放射線機器管理士測驗

Medical Imaging and Radiologic Systems Manager

2024 年 8 月 24 日星期六

1. 除題意不清楚或是圖片有問題，禁止詢問與試題有關的問題。

2. 應答時禁止使用任何文件。

3. 請在電腦答案卡上圈選作答

項目	**填寫內容**
姓名	**您的中文與英文姓名**
試題名稱	**MRSM Test**
項目	不用填寫
科目	不用填寫
受試者識別代碼	您的准考證號碼 **24XXX** 請填寫准考證後 5 碼，將您選定之數字的圓圈塗滿。
科目代碼	不用填寫
地點代碼	不用填寫
作答方式	本測驗共有 90 題問題。請使用 1 到 90 作答欄位。 請將測驗卷 Q1 的答案填入答案卷的答案選擇 1。Q2 = 答案選擇 2，Q3 = 答案選擇 3…Q90 = 答案選擇 90。

MRSM 2024

1. Which of the following device is not a part of quality assurance in ultrasound system?
   (A) AIUM 100 mm test object
   (B) Tissue Equivalent Phantom
   (C) Biopsy Phantom
   (D) Doppler Phantom
   (E) Slice sickness Phantom

2. As a supervisor, what should you do in response to complaints of poor clinical image quality by a single sonographer?
   (A) Investigate if the problem is associated with a particular transducer or sonographer?
   (B) Ignore them
   (C) Fire this sonographer
   (D) Call for the service
   (E) Purchase a new scanner

3. Ultrasound quality testing indicates that the distance measurements in the horizontal direction are not accurate. What is the most likely cause?
   (A) Velocity calibration is not 1540 m/s
   (B) Geometric distortion from nonlinear propagation
   (C) High-frequency components associated with broadband transducer
   (D) Highly attenuation
   (E) Problems with beam steering

4. Ultrasound tissue-mimicking phantoms are unable to evaluate:
   (A) Slice thickness
   (B) Axial resolution
   (C) Temporal resolution
   (D) Lateral resolution
   (E) Direction of flow

5. Using a tissue equivalent phantom, a sonographer adjusts the gain so that reflections on the display change from fully bright to barely visible. What is the sonographer evaluating?
   (A) Range Calibration
   (B) Depth
   (C) Dead zone
   (D) Sensitivity
   (E) All of the above

6. Describes the system's ability to display similar reflectors in the ultrasound phantom with echoes of equal brightless called:
   (A) Uniformity
   (B) Dynamic range
   (C) Axial resolution
   (D) Attenuation
   (E) Focal zone

7. 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

8. Which of the following is correct about the pixel size?
   (A) Pixel size = phase encoding number/matrix
   (B) Pixel size = frequency encoding number/matrixMinimum intensity
   (C) Pixel size = matrix/FOV
   (D) Pixel size = matrix/sampling rate
   (E) Pixel size= phase encoding number/matrix

9. Which is the kind of material for passive magnetic shielding?
   (A) Cu
   (B) Fe
   (C) Al
   (D) Co
   (E) Gd

10. Which method could not be used to remedy the aliased artifact?
   (A) Parallel imaging
   (B) Using pre-saturation bands on areas outside the FOV
   (C) Increased FOV
   (D) Switching the phase and frequency directions
   (E) All of the above

11. In PACS, large-matrix display stations (for DR or CR) have all of the following except:
   (A) A magnification function
   (B) Interactive window and level function
   (C) Ability to measure the linear attenuation coefficient accurately
   (D) Ability to invert the gray scale value of the image

12. The Larmor frequency is the frequency of:
   (A) Pulse repetition
   (B) Nuclear precession
   (C) Phase encoding
   (D) Spatial encoding
   (E) TR

13. The resonance frequency for ^{1}H in a 1.5 T magnetic field is:
   (A) 63 Hz
   (B) 63 kHz
   (C) 63 MHz
   (D) 63 GHz
   (E) 63 THz

14. 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)

15. In spin-echo imaging, the echo signal normally is measured:
   (A) Immediately ($t = 0$)
   (B) After time TE
   (C) After time 4 × T1
   (D) After T2
   (E) After T2*

16. 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

17. 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

18. 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

19. Common MR angiography techniques are based on:
    (A) Phase contrast
    (B) Phase encoding
    (C) T1 contrast
    (D) Spatial encoding
    (E) Time to inversion

20. 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

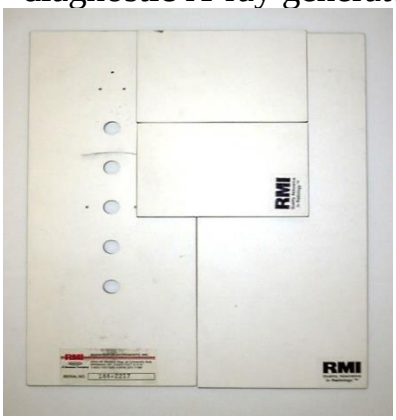
21. The minimum HVL for x-ray units operating at 80 kVp, 50 mAs is___ mm of aluminium
    (A) 1.3
    (B) 1.8
    (C) 2.3
    (D) 2.8
    (E) 3.

22. A major problem with automatic exposure control is:
    (A) backup time often interferes with the exposure
    (B) it is inefficient when high mAs is used
    (C) it does not workwell as short exposure time
    (D) positioning of the part is critical
    (E) None of the above

23. The maximum variability allowed for the reproducibility of exposure at 80 kVp, 10mAs is ±___%
    (A) 5
    (B) 10
    (C) 15
    (D) 20

24. The ability of an imaging system to vrete separate image of closely spaced objects is known as:
(A) screen speed
(B) quantum
(C) quantum mottle
(D) contrast resolution
(E) temporal resolution

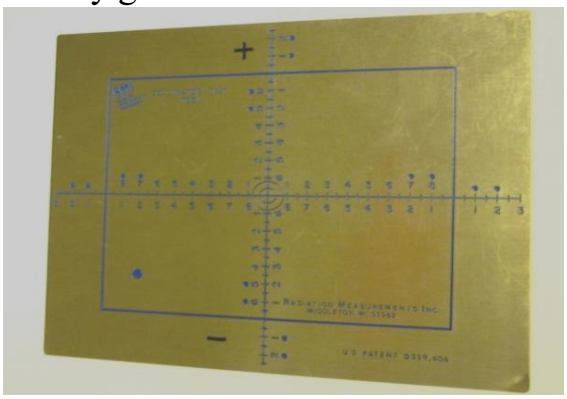
25. What is the purpose of these tools in quality measurement of diagnostic X-ray generator?



(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?

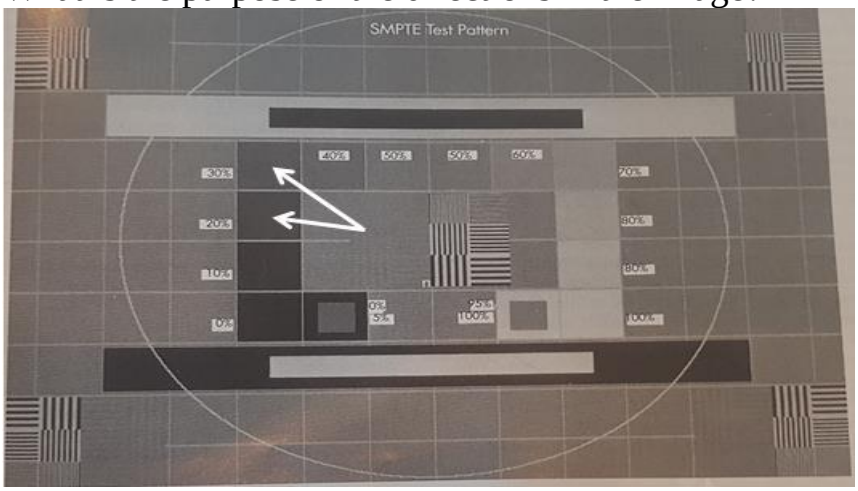


(A) Focal spot test
(B) Grid alignment test
(C) Low - contrast test
(D) Beam – Light field test
(E) Depth test

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

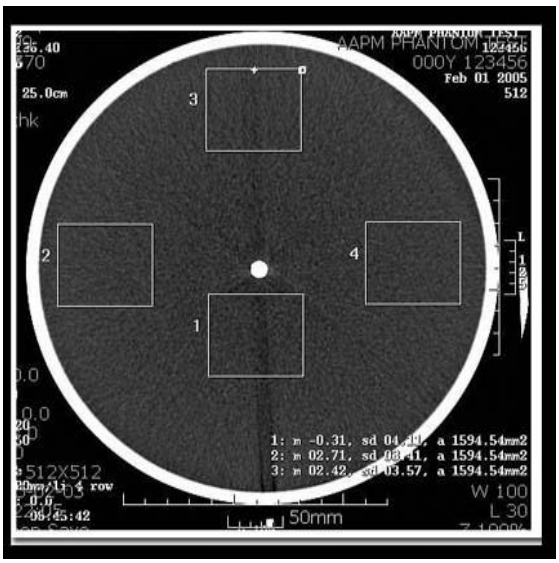
29. What is the purpose of the directions in the image?



(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

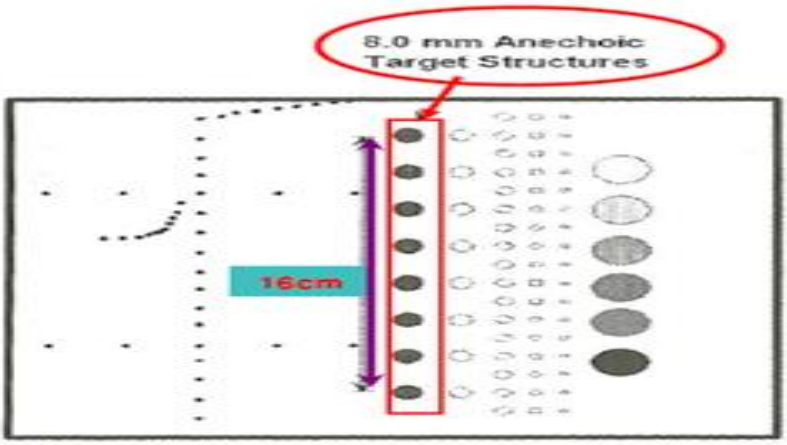
31. What is this CT image for?



(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 heteroheneity
    (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
(C) Data acquisition rate
(D) Patient dose
(E) Scan field

41. CT fluoroscopy minimizes radiation doses by using lower:

(A) Voltage
(B) Current
(C) Collimator thickness
(D) Patient table
(E) Filtration

42. Theoretically best possible CT resolution for a 512^2 matrix and 25 cm FOV is:

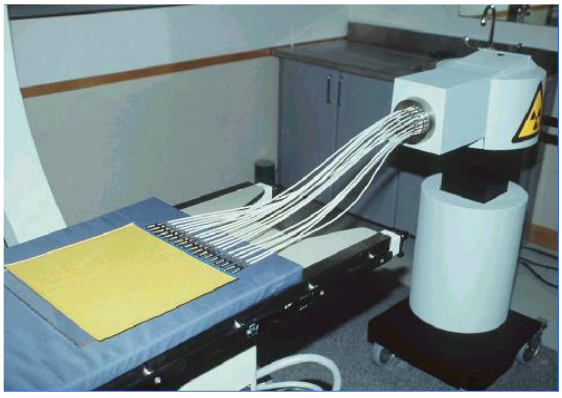
(A) 0.5 lp/mm
(B) 1.0 lp/mm
(C) 2.0 lp/mm
(D) 5.0 lp/mm
(E) 7.0 lp/mm

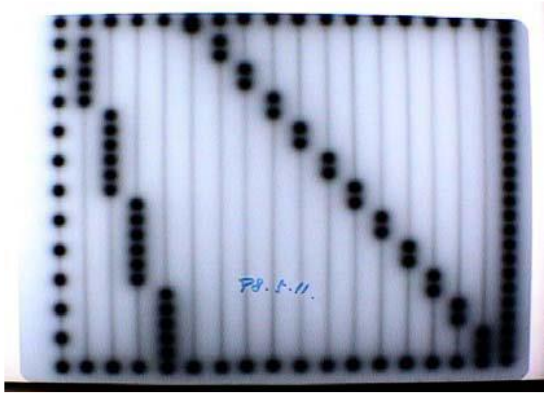
43. Which of the following is incorrect for the quality management of device?

(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

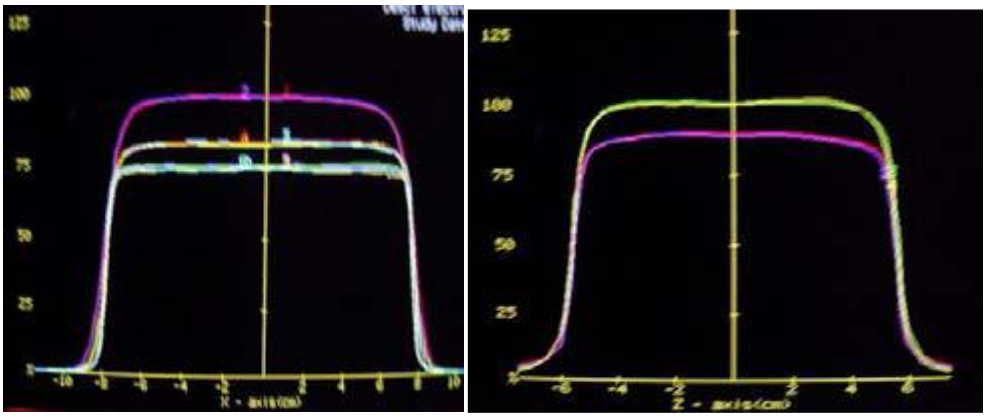




46. Which of the following is correct about next figure?

(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. MQSA stands for:
(A) Medical Quality Site Accreditation
(B) Mammography Quantity Select Aid
(C) Medical Query System Association
(D) Mammography Quality Standards Act
(E) Medical Quality System Aid

49. A 64-slices CT scanner can obtain sixty-four 0.625 mm wide slices in a single 0.5 second axial acquisition. How many 5 mm wide slices can it obtain in a single 1.0 second axial acquisition?

(A) 8
(B) 16
(C) 64
(D) 128
(E) 256

50. What is the ACR CT accreditation program reference dose for routine adult abdomen CT scan?

(A) 60 mGy
(B) 45 mGy
(C) 35 mGy
(D) 25 mGy
(E)10 mGy

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 $CTDI_w$?

(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 × 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. Choose the correct range of total filtration for X-ray equipment with a nominal maximum tube voltage of 150 kV or less.
(A) 1.5 mmAl or more
(B) 2.0 mmAl or more
(C) 2.5 mmAl or more
(D) 3.0 mmAl or more
(E) 3.5 mmAl or more

65. Radiographic kVp variance should be evaluated:
(A) daily
(B) weekly
(C) monthly
(D) semiannually
(E) annually

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 foe 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

76. A department performs a total of 1720 views per month; 146 views must be repeated. What is the repeat rate of this department?
(A) 1.5%
(B) 4.2%
(C) 5.7%
(D) 8.5%
(E) 11.1%

77. A quality management program should encourage:
(A) staff innovation and participate
(B) staff diversity
(C) reduction of the abusive management
(D) A and B
(E) A, B, and C

78. The repeat rate for mammographic departments should not be greater than ____%
(A) 2%
(B) 5%
(C) 8%
(D) 10%
(E) 12%

79. The image parameter that primarily affects T2 weighting is known as what?
(A) TR
(B) TI
(C) Flip angle
(D) TE
(E) All of above

80. Which order are the following coils placed in relationship to the patient?
(A) Shim coils, RF probe, Gradient coils
(B) RF probe, RF coils, Shim coils
(C) RF probe, Shim coils, Gradient coils
(D) Gradient coils, RF probe, Shim coils
(E) RF coils , Shim coils, Gradient coils

81. With regard to ultrasonic image systems, which of the following is not reduced by the effects of damping?
(A). Pulse duration
(B). Refraction
(C). Space pulse length (SPL)
(D). Sensitivity

82. Which of the following instruments has the highest spatial resolution (lp/mm) value in routine clinical use?

(A)CR（computed radiography）

(B)MRI

(C)DBT（digital breast tomosynthesis）

(D)CT

83. Which of the following is NOT an artifact of CT imaging?

(A).beam hardening artifact

(B). partial volume artifact

(C). motion artifact

(D). zipper artifact

84. Which of the following statements is correct about the changes in blood flow and pressure at the site of vascular stenosis in an ultrasound scan?

(A). The blood flow rate is faster and the pressure is reduced

(B). The blood flow velocity becomes faster and the pressure increases

(C). Slowing down of blood flow and increasing pressure

(D). Slowing down of blood flow and decreasing pressure

85. According to the Radiation Medical Exposure Quality Assurance Standard for Computed Tomography Simulation and Positioning Scanners, the accuracy of CT values and CT values of scanning electronic density prostheses should include five test substances and should include at least one of the following? ①. Air ②.Water ③.Bone ④Participants with a CT value above 800 undergoing testing.

(A). ①.②.③.④

(B). only①.②.④

(C). only①.②.③

(D). only①.④

86. A woman underwent a mammography examination and found that after breast compression, the woman's breast thickness was about 8 cm and the breast density was about 80%. It is most suitable for use. What photography conditions were used (target/filter)?

(A)Mo/Mo

(B)Mo/Rh

(C)Rh/Mo

(D)W/Rh

87. In digital images, which of the following is commonly used to evaluate the distribution performance of pixel grayscale values?

(A) histogram

(B) Fourier spectrum

(C).gray-level co-occurrence matrix

(D).fractal dimension

88. Which of the following is the most common neutron beam energy used in boron neutron capture therapy (BNCT)?

(A) 0.5 eV～10 keV

(B) 1 MeV～10 MeV

(C) 100 keV～500 keV

(D) 500 keV～1 MeV

89. Which of the following is wrong in the description of diagnostic radiological image quality?

(A). kVp is the most important factor affecting contrast

(B). The smaller the OID, the smaller the focal blur

(C). Focal blur caused by proximity to the anode is greater than that produced by proximity to the cathode

(D). Magnification factor (MF) = SID/SOD

90.Which of the following comparisons is made with computed radiography (CR) and conventional soft-chip X-rays?

(A).CR Have a high degree of tolerance

(B).CR of patients usually have a lower dose

(C) CR High spatial resolution of the image

(D).CR has a higher linearity of grayscale