CHAPTER ONE: CT: AN OVERVIEW

1. “Tomography” is derived from the Greek word, tomos, which means:
A flat       B section       C instant       D spiral

2. Images are usually recorded on xray film because of ——— compared with that of instant film.
A its wider gray scale       B its lower price       C its greater accessibility       D its greater size selection

3. Dr. ——— developed the fist whole-body CT scanner.
A Smith       B Ledley       C Mumbai       D Chen

4. In conventional CT the patient is scanned ——— slice(s) at a time.
A 4       B 3       C 2       D 1

5. Outside the patient diagnostic uses with CT, ——— investigated its use in sawmill.
A Robertson       B Williams       C Funt and Bryan       D Rossi

6. In ——— the U.S. FDA approved real-time CT fluoroscopy as a clinical tool for use in radiology.

7. Current 64-slice MSCT scanners are capable of shorter than ——— second scan times.
A 60       B 40       C 30       D 20

CHAPTER TWO: INTRODUCTION TO COMPUTERS

8. ——— refers to the physical components of a computer.
A Hardware       B Software       C Peripherals       D HTML

9. Regarding computer processing, ——— refers to the use of two or more connected processing units.
A parallel processing       B multiprocessing       C pipelining       D serial processing

10. In computing, ——— refers to information entered into a computer for processing.
A output       B input       C storing       D transmitting

11. Regarding computer memory, RAM stands for ——— memory.
A random acquisition       B real automated       C random-access       D real access

12. Regarding magnetic tape storage, the amount of data that can be stored on the tape is called its:
A unit capacity       B file load       C data bin       D density

13. Regarding data transmission media, the baud rate refers to the number of discrete signal elements (bauds) transmitted per second.
A True       B False

14. In radiology, PACS stands for picture ——— and communications systems.
A attributes       B assessment       C archiving       D accessing

CHAPTER THREE: DIGITAL IMAGE PROCESSING

15. As a radiation detector, film-screen cannot show differences in tissue contrast that are less than ——— %.
A 20       B 17       C 14       D 10

16. If both the input image and output image are discrete, this is referred to as ——— processing.
A analog       B digital       C computed       D protected

17. Pixels in a digital image represent the information contained in a ——— of tissue in the patient.
A length       B width       C depth       D volume

18. The second step in image digitization is ———, which measures the brightness of each pixel in the entire image.
A scanning       B sampling       C quantization       D classification

19. Regarding image compression, ——— compression provides no loss of any information in the image when the image is decompressed.
A lossless       B lossy       C loosey       D lousaunt

20. In ——— operations, the entire input image is used to compute the value of the pixel in the output image.
A global       B geometric       C standard       D international
21. Regarding image processing hardware, the external image processor is responsible for high-speed processing of the input digital data.
   A True B False

22. The immediate goal of tomography is to eliminate structures ——— the focused section.
   A only above B only below C above and below D to the sides of

23. Regarding CT radiation beams, a heterogeneous beam is also known as a ——— beam.
   A differentiated B variable C monochromatic D polychromatic

24. Conversion of attenuation readings into a CT image is accomplished with what is called ——— algorithms.
   A recurring B reconstruction C reassembling D simple

25. The original CT images were composed of a(n) ——— matrix for a total of 6400 pixels.
   A 320 X 20 B 128 X 50 C 100 X 64 D 80 X 80

26. The pixel size in a CT image can be computed with the FOV (field of view) and matrix size as follows: pixel size equals:
   A matrix size/FOV B FOV/matrix size C FOV x matrix size D FOV/matrix size/2

27. ——— generation scanners were based on the fan beam geometry and translate-rotate motion.
   A First B Second C Third D Fourth

28. First generation CT scanners took at least ——— minutes to produce a complete scan of the patient.
   A 2 to 2.5 B 3 C 3.5 D 4.5 to 5.5

29. The sixth generation, dual source CT scanner consists of two xray tubes and two sets of detectors that are offset by ——— degrees.
   A 90 B 45 C 55 D 70

30. CT scanners use ——— phase power for the efficient production of xrays.
   A two B four C five D three

31. The working life of an CT x-ray tube can range from ——— hours.
   A 10,000 to 40,000 B 1,000 to 4,000 C 100 to 400 D 100,000 to 400,000

32. Filtration of the xray beam increases the mean energy, making it more monochromatic. This is referred to as ——— of the beam.
   A softening B stretching C hardening D disruption

33. The detector in a CT scanner measures the transmitted xrays from the patient and converts them into ——— energy.
   A kinetic B electrical C mechanical D thermal

34. To construct a single CT image, the xray tube and detectors must rotate around the patient for at least ——— degrees.
   A 45 B 90 C 135 D 180

35. ——— is a digital image processing technique to modify images through a filter function.
   A Interpolation B Convolution C Attenuation D Differentiation

36. ——— are the result of preprocessed scan data and are subjected to the image reconstruction algorithm used by the scanner.
   A axial images B 3D images C 2D images D raw data

37. The beam emitted from a four-detector row MSCT scanner is called a ——— beam.
   A cone B cylinder C tube D linear

38. The computer system receives ——— data from the DAS and processes it to reconstruct an image of the cross-sectional anatomy.
   A digital B raw C preprocessed D short

39. The ——— is a mounted framework that surrounds the patient in a vertical plane.
   A generator B xray tube C gantry D patient table

40. ——— are programs that control the hardware components and the overall operation of the computer.
   A Operating systems B Convolution processor C Reconstruction processor D Preprocessing unit

41. The ——— allows system parameters such as scan setup and control parameters to be actuated without typed keyboard commands.
   A floating keyboard B touch panel C image display D optical disk drive
42. The range of the CT numbers in the image is referred to as the window:
A height  B circumference  C diameter  D width

43. Air is assigned a CT number of:
A 1,000  B 500  C -500  D -1,000

44. Preset windows are available on scanners to _______ windowing.
A optimize  B increase  C eliminate  D reduce the need to learn

45. The sagittal image defines a plane that divides the body into _______ sections.
A top and bottom  B front and back  C right and left  D diagonal

46. 3D imaging in CT belongs to a class of digital image processing referred to as image:
A combination  B synthesis  C integration  D meshing

CHAPTER NINE: IMAGE QUALITY

47. Regarding resolution factors, operators may use a small x-ray focal spot. This offers a lower tube current with higher spatial resolution.
A True  B False

48. Although radiography can discriminate a density difference of about 10%, CT can do the accomplish the same from:
A 0.8% to 1.2%  B 1% to 2%  C 7% to 8%  D 0.25% to 0.5%

49. _______ resolution is an indication of a CT scanner’s ability to freeze motions of the scanned object.
A Permanent  B Temporal  C Close gap  D Quick

50. Regarding cardiac CT, the advantage of prospective gating is the _______ for the patient.
A reduction in x-ray dose  B faster scan time  C shorter breath-hold times  D resultant lower cost

51. A(n) _______ is a distortion or error in an image that is unrelated to the subject being studied.
A image noise  B scattered x-ray  C image streak  D artifact

52. _______ artifacts often appear near objects of high densities and can be caused by beam hardening, partial volume averaging, etc.
A Electrical  B Branch  C Shading  D Spot

53. _______ artifacts are caused by incomplete or insufficient projection samples as a result of the cone-beam geometry of multislice CT.
A Scatter  B Shading  C Cone-beam  D Noise-induced

CHAPTER TEN: RADIATION DOSE IN CT

54. The radiation dose refers to the amount of energy _______ the patient.
A that passes through  B that enters  C absorbed by  D that exits

55. _______ effects are those effects for which the probability of the effect occurring depends on the dose.
A Deterministic  B Stochastic  C Latent  D Chance

56. A(n) _______ is an instrument used to accurately quantify radiation exposure.
A radiation badge  B ionization chamber  C control panel  D intensifier

57. The _______ determines the penetrating power of the photons coming from the x-ray tube.
A constant mAs  B effective mAs  C mGy/mAs  D kVp

58. AEC (automatic exposure control) is _______ on CT scanners.
A now commonplace  B not possible  C no longer utilized  D in development

59. In CT, ATCM (automatic tube current modulation) refers to the automatic control of the mA in _______ directions of the patient.
A two  B three  C four  D five

60. To reduce the noise in an image by a factor of 2 requires an increase in the dose by a factor of:
A 2  B 3  C 4  D 5

CHAPTER ELEVEN: SINGLE-SLICE SPIRAL / HELICAL CT...

61. Regarding conventional CT, some degree of anatomy may be missed due to inconsistent levels of inspiration – called slice-to-slice:
A misrepresentation  B misalignment  C misregistration  D mismeasurement
62. In volume scanning, transporting the patient too quickly through the scanner leads to image degradation caused by:
A fogging  B motion artifacts  C inaccurate data  D scatter radiation

63. The x-ray tube and detectors rotate _______ during data collection.
A once per second  B twice per second  C five times per second  D continuously

64. During a scan, the volume coverage equals pitch times:
A slice thickness  B scan time  C gantry angulation  D kVp

65. In a CT scan, collimation determines:
A table speed  B patient dose  C slice thickness  D noise level

CHAPTER TWELVE: MULTISLICE SPIRAL / HELICAL CT...

66. In a scanner, the radiation sensors convert x-ray photons to:
A electrical energy  B heat  C light  D an image

67. In a scanner, the photodiodes convert light into:
A an image  B electrical current  C heat  D mechanical energy

68. Compared with single-slice volume CT, the dual-slice whole-body fan-beam CT reduces scan time by _______ %.
A 15  B 25  C 40  D 50

69. Regarding beam geometry, the beam becomes _______ as the number of detector rows in a multirow detector array increases.
A wider  B more narrow  C longer  D shorter

70. In multislice CT, the z-gap is determined by the pitch and by the:
A gantry angulation  B table speed  C detector row spacing  D collimation

71. _______ describes the number of data collection channels and the effective section thickness determined by the DAS setting.
A linear array detectors  B rebinning  C detector configuration  D fixed-array detectors

72. When the slice thickness is equal to the pixel size, all dimensions of the voxel are equal. The data set acquired is said to be:
A anisotropic  B isotropic  C nonisotropic  D nonanisotropic

73. The first model of the 256-slice 4D scanner was developed in:
A Brazil  B the US  C Sweden  D Japan

CHAPTER THIRTEEN: OTHER TECHNICAL APPLICATIONS OF CT...

74. CT _______ is the use of CT in obtaining 3D imaging of vascular structures with an intravenous injection of contrast medium.
A interventional radiology  B arthroscopy  C IVP  D angiography

75. CTA (computed tomographic angiography) is a 3D examination. Overlying structures may be eliminated by:
A postprocessing  B utilizing an optimal kVp level  C special software in real-time  D certain positioning techniques

76. _______ refers to the viewing and evaluation of the images in the axial data set by panning through the set of images.
A CT fluoroscopy  B interactive cine  C CT angiography  D Multiplanar reconstruction

77. Operators standing in the CT room during the procedure must wear protective apparel of at least _______ mm lead equivalent.
A 0.05  B 0.1  C 0.5  D 0.9

78. CT _______ is a geometric simulation process that provides beam arrangements and treatment fields without any dosimetric information.
A arranging  B miming  C simulation  D preplanning

79. Regarding the process referred to in question 78, image registration occurs _______ image fusion.
A before  B after  C during  D in lieu of

80. Before the actual CT scan is performed, a(n) _______ must be obtained as a prescan localization image.
A scout view  B initial axial image  C ultrasound  D CTA

CHAPTER FOURTEEN: THREE-DIMENSIONAL CT...

81. The purpose of 3D imaging is to use the vast amounts of data collected from the patient to provide _______ information.
A only qualitative  B only quantitative  C no qualitative / quantitative  D qualitative and quantitative

82. The generation of a 3D object using computers is called:
A shading  B modeling  C lighting  D transforming
83. ______ is a computer program that converts the anatomical data collected from the patient into the 3D image on the computer screen.

A Modeling  B Shading  C Rendering  D Lighting

84. With patient motion, final 3D images can have the appearance of step-like contours known as the ______ artifact.

A ridged  B escalator  C erosion  D staircase

85. Regarding volume rendering, one purpose of ______ is to assign different brightness levels or color.

A rendering  B preprocessing  C shading  D transformation

86. Virtual endoscopic images are based on both 2D and 3D CT image data sets by using a technique known as ______ volume rendering.

A perspective  B vantage  C panorama  D context

87. Regarding stand-alone workstation 3D processing techniques, ______ allows two tissue types to be viewed at the same time.

A disarticulation  B virtual reality imaging  C slice plane mapping  D surface / volume rendering

88. A typical CT colonoscopy imaging examination may generate ______ images.

A about 200  B about 400  C about 500  D over 1,000

89. 4D angiography provides 3D images with a fourth dimension, opacity.

A True  B False

90. With virtual bronchoscopy, the viewing direction is unrestricted. However, with real bronchoscopy, only ______ views are possible.

A lateral  B back  C superior / inferior  D frontal

91. A positron has the same mass as a(n) ______ but a positive rather than a negative charge.

A neutron  B proton  C electron  D quark

92. After a positronium annihilates, the resulting photon pair's energy may be determined by using Einstein’s equation - which is:

A \( E=mc^2 \)  B \( E=m^2c \)  C \( E=mc \)  D \( E=m^2c^2 \)

93. Regarding correcting for PET scan emission imaging, an initial ______ scan is needed to acquire a transmission scan.

A scout  B blank  C reference  D zero

94. Hybrid PET/CT scanners were introduced in:

A the 1980s  B the 1990s  C 2001  D 2002

95. In a PET/CT scan, the CT scan is acquired first and can take less than one minute. However, the PET scan can take ______ to acquire.

A 5 to 10 minutes  B 12 to 18 minutes  C 20 to 40 minutes  D 1 to 2 hours

96. When a traumatic brain or facial injury is suspected, CT provides rapid information about contusions. A contusion is a:

A brain bleed  B cerebral blood clot  C type of stroke  D brain bruise

97. Orbital CT scan images should always be available in at least two planes, transverse and:

A coronal  B sagittal  C axial  D horizontal

98. A delay of ______ between injection and acquisition of images of the entire brain increases visualization of the jugular veins.

A 1 hour  B 30 minutes  C 2 minutes  D a few seconds

99. Enlargement of the ______ gland as a result of a goiter is a frequent incidental finding when the neck is imaged for any reason.

A pineal  B thyroid  C thymus  D pituitary

100. In the vast majority of CT exams, the patient is required to lie in a ______ position.

A prone  B supine  C left lateral  D semi-rotated

101. In imaging the neck, ______ is used help distinguish blood vessels from lymph nodes.

A barium  B IV contrast  C simethicone  D hyoscyamine

102. Almost all mediastinal abnormalities detected on chest radiographs (typically suspected masses) can be confirmed with:

A ultrasound  B nuclear medicine  C CT  D fluoroscopy
103. CT can reliably identify significant coronary stenosis in vessels as small as ——— with a sensitivity of 94% to 95%.
A 4mm  B 3.2mm  C 2.1mm  D 1.5mm

104. The ——— is the most commonly injured solid organ in the abdomen, which is commonly diagnosed with contrast-enhanced CT.
A spleen  B liver  C stomach  D gallbladder

105. Angiomyolipomas have a characteristic CT appearance demonstrating areas of ——— attenuation.
A bony  B fatty  C air pocket  D watery

106. ——— has largely replaced standard catheter angiography for the diagnosis of peripheral vascular disease.
A CT calcium scoring  B CT enterography  C CT angiogram (CTA)  D PET/CT

107. Regarding IV CT exams, a mechanical injector is mandatory for the use of injection rates as high as ——— ml per second.
A 1 or 2  B 3 or 4  C 5 or 6  D 0.5

108. According to the text, using renal CT to further characterize a renal mass or to stage a tumor is best done with a ——— phase study.
A single-  B two-  C three-  D four-

109. With MDCT sedation is ——— required for routine head and sinus studies, where some motion is tolerable.
A never  B always  C most of the time  D rarely

110. The dose of contrast material for children is 2 to 3 ml/kg to a maximum of ——— ml.
A 150  B 200  C 250  D 350

111. Pediatric exams of the head, neck, and spine are routinely performed with CT or MRI except for the neonate, where ——— is used.
A PET/CT  B ultrasound  C nuclear medicine  D fluoroscopy

112. Placing the patient ——— may be less intimidating for young children.
A feet first  B head first  C prone  D on the side

113. ——— CT exams can be used to evaluate renal stones.
A Three-phase  B Noncontrast  C Barium  D IV contrast

114. Osseous infections are best evaluated using ——— or MRI.
A ultrasound  B plain radiographs  C bone scan  D CT

115. Regarding pediatric CTA, power injection with a rate of at least ——— ml per second is strongly recommended.
A 0.5  B 1  C 1.5  D 2

116. Ideally, QC should be performed between each patient; however, it would be prudent to perform certain quick tests on a ——— basis.
A daily  B weekly  C bi-weekly  D monthly

117. In testing for CT number calibration, the expected results for the CT number of water should be:
A very close to zero  B 100  C 500  D 1,000

118. In testing for low-contrast resolution, the minimum size of holes visualized ——— over the life of the scanner.
A should increase  B should decrease  C should not increase  D will always fluctuate

119. In testing for hard copy output, adjust the display contrast so that both ——— patches are visible.
A 50% and 75%  B 33% and 66%  C 10% and 90%  D 95% and 100%

120. In testing for light field accuracy, acceptance limits for the light field should be coincident with the radiation field to within 5mm.
A True  B False
Computed Tomography Course Post-Test Answer Sheet

Fill in each blank. There are two options to submit the post-test.

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