

Radiographer Old Questions

1. An ultrasound beam passing through the body

- a is attenuated
- b produces heating of tissues
- c can be reflected
- d produces ionization

2. Ultrasonic pulses

- a are poorly transmitted by liquids
- b are poorly transmitted by air gaps
- c are partially reflected at interfaces between two liquid media
- d are partially transmitted at interfaces between two solid media

3. The Fraunhofer zone is the

- a image plane
- b image focus
- c near field
- d far field

4. Which of the following statements are true concerning the nature of diagnostic ultrasound in liver?

- a The wave speed and frequency are constant regardless of the wavelength
- b The wave speed is constant regardless of the wavelength
- c Wave speed increases with the increasing frequency

d None of the above

5. Which of the following characteristics of diagnostic ultrasound applies also to X-radiation?

a It is a wave phenomenon

b Its wave speed and frequency are inversely proportional

c Matter must be present for transmission

d Molecular compression and rarefaction occur.

6. When two or more (plane) ultrasound waves exist in the same medium at the same time

a they will interfere constructively if traveling with the same direction and phase

b standing waves will be produced if they are traveling with the same direction and phase

c standing waves will be produced if they are traveling in the same direction but out of phase

d None of the above

7. Specific acoustic impedance as applied to diagnostic ultrasound increases with increasing

a frequency

b wavelength

c mass

d density

8. When the diagnostic ultrasound beam is incident on the surface separating different tissues

a none of the beam will be transmitted

b none of the beam will be reflected

- c reflection can occur when the beam is at right angles to the interface
- d when incident at greater than the critical angle, there will be total transmission

9. When an acoustic wave is transmitted through soft tissue

- a there will be no reduction in intensity
- b attenuation will occur
- c energy will be transmitted by way of ionization and excitation
- d energy will be transmitted by way of Compton scattering

10. When an ultrasound beam is attenuated while passing through tissue

- a a 3 dB loss is equivalent to a 50% reduction in intensity
- b a 6 dB loss is equivalent to a 100% reduction in intensity
- c the normal rate is 10 dB/cm/MHz
- d 90% reduction of the original intensity is equivalent to a 90 dB loss

11. When a transmitted ultrasound beam changes direction across an interface, this is called

- a reflection
- b defraction
- c refraction
- d scattering

12. Ultrasound and X-rays differ in which of the following ways?

- a One is transverse, the other longitudinal
- b One requires matter, the other does not
- c One has constant wave speed, the other variable wave speed (in soft tissue)
- d All of the above

13. Diagnostic ultrasound intensity is often measured in

a W/cm^2

b grays

c rad

d decibels

14. Intensity is equal to

a power/area

b area/power

c amplitude/distance

d frequency/wavelength

15. Diagnostic ultrasound intensity

a increases with increasing frequency

b is a measure of particle displacement in the conduction medium

c is measured in mW/cm^2

d is the same as ultrasound power

16. As ultrasound is transmitted through tissue, its intensity decreases because of

a excitation

b absorption

c scattering

d divergence

17. Acoustic reflectivity

a is determined by acoustic impedance at an interface

b equals 100 if $Z_1 = Z_2$

c is higher for an air–soft-tissue interface than a bone–soft-tissue interface

d increases with increasing frequency

18. An ultrasound wave may be described as

a a longitudinal pressure wave

b a transverse wave

c being formed by particle oscillations

d changes in electrical properties of tissues

19. Ultrasound used for diagnosis

a has a frequency in the region 2 to 10 kHz

b has a velocity in air of 1500 ms^{-1}

c will not travel through a vacuum

d is produced and detected by a transducer

20. Ultrasound has the following properties. It

a can be deflected by a magnetic field

b is attenuated in tissue

c has a sinusoidal wave form

d can travel through water

21. An ultrasound beam is attenuated

a by reflection at a tissue interface

b and causes ionization of atoms

c by scattering

d by absorption in tissues

22. Greater than 50% energy reflection will take place at a

- a soft-tissue–bone interface
- b water–soft-tissue interface
- c soft-tissue–gas interface
- d muscle–fat interface

23. The magnitude of the reflected signal

- a decreases as the angle of incidence approaches 90 degrees
- b depends on the change of acoustic impedance at an interface
- c is independent of the acoustic impedance
- d depends on the frequency of the beam

24. Interference phenomena

- a may occur when two waves interact
- b are more common with continuous wave ultrasound
- c always produce a wave form of reduced amplitude
- d may be of value to ultrasound

25. Acoustic impedance depends on

- a the intensity of the ultrasound beam
- b the elasticity of the tissue
- c tissue density
- d tissue temperature

26. In which of the following materials is the speed of ultrasound greatest?

- a Air
- b Bone

- c Water
- d Soft tissue

27. What is the wavelength of a 5 MHz ultrasound pulse in soft tissue?

- a 0.3 mm
- b 0.5 mm
- c 3 mm
- d 5 mm

28. As frequency increases

- a wavelength increases
- b imaging depth decreases
- c propagation speed decreases
- d a and b

29. The frequency of a sound wave is determined by

- a the media through which it travels
- b its propagation
- c its source
- d reflection

30. As frequency increases, the attenuation coefficient

- a decreases
- b increases
- c stays the same
- d attenuation coefficient not affected by frequency

31. Which of the following sound frequencies would include diagnostic ultrasound?

- a 10 Hz
- b 10 kHz
- c 100 kHz
- d 10 MHz

32. Velocity of ultrasound

- a depends on the transmitted frequency
- b varies for different materials
- c is temperature dependent
- d is equal for muscle and bone

33. The velocity of an ultrasound beam may be determined by measuring the

- a time taken for a pulse to be returned through a Perspex block of a known thickness
- b time taken for a pulse to be returned through a known depth of water
- c reflection of the beam by a wire mesh placed in water
- d distance between peaks of the wave form

34. The propagation speed of sound through soft tissue is

- a 1450 ms^{-1}
- b 1650 ms^{-1}
- c 1540 ms^{-1}
- d 1230 cms^{-1}

35. Given the various physical characteristics of ultrasound, then it is true that

- a its speed is the same in all materials
- b its speed does not depend on its frequency
- c its speed depends on the density of the supporting medium
- d its speed increases with frequency

36. Lateral resolution can be improved by

- a damping
- b pulsing
- c focusing
- d reflecting

37. Axial resolution can be improved by

- a damping
- b pulsing
- c focusing
- d increasing operating frequency

38. The resolution of an ultrasound beam may be determined by

- a imaging a series of wires at varying depth from the transducer face
- b imaging a series of wires all the same depth from the transducer face
- c compound scanning around a Perspex block containing a single central wire
- d linear scanning of a single wire in a water bath

39. The lateral resolution of the diagnostic ultrasound system is

- a also called the azimuthal resolution
- b determined by the slice thickness
- c better with higher frequency

d better than axial resolution

40. The axial resolution of a transducer is primarily determined by

a spatial pulse length

b the transducer diameter

c the acoustic impedance of tissue

d density

41. The lateral resolution of a transducer is primarily determined by

a spatial pulse length

b the beam width

c the acoustic impedance of tissue

d applied voltage

42. The fundamental operating principle of medical ultrasound transducers is

a Snell's law

b ALARA principle

c piezoelectric effect

d impedance effect

43. Which one of the following quantities varies the most with distance from the transducer face?

a Axial resolution

b Lateral resolution

c Frequency

d Wavelength

44. What determines the transducer frequency selection for diagnostic ultrasound?

- a Intensity and resolution
- b Intensity and propagation speed
- c Scattering and impedance
- d Resolution and penetration

45. Which of the following improves sound transmission from the transducer element into the tissue?

- a Matching layer
- b Doppler effect
- c Damping material
- d Coupling medium

46. The active elements of the diagnostic ultrasound transducer

- a may be crystalline material
- b operate on the basis of the photoelectric effect
- c convert electrical energy into mechanical energy
- d convert mechanical energy into electrical energy

47. The principle on which the ultrasound transducer operates is the

- a photoelectric effect
- b crystalline effect
- c piezoelectric effect
- d transducer effect

48. A piezoelectric crystal may be made of

a aluminum

b calcium tungstate

c quartz

d lithium fluoride