Longitudinal waves are

- (A) parallel to the axis of the wave propagation**
- (B) perpendicular to the axis of the wave propagation**
- (C) compressed perpendicular to the axis of the wave propagation**
- (D) none of the above**

32. Wavelength has the greatest effect on

- (A) lateral resolution**
- (B) far zone**
- (C) axial resolution**
- (D) temporal resolution**

33. What is necessary to calculate distance to a reflector ?

- (A) density and pulse length**
- (B) density and round-trip time**
- (C) attenuation coefficient and reflector amplitude**
- (D) propagation speed and round-trip time**

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34. Scattering is

- (A) redirection of the sound beam in many directions**
- (B) bending of the sound beam in any direction**
- (C) heat conversion**
- (D) none of the above**

35. The percentage of ultrasound reflected at an air/liquid interface is

- (A) 100%**
- (B) high**
- (C) low**
- (D) none**

36. A specular reflector has surface texture _____ the wavelength of the incident wave

- (A) less than**
- (B) equal to**
- (C) irrelevant to**
- (C) greater than**

37. In a cathode ray tube display device the electron beam is steered by

- (A) deflection plates**
- (B) phased arrays**
- (C) photon converters**
- (D) voltages from the scan converter**

38. If it takes 50 microseconds for a pulse to return as an echo, how deep is the reflector ?

- (A) 1 cm**
- (B) 2 cm**
- (C) 3 cm**
- (D) 4 cm**

39. Q value is determined by

- (A) frequency and bandwidth**
- (B) pulse duration and bandwidth**
- (C) impedance and bandwidth**
- (D) none of the above**

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- 40. Shadowing artifacts are**
(A) from velocity change
(B) observed distal to cystic structures
(C) caused by differences in attenuation
(D) none of the above
- 41. A-mode scanning represents the depth of the signal in the horizontal dimension.**
(A) True
(B) False
- 42. Poiseuille's equation states that the volume rate of flow through a vessel is inversely proportional to**
(A) vessel radius
(B) blood density
(C) pressure gradient
(D) blood viscosity
- 43. Temperature is an acoustic variable**
(A) True
(B) False
- 44. Spatial pulse length _____ if the frequency is increased**
(A) Increases
(B) decreases
(C) remains the same
(D) is unrelated
- 45. The Reynolds number predicts aliasing**
(A) True
(B) False
- 46. Transverse waves are**
(A) parallel to the axis of the wave propagation
(B) perpendicular to the axis of the wave propagation
(C) compressed perpendicular to the axis of the wave propagation
(D) none of the above

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- 47. Beam diameter determines**
- (A) temporal resolution**
 - (B) the number of scan lines**
 - (C) axial resolution**
 - (D) lateral resolution**
- 48. Mirror image artifact is sometimes seen near the**
- (A) aorta**
 - (B) gall bladder**
 - (C) stomach**
 - (D) diaphragm**
- 49. The binary number 1011000 equals the decimal number**
- (A) 64**
 - (B) 101**
 - (C) 88**
 - (D) 1342**
- 50. Low frequency transducers have**
- (A) shorter wavelengths and less penetration**
 - (B) longer wavelengths and greater penetration**
 - (C) shorter wavelengths and greater penetration**
 - (D) longer wavelengths and less penetration**

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Physics 50 Questions Worksheet and Answer Key

- 1 _____
- 2 _____
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- 37 _____
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- 48 _____
- 49 _____
- 50 _____

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1. D
2. B
3. A
4. D
5. A
6. D
7. A
8. A
9. A
10. C
11. B
12. B
13. A
14. A
15. A
16. C
17. D
18. A
19. A
20. C
21. C
22. A
23. D
24. B
25. B
26. A
27. A
28. B
29. B
30. B
31. A
32. C
33. D
34. A
35. B
36. C
37. A
38. C

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- 39. A
- 40. C
- 41. A
- 42. D
- 43. A
- 44. B
- 45. B
- 46. B
- 47. D
- 48. D
- 49. C
- 50. B