

MULTIPLE CHOICE

1. Historically, the development of ultrasound began shortly after:
 - a. radio communication in World War I.
 - b. sonar in World War II.
 - c. nuclear testing in World War II.
 - d. the launching of Sputnik.

ANS: B

World War II brought sonar equipment to the forefront for defense purposes. Ultrasound was influenced by the success of sonar equipment.

PTS: 1 REF: p. 7

OBJ: Detail a timeline for pioneers in the advancement of medical diagnostic ultrasound.

TOP: Historical overview of sound theory and medical ultrasound

2. The early applications of obstetric ultrasound were initiated by:
 - a. Joseph Holmes.
 - b. Ian Donald.
 - c. John Howry.
 - d. William Fry.

ANS: B

The early obstetric compound scanner was built by Tom Brown and Dr. Ian Donald in Scotland in 1957.

PTS: 1 REF: p. 7

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3. Visualization of the cardiac structures in the heart was discovered by:
 - a. Joseph Holmes.
 - b. Ian Donald.
 - c. Hertz and Edler.
 - d. George Ludwig.

ANS: C

In 1954, echocardiographic techniques were developed in Sweden by Drs. C.H. Hertz and I. Edler.

PTS: 1 REF: p. 7

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4. Which one of the following statements about the role of sonographers is *false*?
 - a. Sonographers perform ultrasound studies and gather diagnostic data independent

- of the physician.
- b. Sonographers must possess intellectual curiosity and perseverance.
 - c. Sonographers must have a technical aptitude.
 - d. Sonographers must be able to communicate on different levels.

ANS: A

A sonographer performs ultrasound studies gathering diagnostic data under *both* the direct and the indirect supervision of a physician. They also must assess clinical history and symptoms, interpret laboratory values, and understand other diagnostic examinations.

PTS: 1 REF: p. 5 OBJ: Describe a career in ultrasound.
TOP: Role of the sonographer

5. In soft tissues, the assumed propagation velocity is (*in meters per second*):
- a. 1320.
 - b. 1450.
 - c. 1540.
 - d. 1650.

ANS: C

In soft tissues, the assumed propagation velocity (speed) is 1540 meters per second.

PTS: 1 REF: p. 9
OBJ: Demonstrate an understanding of the basic principles and terminology of ultrasound.
TOP: Introduction to basic ultrasound principles - Acoustics

6. Diagnostic ultrasound uses the frequencies of:
- a. 10 to 15 kHz.
 - b. 1 to 20 kHz.
 - c. 100 to 1000 Hz.
 - d. 1 to 20 MHz.

ANS: D

Diagnostic application of ultrasound uses frequencies of 1 to 20 million cycles per second (1 to 20 MHz).

PTS: 1 REF: p. 9
OBJ: Demonstrate an understanding of the basic principles and terminology of ultrasound.
TOP: Introduction to basic ultrasound principles - Acoustics

7. The device that converts energy from one form to another is called the:
- a. digitizer.
 - b. transducer.
 - c. scan converter.
 - d. beam former.

ANS: B

Piezoelectric elements (transducers) convert electric energy into ultrasound energy and vice versa.

PTS: 1 REF: p. 12

OBJ: Demonstrate an understanding of the basic principles and terminology of ultrasound.

TOP: Introduction to basic ultrasound principles - Acoustics

8. The angle of reflection is equal to the:

- a. acoustic impedance.
- b. angle of incidence.
- c. refraction.
- d. image resolution.

ANS: B

Angle of reflection is the angle between the reflected sound direction and a line perpendicular to the media boundary.

PTS: 1

REF: p. 6

OBJ: Demonstrate an understanding of the basic principles and terminology of ultrasound.

TOP: Historical overview of sound theory and medical ultrasound

9. The display mode that shows time along the horizontal axis and depth along the vertical axis is:

- a. A mode.
- b. B mode.
- c. M-mode.
- d. real-time.

ANS: C

Motion mode (M-mode) displays the depth along the vertical axis versus the time along the horizontal axis.

PTS: 1

REF: p. 15

OBJ: Identify ultrasound instruments and discuss their uses.

TOP: Pulse-echo display modes - M-mode

10. Which one of the following statements about the Doppler principle is *false*?

- a. Doppler refers to a change in frequency in which the motion of laminar or turbulent flow is detected within a vascular structure.
- b. The beam should be perpendicular to the flow.
- c. The Doppler shift is directly proportional to the velocity of the red blood cell.
- d. If the red blood cell moves away from the transducer, then the fall in frequency is directly proportional to the velocity and direction of the red blood cell movement.

ANS: B

The beam should be parallel to the flow to obtain the maximum velocity. The frequency of the Doppler shift is proportional to the cosine of the Doppler angle. At a 90-degree angle (perpendicular to flow), the Doppler shift is zero, regardless of the flow velocity.

PTS: 1

REF: p. 18 | p. 19

OBJ: Discuss three-dimensional and Doppler ultrasound.

TOP: Doppler Ultrasound - Doppler Shift

11. The Fresnel zone is also called the:

- a. far field.
- b. focal point.
- c. near zone.
- d. Nyquist limit.

ANS: C

The Fresnel or near zone is the field closest to the transducer during the formation of the sound beam.

PTS: 1 REF: p. 18

OBJ: Demonstrate an understanding of the basic principles and terminology of ultrasound.

TOP: System Controls for Image Optimization - Focal Zone

12. The higher the transducer frequency, the:

- a. shorter the wavelength.
- b. faster the frame rate.
- c. deeper the penetration depth.
- d. slower the frame rate.

ANS: A

The higher the frequency, the shorter the wavelength (inversely related).

PTS: 1 REF: p. 18 | p. 22

OBJ: Demonstrate an understanding of the basic principles and terminology of ultrasound.

TOP: Introduction to basic ultrasound principles - Image resolution