## **Image Production Mock Registry**

1. Which of the following terms best describes the artifact present in the image? See Fig.



- A. Edge gradient
- B. Gibbs phenomenon
- C. Density gradient
- D. Partial volume

2. Which of the following section widths would cause the greatest amount of partial volume averaging?

- A. 1 mm
- B. 3 mm
- C. 5 mm
- D. 10 mm

3. Errors during the measurement of transmitted radiation by the detectors can result in a form of noise on the image referred to as a(n):

- A. fluctuation.
- B. artifact.
- C. line spread.
- D. encryption.

4. The broadening of the slice sensitivity profile inherent to helical CT acquisition is said to negatively affect the:

- A. in-plane spatial resolution.
- B. longitudinal spatial resolution.
- C. contrast resolution.
- D. temporal resolution.

5 The CT number is a relative value that standardizes the attenuation value ( $\mu$ ) of a tissue by comparing it with the attenuation of:

- A. water.
- B. air.
- C. bone.
- D. a standard Plexiglass phantom.

6. Which of the following technical factors exhibits an effect upon longitudinal spatial resolution?

- 1. Detector pitch
- 2. Interpolation algorithm
- 3. Display field of view (DFOV)
- A. 1 only
- B. 3 only
- C. 1 and 2 only
- D. 1 and 3 only

7. A CT system measures the average linear attenuation coefficient of a voxel of tissue to be 0.189. The linear attenuation coefficient of water for this scanner equals 0.181. The CT number assigned to the pixel representing this voxel of tissue equals:

- A. -956 HU.
- B. -173 HU.
- C. +44 HU.
- D. +1044 HU.
- 8. The types of detectors used in computed tomography are:
  - 1. Gas ionization
  - 2. Stimulable phosphor
  - 3. Scintillation
  - A. 1 only.
  - B. 3 only.
  - C. 1 and 3 only.
  - D. 2 and 3 only.

9. A test phantom containing water is scanned and five region-of-interest measurements are performed. The subsequent density measurements are compared and demonstrate a maximum deviation of less than 2 HU. This quality assurance test was performed to evaluate the scanner's:

- A. spatial resolution.
- B. cross-field uniformity.
- C. signal-to-noise ratio.
- D. contrast resolution.

10. A 64-slice MSCT system employs an array of 64 detectors, each with a dimension of 0.625 mm. What beam collimation is required to expose the middle 32 detectors of the array to transmitted x-radiation?

- A. 10 mm
- B. 20 mm
- C. 32 mm
- D. 64 mm

11. Which of the following terms accurately describes the type of x-ray beam used in a third-generation CT scanner?

- A. Pencil beam
- B. Fan beam
- C. Nutating beam
- D. Electron beam

12. Which of the following is not a typical matrix size used with a modern CT scanner?

- A. 80 X 80
- B. 320 X 320
- C. 512 X 512
- D. 1024 X 1024

13. In 1979, the scientists \_\_\_\_\_\_ and \_\_\_\_\_ shared the Nobel Prize for their research in computed tomography.

- A. Watson and Crick
- B. Olendorf and Hounsfield
- C. Hounsfield and Cormack
- D. Hounsfield and Ambrose

14. Which of the following types of image reconstruction was used in the first prototype CT scanner?

- A. Convolution method
- B. Iterative technique
- C. Fourier transform
- D. Back-projection

15. Which of the following acquisitions may be characterized as noncontiguous?

- A. 2.5-mm sections reconstructed every 1.25 mm
- B. 5.0-mm sections reconstructed every 7.5 mm
- C. 3.75-mm sections reconstructed every 3.75 mm
- D. 20-second cine acquisition with 1.25-mm sections

16. The 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

17. Which of the following is not used to archive CT images?

- A. 3.5-inch floppy disk
- B. Magnetic tape
- C. VHS tape
- D. Magnetic optical disk

18. An acquisition is made on a 4-slice MSCT system with a detector array of 16 x 1.25-mm detector elements along the z-axis. With a selected beam width of 20 mm, what beam pitch would result in the table moving 35.00 mm for each rotation of the gantry?

- A. 1.0
- B. 1.5
- C. 1.75
- D. 2.0





- A. Modulation transfer function (MTF)
- B. Signal-to-noise ratio (SNR)
- C. Views per rotation (VPR)
- D. Slice sensitivity profile (SSP)

20. During a CT scan, each sample of ray sum measurements made by the data acquisition system (DAS) is called a:

- A. signal.
- B. view.
- C. projection.
- D. ray.

21The high-density objects labeled as Number 2 most likely represent: See Fig.



- A. gunshot fragments.
- B. loose change in the patient's clothing.
- C. surgical staples.
- D. ingested metallic material.

22. In an MSCT system, the detector array is composed of multiple rows of individual detector elements along the:

- A. x-axis.
- B. y-axis.
- C. z-axis.
- D. entire circumference of the gantry.

23. Which of the following statements concerning the translate-rotate mode of CT data acquisition is/are correct?

- 1. 360-degree circular detector arrays are used.
- 2. Data are collected only during translation.
- 3. Was used in first- and second-generation CT scanners.
- A. 2 only
- B. 3 only
- C. 1 and 2 only
- D. 2 and 3 only

24. A voxel may be defined as which of the following?

- A. The portion of the CRT displaying the image
- B. A miniature image
- C. A volume element
- D. An arrangement of pixels

25. A CT scanner with a limiting resolution of 15 lp/cm can resolve an object as small as:

- A. 0.1 mm.
- B. 0.3 mm.
- C. 0.6 mm.
- D. 1.0 mm.

26. The ability of an object to attenuate the x-ray beam is assigned a value known as the:

- A. linear attenuation coefficient.
- B. Hounsfield value.
- C. CT number.
- D. ray sum.

27. A 512 X 512 matrix will consist of how many pixels?

- A. 512
- B. 1024
- C. 26,214
- D. 262,144

28. The grainy appearance of the pelvic image shown is commonly referred to as: See Fig.



- A. tube arcing.
- B. noise.
- C. edge gradient.
- D. partial volume artifact.

29. The assignment of different generations to CT scanners is based on the configuration of the:

- A. patient and gantry.
- B. tube and detectors.
- C. anode and cathode.
- D. tube and collimators.

30. Which of the following anatomic quadrants has been removed from the 3-D model? See Fig.



- A. Left posterior inferior
- B. Right anterior inferior
- C. Left anterior superior
- D. Right anterior superior

31. The computerized communication system used by a PACS to transmit data is referred to as a:

- A. convolution.
- B. hierarchy.
- C. network.
- D. matrix.

32. Which of the following statements best describes why the image of the chest is displayed at a window whose level is -700 and width is 1500? See Fig.



- A. CT images of the lung should always be displayed in predetermined "lung" windows.
- B. Soft tissue demonstration is not required during the CT evaluation of the chest.
- C. Strict protocols regarding image display should never be altered by the operator.
- D. The level is set at the average Hounsfield value for the tissue of interest within a range determined by the window width.

33. A CT scanner measures the linear attenuation coefficient of a voxel of tissue as 0.40. The linear attenuation coefficient of water for this scanner equals 0.20. The CT number assigned to the pixel representing this voxel of tissue equals:

- A. -1000 HU.
- B. 0 HU.
- C. 1 HU.
- D. +1000 HU.

34. The artifact present was most likely caused by: See Fig.



- A. patient motion.
- B. surgical staples.
- C. gallstones.
- D. detector malfunction.

35. CT acquisition of a water-filled phantom is performed utilizing a standardized set of technical factors. If a region-of-interest (ROI) measurement is made, the image noise corresponds to which of the following data?

- A. Mean CT number
- B. Standard deviation
- C. CT number mode
- D. Median Hounsfield value

<sup>36.</sup> The following formula is used to calculate the linear attenuation coefficient: I =  $IOe-\mu x$  The symbol "x" identifies:

- A. Euler's constant.
- B. absorber thickness.
- C. the unknown.
- D. transmitted photons.

<sup>37.</sup> The image was produced with a 1.0-mm aperture size and was displayed using a  $512^{2}$  matrix and a 15-cm DFOV. The voxel dimension for this image would be: See Fig.



- A. 0.29 mm × 0.29 mm × 1.0 mm.
- B. 2.9 mm × 2.9 mm × 1.0 mm.
- C. 3.4 mm × 3.4 mm × 1.0 mm.
- D. 0.29 mm × 0.29 mm × 1.0 cm.

38. In a modern CT system, the total number of possible Hounsfield values that may be assigned to any one pixel is approximately:

- A. 512.
- B. 1024.
- C. 2000.
- D. 4096.

39. Cupping artifacts most commonly occur in the:

- A. chest.
- B. abdomen.
- C. pelvis.
- D. brain.

40. Important characteristics of a quality control program in CT include:

- 1. Consistent testing frequency.
- 2. Prompt corrective actions when necessary.
- 3. Accurate record-keeping.
- A. 1 only.
- B. 1 and 2 only.
- C. 1 and 3 only.
- D. 1, 2, and 3.

41. The phantom imaged is used to test which of the following image quality factors of a CT scanner? See Fig.



- A. Spatial resolution
- B. Noise
- C. Linearity
- D. Contrast resolution

42. Which of the following technical changes may increase the partial volume effect present on a spiral CT scan?

- A. Decrease in pitch.
- B. Decrease in section width.
- C. Increase in matrix size.
- D. Increase in pitch.

43. The spatial resolution of a CT scanner is often measured using the MTF of the system, which is an acronym for:

- A. maximum transmissivity frequency.
- B. modulation target function.
- C. minimum transmissivity frequency.
- D. modulation transfer function.

44. Which of the following types of image noise can be most easily reduced by the CT technologist?

- A. Electronic noise
- B. Artifactual noise
- C. Quantum noise
- D. Detector noise

45. The interaction between x-ray and matter that is responsible for the production of the scatter radiation absorbed by the patient and detectors is:

- A. Compton effect.
- B. bremsstrahlung.
- C. photoelectric.
- D. characteristic.

<sup>46</sup> Which of the following technologic advances has led to the development of spiral/helical CT scanning?

- 1. Slip-ring technology.
- 2. Electron beam technology.
- 3. High-efficiency x-ray tubes.
- A. 1 only
- B. 1 and 2 only
- C. 1 and 3 only
- D. 1, 2, and 3

47. The spatial resolution of a CT scanner is usually given in the unit of measure:

- A. HU.
- B. lp/cm.
- C. μm.
- D. Hz.

<sup>48.</sup> The dimensions of a voxel may be calculated as the product of which of the following?

- A. Matrix size and pixel size
- B. Pixel size and section width
- C. DFOV and matrix size
- D. DFOV and pixel size

49. Which of the following corresponds to the full width at half maximum of the graph? See Fig.



50. Which of the following types of gas is commonly used for gas ionization CT detectors?

- A. Xenon
- B. Cadmium tungstate
- C. Helium
- D. Nitrogen

51. The computer technique used to reduce the size and storage requirements of digital CT image data is called:

- A. archival.
- B. compression.
- C. encryption.
- D. rendering.

52. For a given CT acquisition, the calculated mAs applied to each reconstructed slice may be referred to as the:

- A. effective mAs.
- B. peak mAs.
- C. absorbed mAs.
- D. constant mAs.

53. Which of the following formulas may be used to calculate the dimensions of a pixel?

- A. Pixel size = matrix size/DFOV
- B. Pixel size = DFOV X matrix size
- C. Pixel size = slice thickness/matrix size
- D. Pixel size = DFOV/matrix size

54. A CT image of a homogeneous material contains variations in CT number from pixel to pixel. This image is said to have:

- A. high contrast.
- B. sensitivity.
- C. definition.
- D. noise.

55. Which of the following is used in gas ionization CT detectors?

- A. Neon
- B. Xenon
- C. Helium
- D. Nitrogen

56. Which of the following acquisitions may be characterized as overlapping?

- A. 2.5-mm sections reconstructed every 1.25 mm
- B. 5.0-mm sections reconstructed every 7.5 mm
- C. 3.75-mm sections reconstructed every 3.75 mm
- D. 20-second cine acquisition with 1.25-mm sections
- 57. The artifact present is most likely caused by: See Fig.



- A. involuntary motion.
- B. aliasing.
- C. surgical staples.
- D. tube arcing.

58. Which of the following corresponds to the longitudinal dimension of the CT image voxel?

- A. x-axis
- B. y-axis
- C. z-axis
- D. Orthogonal axis

59. Which of the following mathematical techniques is used for the reconstruction of volumetric MDCT images?

- A. 180-degree interpolation (180LI)
- B. 360-degree interpolation (360LI)
- C. Back-projection
- D. Fourier reconstruction

60. Which of the following will serve to decrease the noise of a CT image?

- A. Decrease in dose.
- B. Decrease in slice thickness.
- C. Increase in matrix size.
- D. Decrease in matrix size.

61Which of the following azimuth settings was used to produce the localizer image? See Fig.



- A. 0 degrees
- B. 90 degrees
- C. 180 degrees
- D. 270 degrees

62The patient scanned in the image measured 38 cm across. An appropriate DFOV for the display of this image would be: See Fig.



- A. 34 cm.
- B. 40 cm.
- C. 44 cm.
- D. 48 cm.

63. The technique that provides the detail of the outer portions of the 3-D model while maintaining the typical CT detail of the lungs inside is called: See Fig.



A. maximum intensity projection (MIP).

- B. surface rendering.
- C. summed projection.
- D. voxel gradient.

<sup>64.</sup> Which of the following components of CT image quality is/are being evaluated? See Fig.

- 1. Linearity
- 2. Section width
- 3. Spatial resolution



- A. 1 only
- B. 1 and 2 only
- C. 2 and 3 only
- D. 1, 2, and 3

65. The Hounsfield value of a pixel is directly related to which of the following?

- A. Window width
- B. Field of view size
- C.  $\mu$  of H2O
- D. Window level

66. The ability of a CT system to maintain consistent Hounsfield values across the entire image of a homogeneous object is termed:

- A. linearity.
- B. calibration.
- C. uniformity.
- D. contrast resolution.

67. In multislice CT (MSCT), the beam pitch is equal to the table feed per rotation divided by the:

- A. number of detectors.
- B. pre-patient collimation.
- C. total collimation.
- D. number of channels.

68. Which of the following components of the CT system is the most common cause of ring artifacts on the reconstructed CT image?

- A. x-ray tube
- B. Collimator
- C. Slip-ring
- D. Detector
- 69. A voxel's dimension may be decreased by which of the following?
  - A. Decreasing the section width
  - B. Decreasing the matrix size
  - C. Increasing the section width
  - D. Increasing the DFOV

70. Which of the following manipulations involves the use of image data?

- A. Adjusting the width and level of a window setting
- B. Decreasing the DFOV
- C. Changing the algorithm selection
- D. Increasing the matrix size
- 71. When one is choosing a window to display a CT image, the width defines the:
  - A. midpoint of the range of pixels displayed.
  - B. range of CT numbers (pixels) to be displayed.
  - C. range of pixel values included in an ROI.
  - D. average CT number of the tissue of interest.

72. The process by which electrons are produced at the cathode of a CT x-ray tube is known as:

- A. rectification.
- B. anode heel effect.
- C. thermionic emission.
- D. isotropic emission.

73. The process of scanning a phantom device of known density to improve the accuracy of CT attenuation measurement may be referred to as:

- A. Hounsfield correction.
- B. linearity.
- C. uniformity.
- D. calibration.

74. Which of the following is not an iterative method of CT image reconstruction?

- A. Point-by-point correction
- B. Fourier transformation
- C. Simultaneous reconstruction
- D. Ray-by-ray correction
- 75. The streaking artifacts present were most likely caused by: See Fig.



- A. tube arcing.
- B. dental fillings.
- C. detector malfunction.
- D. insufficient technique.

76A straight line appearing vertically on the scanogram (pilot) of a fourthgeneration CT scanner is an artifact most likely caused by:

- A. edge gradient.
- B. detector malfunction.
- C. tube arcing.
- D. beam hardening.

77. The primary advantage of an isotropic MDCT data set is:

- A. reduced scan time.
- B. increased signal-to-noise ratio (SNR).
- C. improved raw data convolution.
- D. high-quality multiplanar reformations (MPRs).

78. Increasing the detector pitch during a spiral CT examination adversely affects the spatial resolution along which of the following?

- A. Axial plane
- B. x-axis
- C. y-axis
- D. z-axis

79. For single-slice CT (SSCT) systems, which of the following statements regarding retrospective image reconstruction is FALSE?

- A. The algorithm, matrix size, and DFOV may all be changed.
- B. The slice thickness and SFOV may be changed.
- C. Scan (raw) data must be available.
- D. Retrospective image reconstruction may be used to adjust the center of the image.

<sup>80.</sup> The ability of the CT system to reduce involuntary motion artifacts and provide CT images free of motion artifact is determined by which of the following components of image quality?

- A. In-plane spatial resolution
- B. Temporal resolution
- C. Longitudinal spatial resolution
- D. Contrast resolution

81. The volume of a voxel may be calculated by multiplying the pixel dimension (mm2) by the:

- A. display field of view (DFOV).
- B. section width.
- C. pitch.
- D. scan field of view (SFOV).

82. Which of the following technical parameters would greatly improve the quality of CT studies requiring multiplanar reformation (MPR) images?

- A. Noncontiguous scans
- B. Wide section thicknesses
- C. Contiguous scans with wide section thickness
- D. Overlapping scans with narrow sections

83. As a solid-state CT detector measures transmitted radiation, it emits a proportional response in the form of a(n):

- A. digital signal.
- B. quantity of gas ions.
- C. analog signal.
- D. modulation transfer function.

84. Two adjacent pixels are measured to have a difference of 1 HU. This amounts to a tissue density difference of approximately:

- A. 0.1%.
- B. 1.0%.
- C. 10%.
- D. 25%.

85. A CT image is reconstructed using a  $512^{2}$  matrix and a display field of view of 17 cm. What is the linear dimension of each pixel?

- A. 0.033 mm
- B. 0.33 mm
- C. 3.01 mm
- D. 30.1 mm

86. When one is using a third-generation CT scanner, it is important that reference detectors positioned at the peripheral portions of the detector array be exposed to:

- A. homogeneous radiation.
- B. unattenuated radiation.
- C. monochromatic radiation.
- D. remnant radiation.

87. Which of the following mathematical functions may be used to quantify the spatial resolution of a CT scanner?

- 1. PSF
- 2. MTF
- 3. LSF
- A. 2 only
- B. 1 and 2 only
- C. 2 and 3 only
- D. 1, 2, and 3

88. The human eye is capable of differentiating approximately \_\_\_\_\_\_ shades of gray.

- A. 10 to 25
- B. 60 to 80
- C. 100 to 120
- D. 250 to 256

89. The portion of the primary beam interacting with a single detector is known as a:

- A. ray.
- B. view.
- C. profile.
- D. sample.

<sup>90.</sup> What is the display field of view used for a 320<sup>2</sup> matrix image with a pixel dimension of 0.75 mm X 0.75 mm?

- A. 12 cm
- B. 24 cm
- C. 36 cm
- D. 48 cm

91. Which of the following technical adjustments may be employed to improve the temporal resolution of an MDCT system?

- 1. Decreased scan time
- 2. Decreased section width
- 3. Decreased DFOV
- A. 1 only
- B. 1 and 2 only
- C. 2 and 3 only
- D. 1, 2, and 3

92. The technique that allows the user to select the range of pixel values used in a3-D CT reformation is termed:

- A. thresholding.
- B. windowing.
- C. retrospective reconstruction.
- D. targeting.

93. A pixel may be defined as:

- A. the portion of the CRT displaying the image.
- B. a volume element.
- C. a picture element.
- D. a miniature image.

94. An MDCT image is reconstructed using a 512<sup>2</sup> matrix and a display field of view of 44 cm. If the detector collimation is set to a section width of 2.5 mm, what is the volume of each voxel?

- A. 0.21 mm<sup>3</sup>
- B. 1.85 mm<sup>3</sup>
- C. 2.15 mm<sup>3</sup>
- D. 3.36 mm<sup>3</sup>

95. Each 1.0% in contrast between adjacent objects amounts to a difference in pixel value of approximately:

- A. 3 HU.
- B. 10 HU.
- C. 25 HU.
- D. 60 HU.

96. Which of the following quality control tests should be performed daily on a CT scanner?

- 1. Check CT number calibration.
- 2. Examine noise levels (standard deviation) of a water phantom.
- 3. Test accuracy of laser localization device.
- A. 1 only
- B. 1 and 2 only
- C. 1 and 3 only
- D. 1, 2, and 3

97. Which of the following technical adjustments would decrease the quantum noise of a CT image?

- 1. Increase mAs.
- 2. Decrease section width.
- 3. Increase section width.
- A. 1 only
- B. 1 and 2 only
- C. 1 and 3 only
- D. 1, 2, and 3

98. The type of MSCT detector array that contains midline narrow elements flanked by wider detectors is called a(n):

- A. uniform matrix array.
- B. adaptive array.
- C. hybrid array.
- D. stationary array.

99. Which of the following may be used for the archival storage of CT images?

- 1. CD-ROM.
- 2. VHS tape
- 3. Magnetic optical disk
- A. 1 only
- B. 1 and 3 only
- C. 2 and 3 only
- D. 1, 2, and 3

100. What is the maximum number of line pairs per centimeter (lp/cm) the smooth algorithm can demonstrate?



D. 9.0

101 Soft copies of CT images are stored on which of the following media?

- 1. Hard drives
- 2. Magnetic optical disk
- 3. Laser film
- A. 3 only
- B. 1 and 2 only
- C. 1 and 3 only
- D. 2 and 3 only

102. CT images that have been reconstructed from a portion of the data acquisition process in the hopes of reducing patient motion artifacts are called:

- A. dynamic images.
- B. subtraction images.
- C. segmented images.
- D. filtered images.

103. Which of the following factors has no measurable effect on spatial resolution?

- A. Focal spot size
- B. kVp
- C. Detector sampling frequency
- D. Matrix size

104. The largest deterrent of a CT scanner's contrast resolution is:

- A. patient motion.
- B. noise.
- C. hardware malfunction.
- D. beam hardening.

105. The type of compensating filter used at the x-ray tube of a CT scanner is called a:

- A. kernel.
- B. water bath.
- C. bow-tie filter.
- D. wedge filter.

106. Which of the following components of CT image quality may be controlled by the technologist?

- 1. Spatial resolution
- 2. Contrast resolution
- 3. Noise
- A. 2 only
- B. 3 only
- C. 1 and 3 only
- D. 1, 2, and 3

<sup>107.</sup> \_\_\_\_\_\_ is the term used to describe the ability of a PACS to transmit data from the imaging facility to an off-site location.

- A. Encryption
- B. DICOM
- C. HL7
- D. Teleradiology

108. Which of the following technical factor adjustments will result in a reduction in patient radiation dose?

- A. Increase milliamperage (mA).
- B. Decrease detector pitch.
- C. Increase scan time.
- D. Decrease milliamperage (mA).

109. The Digital Imaging and Communications in Medicine (DICOM) protocol was developed to:

- A. protect patient confidentiality.
- B. reduce patient radiation dose from CT imaging.
- C. standardize the networking and storage of digital images.
- D. increase the availability of cardiac CT.

110. Which of the following adjustments in technical factors will result in an increase in spatial resolution?

- A. Increase in tube filament.
- B. Increase in sampling frequency.
- C. Increase in section width.
- D. Increase in display field of view (DFOV).

111. The ROI measures -987 HU. This phantom insert most likely represents: See



- A. bone.
- B. acrylic.
- C. polyethylene.
- D. air.

112. A voxel whose attenuation coefficient is less than that of water is assigned a pixel value with a(n) \_\_\_\_\_\_ CT number.

- A. positive
- B. extremely large
- C. negative
- D. invalid

113. Which of the following reduces the scatter radiation reaching the detectors?

- A. Post-patient collimation
- B. Pre-patient collimation
- C. Pre-detector collimation
- D. Both a and c

114. The term beam hardening is used to describe which of the following physical phenomena?

- A. The decrease in average photon energy of a heterogeneous x-ray beam
- B. The increase in average photon energy of a homogeneous x-ray beam
- C. The increase in average photon energy of a heterogeneous x-ray beam
- D. The decrease in average photon energy of a homogeneous x-ray beam

115. Which of the following is the primary interaction between x-ray photons and tissue during computed tomography?

- A. Bremsstrahlung
- B. Characteristic
- C. Compton effect
- D. Coherent scatter

116. Which of the following is capable of causing an edge gradient artifact?

- A. Detector malfunction
- B. Involuntary patient motion
- C. Dense bone
- D. Tube arcing

117. Which of the following would increase the signal-to-noise ratio of a CT image?

- A. Decreased aperture size
- B. Decreased mAs
- C. Increased filtration
- D. Increased aperture size

118. The full width at half maximum (FWHM) of a slice sensitivity profile diagram indicates the:

- A. limiting resolution.
- B. signal-to-noise ratio (SNR).
- C. dose profile.
- D. effective section width.

119. The approximate inherent filtration of the CT x-ray amounts to an aluminum equivalent of:

- A. 1.2 mm.
- B. 3.0 mm.
- C. 5.8 mm.
- D. 10.0 mm.

120. Which of the following steps could be taken to reduce the artifact? See Fig.

- 1. Reduce section thickness.
- 2. Angle gantry around fillings.
- 3. Decrease kVp.



- A. 1 only
- B. 2 only
- C. 3 only
- D. 2 and 3 only

121. During CT angiography, images may be reconstructed using only the greatest density encountered along each ray. This type of specialized CT image is called a(n):

- A. 3-D model.
- B. volume-rendered image.
- C. MIP image.
- D. surface-rendered image.

122. Which of the following technical adjustments would result in a decrease in the signal-to-noise ratio (SNR)?

- A. Reducing the section width
- B. Decreasing the detector pitch
- C. Selecting a smooth algorithm over a bone algorithm
- D. Increasing in the display field of view (DFOV)

123. Which of the following is the most likely cause of the inferior quality of the image shown? See Fig.



- A. Beam hardening
- B. Detector malfunction
- C. Insufficient patient radiation dose
- D. Incorrect SFOV

124. The number, length, and organization of the individual detector elements in an MSCT system are referred to as the:

- A. detector configuration.
- B. array pitch.
- C. CT generation.
- D. detector pitch.

125. The ability of a CT scanner to image a small high-density object is controlled by the \_\_\_\_\_\_ of the scanner.

A. contrast resolution

- B. spatial resolution
- C. sensitivity
- D. both a and c

126. Phantom measurement of the uniformity of a CT system is performed primarily to assess the negative effects of:

- A. partial volume averaging.
- B. noise.
- C. detector drift.
- D. beam hardening.

127. Which of the following term(s) is/are commonly used to describe a CT scanner's ability to differentiate objects with similar linear attenuation coefficients?

- 1. Spatial resolution
- 2. Sensitivity
- 3. Contrast resolution
- A. 1 only
- B. 3 only
- C. 1 and 2 only
- D. 2 and 3 only

128. Which of the following types of algorithms would be best suited to demonstrate the bony details of the shoulder joint in the figure? See Fig.



- A. High spatial frequency
- B. Soft tissue
- C. Standard
- D. Low spatial frequency

129. What is the dimension of each pixel in the matrix of an image with the following parameters?

FOV = 25.6 cm Matrix = 512 mm X 512 mm

- A. 0.5 mm
- B. 0.5 cm
- C. 0.05 cm
- D. Both a and c

130. The streaking artifact present is most likely because of: See Fig.



- A. detector malfunction.
- B. tube arcing.
- C. beam hardening.
- D. out-of-field errors.

131. Which of the following matrices would provide the greatest spatial resolution?

- A. 256 × 256
- B. 320 × 320
- C. 512 × 512
- D. 1024 × 1024

132. Which of the following CT image archival media is capable of storing the greatest amount of information?

- A. Magnetic tape
- B. 5-inch floppy disk
- C. 3-inch floppy disk
- D. Magnetic optical disk

133. In 1917, Austrian mathematician \_\_\_\_\_\_ proved that it was possible to reconstruct a three-dimensional object from the infinite set of all of its projections.

- A. Radon
- B. Tsien
- C. Bracewell
- D. Cormack

134. For a single-slice CT (SSCT) system, which of the following statements regarding pre-patient collimation is true?

1. An increase in pre-patient collimation increases patient radiation dose.

2. Pre-patient collimation is used to focus radiation through the section of interest.

3. Pre-patient collimation directly controls slice thickness.

- A. 2 only
- B. 3 only
- C. 1 and 2 only
- D. 2 and 3 only

135. A CT scanner capable of producing an image that is a perfect reproduction of the actual anatomic section is said to have an MTF of:

- A. 0.
- B. 1.
- C. 10.
- D. 100.

136. Areas of a CT image containing abrupt changes in tissue density are electronically represented by:

- A. positive CT numbers.
- B. high spatial frequencies.
- C. negative CT numbers.
- D. low spatial frequencies.

137. Which of the following would increase the noise apparent on a CT image?

- A. Increase in mAs
- B. Decrease in aperture size
- C. Increase in filtration
- D. Decrease in matrix size

138. Which of the following technical factors exhibit an effect upon longitudinal spatial resolution?

- 1. Detector collimation
- 2. Detector pitch
- 3. Interpolation algorithm
- A. 1 only
- B. 2 only
- C. 2 and 3 only
- D. 1, 2, and 3

139. The typical range for possible pixel values in a modern CT system is between:

- A. -512 HU and +512 HU.
- B. -1000 HU and +1000 HU.
- C. -1024 HU and +3071 HU.
- D. -4096 HU and +4096 HU.

<sup>140.</sup> The graph is used to evaluate which of the following components of CT image quality? See Fig.



- A. Spatial resolution
- B. Signal-to-noise ratio (SNR)
- C. Temporal resolution
- D. Contrast resolution

141. The component of the DAS responsible for strengthening the signal emitted from a detector is termed the:

- A. digital-to-analog converter (DAC).
- B. preamplifier.
- C. high-resolution comb.
- D. bow-tie filter.

142. Which of the following archival media is capable of storing the largest number of CT images?

- A. Floppy disk
- B. Magnetic tape
- C. VHS tape
- D. Optical disk

143. The average CT value for blood is approximately:

- A. -50 HU.
- B. 0 HU.
- C. +45 HU.
- D. +100 HU.

144. Which of the following window levels was most likely used to display the image shown? See Fig.



- A. -700 HU
- B. 0 HU
- C. +50 HU
- D. +250 HU

145. Which of the following is used to archive a hard copy of a CT image?

- A. Laser film
- B. PACS
- C. CD-ROM
- D. LAN