

MRSM

1. A 2 MHz transducer has an approximate wavelength of:
 - (A) 0.01 mm
 - (B) 0.1 mm
 - (C) 1.0 mm
 - (D) 10 mm
 - (E) 20mm

2. Which of the following has the highest acoustic impedance?
 - (A) Bone
 - (B) Fat
 - (C) Air
 - (D) Water
 - (E) Soft tissue

3. If an ultrasound beam is attenuated by 99%, the attenuation is:
 - (A) 1 dB
 - (B) 3 dB
 - (C) 5dB
 - (D) 10 dB
 - (E) 20 dB

4. Ultrasound shadowing artifacts are unlikely behind:
 - (A) Strong attenuators
 - (B) Bone
 - (C) Stone
 - (D) Air
 - (E) Fluid-filled cysts

5. What is the imaging depth or penetration in soft tissue with a ultrasound probe of 5 MHz?
 - (A) 1
 - (B) 4
 - (C) 8
 - (D) 12
 - (E) 30

6. An ultrasound beam traveling through tissue *cannot* be:
 - (A) Absorbed

- (B) Amplified
- (C) Scattered
- (D) Reflected
- (E) Attenuation

7. The Q factor of a transducer refer to:

- (A) Coupling efficiency
- (B) Minimum intensity
- (C) Question
- (D) Maximum intensity
- (E) Purity of the frequency

8. An echo received 65 microseconds after the signal is sent is from what depth?

- (A) 2 cm
- (B) 5cm
- (C) 7cm
- (D) 9cm
- (E) 10 cm

9. Ultrasound signals are converted from digital data to a video monitor display using a:

- (A) Log amplifier
- (B) Photomultiplier tube
- (C) Photocathode
- (D) Scan converter
- (E) Wi-Fi

10. Lateral resolution in ultrasound imaging would most likely be improved by:

- (A) Increasing transducer focusing
- (B) Imaging in the Fraunhofer zone
- (C) Using fewer scan line
- (D) Increasing the frequency
- (E) Increasing baseline

11. The Doppler shift from a moving object depends on all of the following except?

- (A) Speed of ultrasound beam
- (B) Frequency
- (C) Angle between beam and object
- (D) Object depth
- (E) Velocity

12. Which of the following angle will general the largest Doppler shift?
- (A) 90°
 - (B) 60°
 - (C) 45°
 - (D) 30°
 - (E) 0°
13. The Larmor frequency is the frequency of:
- (A) Pulse repetition
 - (B) Nuclear precession
 - (C) Phase encoding
 - (D) Spatial encoding
 - (E) TR
14. The resonance frequency for ^1H in a 1.5 T magnetic field is:
- (A) 63 Hz
 - (B) 63kHz
 - (C) 63MHz
 - (D) 63GHz
 - (E) 63THz
15. The FDA limit power deposition in patients undergoing MR does *not* include:
- (A) 3.2 W/kg averaged over the head
 - (B) 8 W/kg peak value
 - (C) 0.4 w/kg averaged over body
 - (D) A less than 3°C temperature rise in the heart
 - (E) Over 4T requires investigational device exemption (IDE)
16. In spin-echo imaging, the echo signal normally is measured:
- (A) Immediately ($t = 0$)
 - (B) After time TE
 - (C) After time $4 \times T_1$
 - (D) After T2
 - (E) After T2*
17. MR SNR cannot be improved by increasing the:
- (A) Matrix size
 - (B) Number of acquisitions
 - (C) Static magnetic-field strength
 - (D) Section thickness

(E) Spatial resolution

18. In MR, motion results in ghost images that appear in which direction?

- (A) Read encode
- (B) Phase encode
- (C) Slice selection axis
- (D) PA
- (E) Lateral

19. Contrast in MR can be due to all the following differences *except*:

- (A) Presence of flow
- (B) Proton density
- (C) T1
- (D) Atomic number
- (E) T2

20. Common MR angiography techniques are based on:

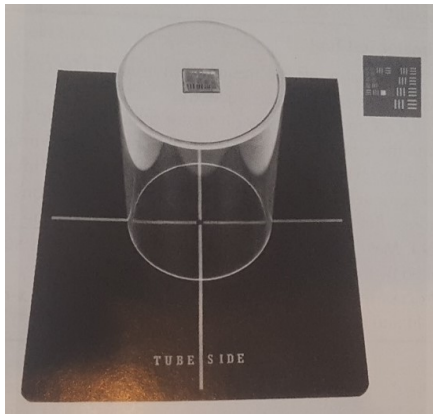
- (A) Phase contrast
- (B) Phase encoding
- (C) T1 contrast
- (D) Spatial encoding
- (E) Time to inversion

21. What is the purpose of these tools in quality measurement of diagnostic X-ray generator?

- (A) Timer accuracy
- (B) Focal spot test
- (C) Resolution test
- (D) mAs reciprocity
- (E) light indicator test

22. The minimum HVL for x-ray units operating at 80kVp, 50mAs is ____mm of aluminium

- (A) 1.3
- (B) 1.8
- (C) 2.3
- (D) 2.8
- (E) 3.1



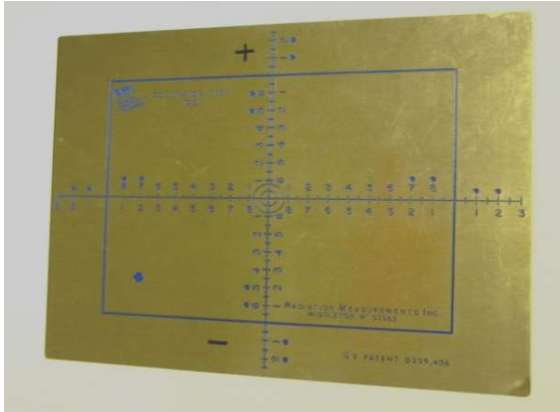
23. The maximum variability allowed for the reproducibility of exposure at 80kVp, 10mAs is \pm ___%
- (A) 5
 - (B) 10
 - (C) 15
 - (D) 20
 - (E) 30
24. Which of the following is the right answer about Exposure Dose in SI unit (International system of units)?
- (A) R (Roentgen)
 - (B) Gy (Gray)
 - (C) Sv (Sivert)
 - (D) C/kg (Coulomb/kilogram)
 - (E) Kerma
25. What is the purpose of these tools in quality measurement of diagnostic X-ray generator?



- (A) Collimator test
 - (B) Grid alignment test
 - (C) Beam alignment test
 - (D) Half Value Layer test
 - (E) Dose rate test
26. Which of the following is correct explanation of improve matter in image when using grid?

- (A) Contrast
- (B) Latitude
- (C) Sharpness
- (D) Resolution
- (E) Field size

27. What is the purpose of these tools in quality measurement of diagnostic X-ray generator?



- (A) Focal spot test
- (B) Grid alignment test
- (C) Low - contrast test
- (D) Beam – Light field test
- (E) Depth test

28. What is the purpose of these tools in quality measurement of diagnostic X-ray generator?

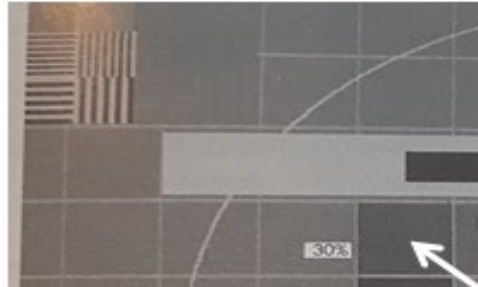


- (A) Tube kilovolt
- (B) Depth
- (C) Exposure time
- (D) Exposure dose
- (E) Auto exposure control

29. What is the purpose of the directions in the image?



22. 화살표의 평가항목은?

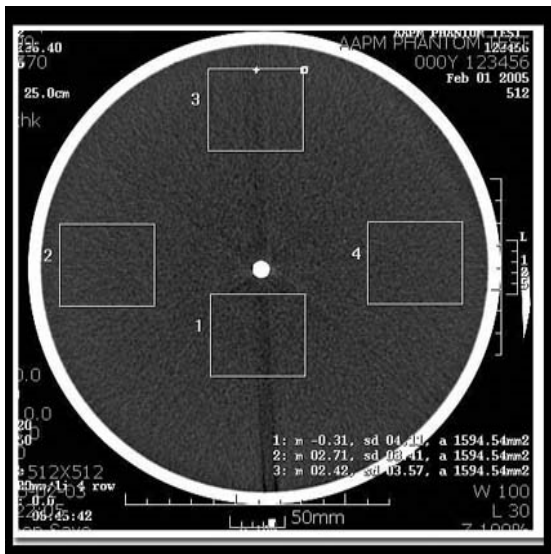


- (A) Gray scale steps
- (B) Contrast resolution
- (C) Uniform background
- (D) 5% Contrast patches
- (E) Axial resolution

30. Choose the item relevant to CT resolution in the axial direction.

- (A) Scan time
- (B) Helical pitch
- (C) Display pixel size
- (D) Detector sensitivity
- (E) Dose rate

31. What is this CT image for?



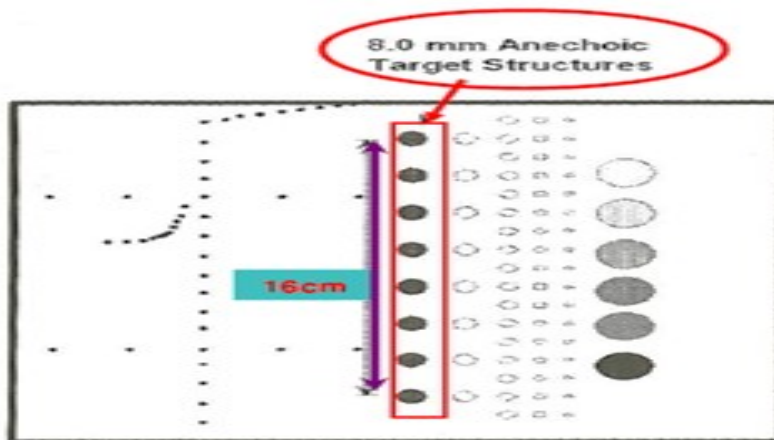
- (A) Linearity
- (B) Uniformity
- (C) CT number

- (D) Slice thickness
- (E) CTDI

32. Partial volume artifacts in CT are generally reduced by reducing the:

- (A) Section thickness
- (B) Scanning time
- (C) Image matrix size
- (D) Focal spot size
- (E) mAs

33. Which of the following is correct for the item which can be measured using 8mm anechoic target from the below image?



- (A) Resolution: The ability of distinguishing two neighboring objects
- (B) Dead zone: The distance from the front of transducer to the echo that can be found firstly
- (C) Sensitivity: The ability that can be found and visualized the weak echo of small object which is placed at the specific depth
- (D) Focal Zone: Provision the most accurate diagnostic information with the region that is maximum intensity and lateral resolution nearby the focal point
- (E) Gary scale: The ability of distinguishing different objects scale

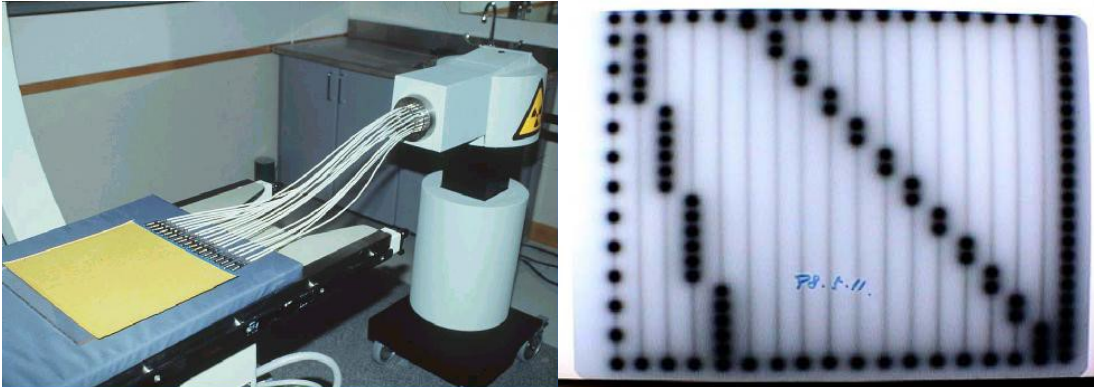
34. Which of the following is not concerned with receiver function?

- (A) Rejection
- (B) Converting to TV signal
- (C) Amplification (gain)
- (D) Compensation (T.G.C)
- (E) Attenuation

35. Which of the following does not need the regular quality management in ultrasonography?
- (A) Distance
 - (B) Uniformity
 - (C) Axial resolution
 - (D) Maximum depth of visualization
 - (E) System Sensitivity
36. Following are the statement of Gauss line. Which composition that can be effected from MRI equipment is correct?
- (A) 1 Gauss line – Watch
 - (B) 1 Gauss line – Monitor
 - (C) 5 Gauss line – Film developer
 - (D) 5 Gauss line – Pacemaker
 - (E) 10 Gauss line – Each kind of tools
37. This technique was developed in 1930 and be used currently. Which of the following is the gradual approaching method to obtain the goal effectively to set up the goal, facilitate the improvement process, take actions, and evaluate and maintain?
- (A) CPDA
 - (B) DAPC
 - (C) PDCA
 - (D) ACPD
 - (E) CAPD
38. National Radiological Protection Board(NRPB) had published “Exposure of Electric-magnetic field in MRI imaging for pregnant woman”, and it suggested the period to avoid the examination. Which following period is correct?
- (A) Early pregnancy
 - (B) 2 weeks
 - (C) 3 months – 6 months
 - (D) 6 months – Prior to delivery
 - (E) Early pregnancy – until 3months
39. CT number depends on all the following *except*:
- (A) Beam hardening
 - (B) Tissue heterogeneity
 - (C) mAs
 - (D) x-ray attenuation
 - (E) kVp

40. The main advantage of helical CT over conventional (axial) CT is improved:
- (A) Spatial resolution
 - (B) Low contrast detection
 - (A) Data acquisition rate
 - (B) Patient dose
 - (C) Scan field
41. CT fluoroscopy minimizes radiation doses by using lower: Filtration
- (A) Voltage
 - (B) Current
 - (C) Collimator thickness
 - (D) Patient table
42. theoretically best possible CT resolution for a 512^2 matrix and 25 cm FOV is:
- (A) 0.5 lp/mm
 - (B) 1.0 lp/mm
 - (C) 2.0 lp/mm
 - (D) 5.0 lp/mm
 - (E) 7.0 lp/mm
43. Which of the following is incorrect for the quality management of device?
- (A) It is the activity for maintenance the uniformity of image quality always.
 - (B) It can reduce additional scatter radiation dose from device.
 - (C) It can reduce a time for repeated examination and the maintenance of device.
 - (D) It can find the changes from the deterioration of the device quality and general aging.
 - (E) The measuring activity is needed for optimization of capacity of the device when breakdown or some problem is occurred only.
44. Which is the acceptable limitation of X-ray output constancy for Linac?
- (A) 1%
 - (B) 2%
 - (C) 3%
 - (D) 5%
 - (E) 7%
45. Which QA procedure is related these images?
- (A) Source Dwell Position Check
 - (B) PDD & TMR

- (C) Symmetry, Flatness
- (D) Collimator cross hair line
- (E) Dose rate

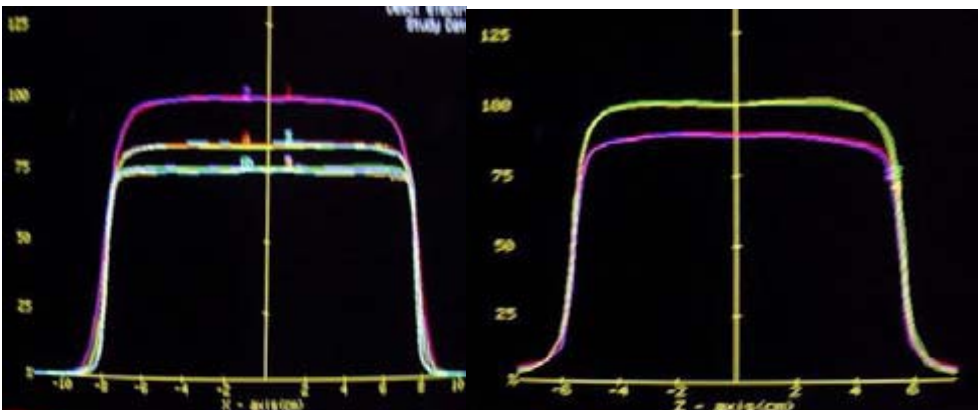


46. Which of the following is correct about next figure?



- (A) It is the specimen of thyroid tissue.
- (B) It is neck phantom.
- (C) It is breast phantom.
- (D) It is thyroid phantom.
- (E) It is kidney phantom.

47. What is the item of Quality Control for radiation treatment devices in this picture?



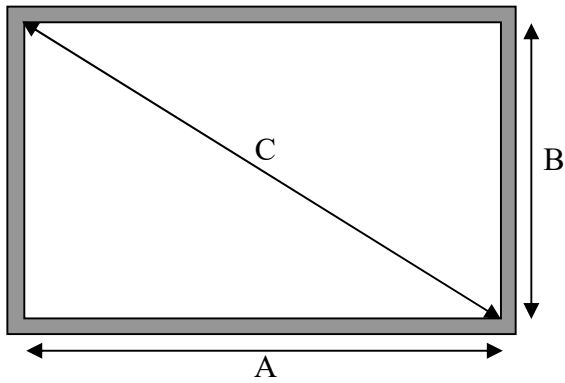
- (A) PDD

- (B) Energy
- (C) Symmetry, Flatness
- (D) TMR
- (E) TPR

48. Which of the following does not need the regular quality management in ultrasonography?

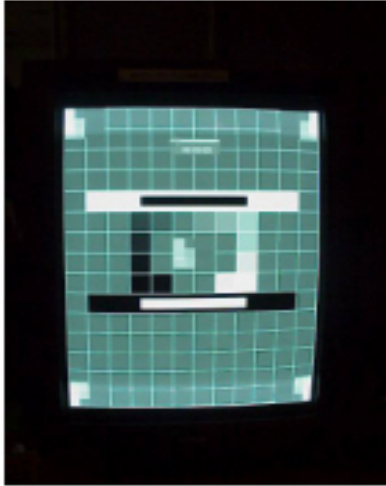
- (A) Distance
- (B) Uniformity
- (C) Axial resolution
- (D) Maximum depth of visualization
- (E) transverse resolution

49. What is the size of monitor in this image?



- (A) Length of C
- (B) Length of $A \times B$
- (C) Length of $A \div B$
- (D) Length of $A + B$
- (E) Length of $A + B + C$

50. What is this test for?



- (A) Virus Checking
- (B) Server Checking
- (C) Monitor Calibration
- (D) Illuminator Calibration
- (E) Amplifier Calibration

51. Which one is measured on the slice-sensitivity profiles as parameters to quantify the longitudinal resolution?

- (A) FWHM (full-width at half maximum)
- (B) pixel size
- (C) matrix size
- (D) reconstruction increment
- (E) field of view

52. Increasing kVp of MDCT would have what effect on the CTDIw?

- (A) increase
- (B) decrease
- (C) no change
- (D) stochastic increasing
- (E) none of the above

53. CT numbers depend upon?

- (A) Number of pixels
- (B) Source to detector distance
- (C) Spatial resolution
- (D) KVp
- (E) mA

54. Which of the following statement about CTDI or DLP is not true?
- (A) $CTDI_{vol}$ is a measure of exposure per slice.
 - (B) DLP is measure of total radiation exposure for the whole series of images.
 - (C) $CTDI_{vol}$ is dependent of scan length.
 - (D) DLP is proportional to scan length.
 - (E) none of the above
55. Which one is related to radiation risk ?
- (A) DLP
 - (B) MTF
 - (C) $CTDI_{vol}$
 - (D) FWHM
 - (E) reconstruction increment
56. According to the following formulas, which one is not true?
- (A) $CTDI_w = 1/3 CTDI_{100,center} + 2/3 CTDI_{100,edge}$
 - (B) $CTDI_{vol} = pitch / CTDI_w$
 - (C) $DLP = CTDI_{vol} \times scan\ length$
 - (D) Effective dose = $k \times DLP$ (k: a conversion factor)
 - (E) none of the above
57. Which of the following is the method for dose reduction by operator of CT?
- (A) reduction of electric noise
 - (B) development of fine focus x-ray tube
 - (C) using dose modulation
 - (D) reduction of skin dose by beam hardening
 - (E) all of the above
58. Visibility of small high-contrast CT lesions would most likely improve with decreasing:
- (A) Patient dose
 - (B) Scan time
 - (C) Field of view
 - (D) Slice thickness
 - (E) all of the above
59. About measuring the CTDI (CT dose index), which one of the following is correct?
- (A) An X-ray film or an image plate must be used
 - (B) The reading on the ion-chamber is in the unit of mGy.
 - (C) There are 2 cylindrical phantoms with different diameters, 16cm and 32cm.
 - (D) On the CT image of the phantom, there must be drawn 5 circular ROIs and one of

these ROIs must be on the isocenter.

(E) none of the above

60. Which of the following is correct about linearity for evaluation of image quality?
- (A) to distinguish the adjacent structures have high contrast
 - (B) to show the fine change of the object density
 - (C) to show the change of the CT number of ROI for uniform material like water
 - (D) to show the relation between CT number of imaged object and linear attenuation coefficient
 - (E) none of the above
61. Methods of reducing CT image noise include:
- (A) increases x-ray dose
 - (B) decreases x-ray dose
 - (C) decreases the FOV
 - (D) decreases scan time
 - (E) none of the above
62. If a CT detector has an offset or gain difference of 0.1% with neighboring detectors, which type of artifact will be depicted ?
- (A) stair-step artifact
 - (B) beam hardening
 - (C) partial volume
 - (D) ring
 - (E) all of the above
63. Acceptance testing is not be performed at the time of
- (A) initial installation
 - (B) replacing light localizers
 - (C) replacing the X-ray tube
 - (D) replacing detector array
 - (E) none of the above
64. A quality control program for CT equipment should include: 1. visual inspection. 2. environmental inspection. 3. performance testing
- (A) 1 and 2 only
 - (B) 2 and 3 only
 - (C) 1 and 3 only
 - (D) 1, 2, and 3
 - (E) none of the above

65. The ability of an imaging system to create separate image of closely spaced objects known as:
- (A) screen speed
 - (B) spatial resolution
 - (C) contrast resolution.
 - (D) quantum mottle
 - (E) quantum detection efficiency
66. What is used as the reference material for CT number calibration?
- (A) bone
 - (B) liver
 - (C) water
 - (D) lung
 - (E) all of the above
67. Which of the following is the primary determination of slice thickness?
- (A) spacing between detectors
 - (B) collimators
 - (C) focal spot size
 - (D) field of view
 - (E) grid
68. Which term describes the ability of a CT scanner to differentiate objects with minimal differences in attenuation coefficients?
- (A) spatial resolution
 - (B) contrast resolution
 - (C) linearity
 - (D) modulation
 - (E) speed
69. Which of the following factors can affect the accuracy of a density (Hounsfield) measurement in a CT image?
- (A) system calibration
 - (B) window width setting
 - (C) window level setting
 - (D) display field of view
 - (E) all of the above

70. Spatial resolution can be improved by increasing the:

- (A) FOV
- (B) matrix
- (C) pixel size
- (D) slice thickness
- (E) none of the above

71. The main limiting factor for contrast resolution is:

- (A) noise
- (B) pixel depth
- (C) voxel volume
- (D) focal spot size
- (E) none of the above

72. The modulation transfer function is one method of measuring:

- (A) low-contrast resolution
- (B) high-contrast spatial resolution
- (C) attenuation
- (D) section thickness
- (E) none of the above

73. A contemporary CT system should be able to detect 3 mm objects with density differences of:

- (A) 0.05%
- (B) 0.5%
- (C) 1.0%
- (D) 1.5%
- (E) 2.0%

74. What is the tolerance limit for noise in a CT image?

- (A) ± 3
- (B) ± 5
- (C) ± 10
- (D) ± 15
- (E) ± 20

75. The CT accreditation phantom from the American College of Radiology contains four modules to evaluate the CT scanner performance. This phantom provides parameters or functions for CT acceptance and annual testing, but excluding

- (A) high contrast resolution

- (B) uniformity and noise
- (C) slice thickness
- (D) dose profile
- (E) all of the above