電腦斷層測驗

Computed Tomography

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	**CT 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 80 題問題。請使用 1 到 80 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…Q80 = 答案選擇 80。

1. What does DLP stand for in the context of CT dose measurement?
   A. Dose Length Product
   B. Dose Level Percentage
   C. Dose Limitation Protocol
   D. Diagnostic Level Projection

2. How is the data from the CT detectors converted into an image?
   A. By using Fourier transformation
   B. By using algebraic reconstruction techniques (ART)
   C. By using filtered back projection (FBP)
   D. By using magnetic resonance algorithms

3. Which biochemical test needs to be evaluated in the patient before administering contrast media for a computed tomography (CT) scan?
   A. glucose
   B. uric acid
   C. creatinine
   D. cholesterol

4. If a CT image is displayed with a window width set to 100 and a window level set to 120, what will the CT image display?
   A. Tissues with CT values ranging from 40 to 160 will be displayed in grayscale, with all others displayed in black.
   B. All CT values less than 40 will be displayed in white, values greater than 160 in black, and values between 40 and 160 in grayscale.
   C. All CT values less than 70 will be displayed in black, values greater than 170 in white, and values between 70 and 170 in grayscale.
   D. Tissues with CT values ranging from 100 to 220 will be displayed in grayscale, with all others displayed in black.

5. For CT images, which combination is likely to achieve the highest spatial resolution?

A. FOV：30 cm, image matrix：512×512

B. FOV：20 cm, image matrix：512×512

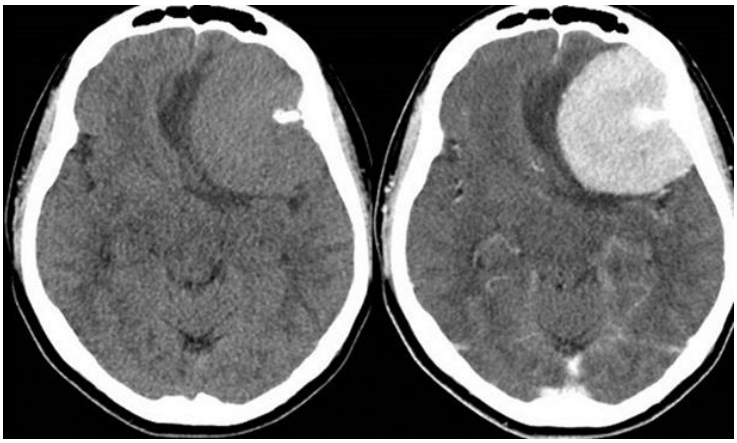
C. FOV：30 cm, image matrix：1024×1024

D. FOV：20 cm, image matrix：1024×1024

6. What is the “air calibration (or blank scan)” of CT scanners for?

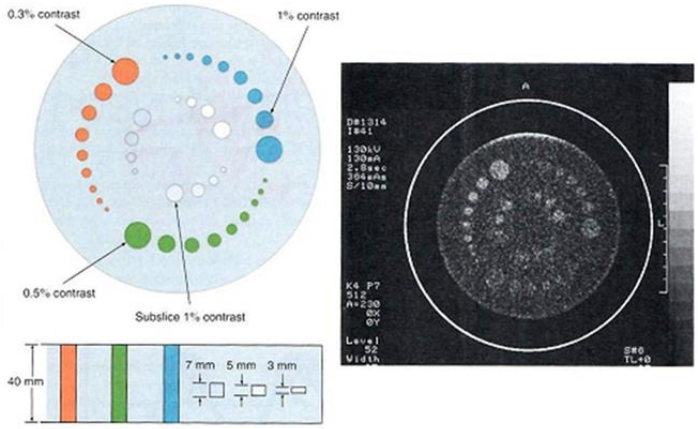
A. To calibrate the CT numbers
B. To reduce the image noise.
C. To assure the kVp.
D. To check the gantry rotational speed

7. The following image shows a head CT. Which of the following is the most likely diagnosis?



A. Cerebral hemorrhage
B. Meningioma
C. Subdural hematoma
D. Malignant glioma

8. Which of following can be measured by the phantom image?

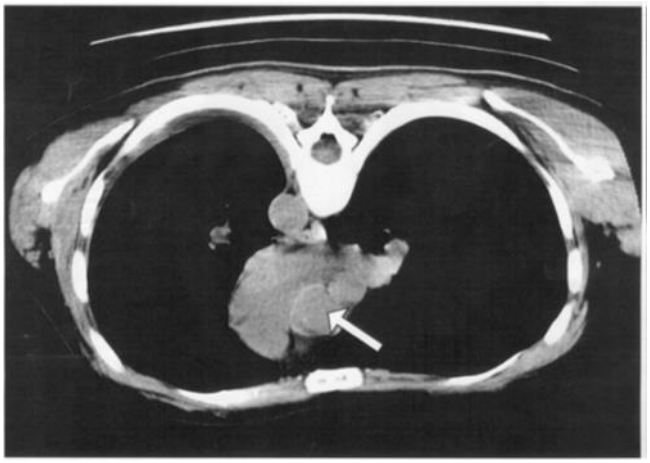


A. High contrast resolution testing
B. Low contrast resolution testing
C. High spatial resolution testing
D. Low spatial resolution testing

9. The patient has intraventricular hemorrhage (IVH). In the sagittal reformatted CT image , what structure does the arrow point to?

A. Third ventricle
B. Fourth ventricle
C. Fifth ventricle
D. Lateral ventricles

10. The structure indicated by the arrow in the attached image is?



A. Ascending aorta
B. Descending aorta
C. Pulmonary artery
D. Pulmonary vein

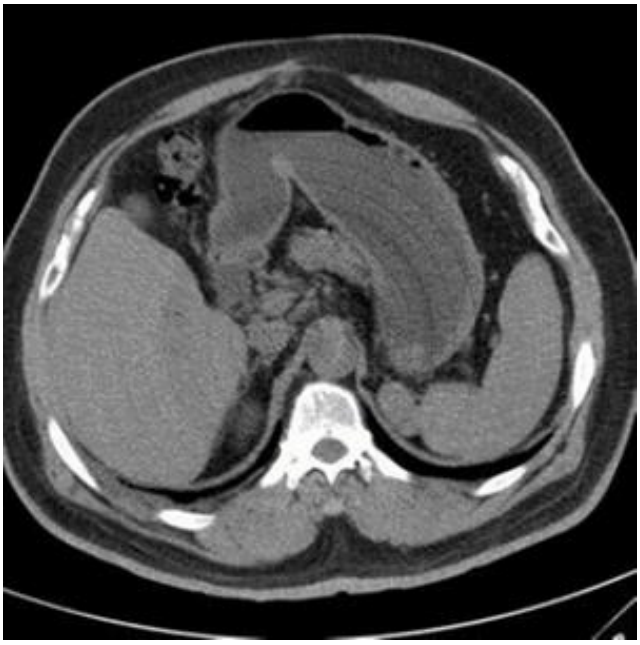
11. To avoid the artifact shown in the image below during coronary artery CT scanning, which method is least appropriate?

A. Using ECG-gating control
B. Switching to electron-beam CT
C. Achieving a rotation speed of 1s/rotatiom
D. Lowering the patient's heart rate.

12. The correct statement regarding DLP (Dose-Length Product) is:
    A. Inversely proportional to CTDIvol.
    B. Inversely proportional to the length of the CT scan range in the Z-axis.
    C. Inversely proportional to weighted CTDI.
    D. Inversely proportional to pitch.

13. What the factor to calculate the CT number?
    A. linear attenuation coefficient
    B. kV
    C. mAs
    D. atomic number

14. The cause of the artifact in the attached CT image may be due to which of the following?



    A. Presence of metallic foreign body
    B. Involuntary patient movement
    C. Partial volume effect
    D. Detector malfunction

15. In a head CT scan, which structure has the highest CT number?
    A. Cerebrospinal fluid
    B. Gray matter
    C. Blood
    D. Fat

16. Which of the following combinations is not appropriate?
    A. BHC – Head
    B. Quantum denoising filter – Smoothing filter
    C. Streak artifact – Pelvic region
    D. Cupping artifact – Beam hardening correction

17. Which of following is the dominant factor of in-plane spatial resolution in CT image?
    A. detector size
    B. kVp
    C. mAs
    D. slice thickness

18. CT perfusion technique is usually used in:
    A. Brain tumor
    B. Aneurysm
    C. Aortic dissection
    D. Stroke

19. Which of following is not a characteristic of an HRCT scan?
    A. thinner slice thickness
    B. lower radiation dose
    C. higher mA
    D. higher kVp

20. Which of the following is an incorrect CT detector?
    A. The detector has the scintillation type and the gas type.
    B. The curve linear detector has the better uniformity concerning the length of ray than the Linear detector.
    C. The scintillation type is better than the gas type for effectiveness of detection.
    D. The gas detector has no way to reduce scattered rays.
21. Computed tomography examination is as shown below. Which of the following descriptions is most appropriate?

    A. multiplanar reformat sagittal image
    B. volume rendering axial image
    C. multiplanar reformat coronal image
    D. volume rendering sagittal image

22. Computed tomography is shown in the figure below. Which of the following tissue components are represented by the arrows in the figure?

A. water
B. air
C. soft tissue
D. calcification

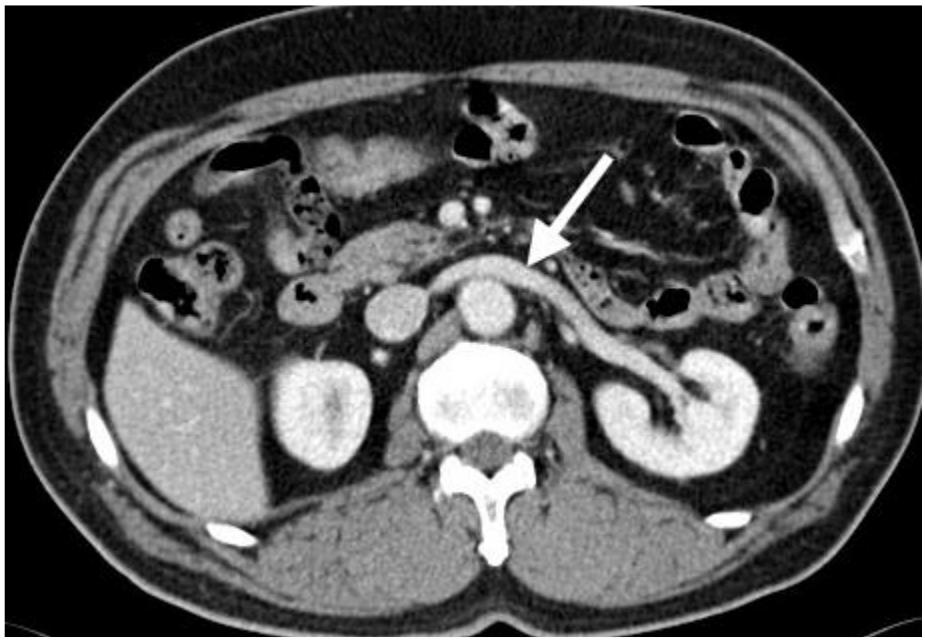
23. If CT noise is to be reduced to 1/3 of the original value, how many times does the dose need to be increased?
A. 3
B. 6
C. 9
D. 27

24. Which of the following is not a common image artifact in CT scan?
A. beam hardening artifact
B. zipper artifact
C. partial volume artifact
D. motion artifact

25. A 512×512 CT image has a field of view (FOV) of 20 cm. What is its spatial resolution in lp/mm?
    A. 0.39
    B. 0.78
    C. 1.28
    D. 2.56

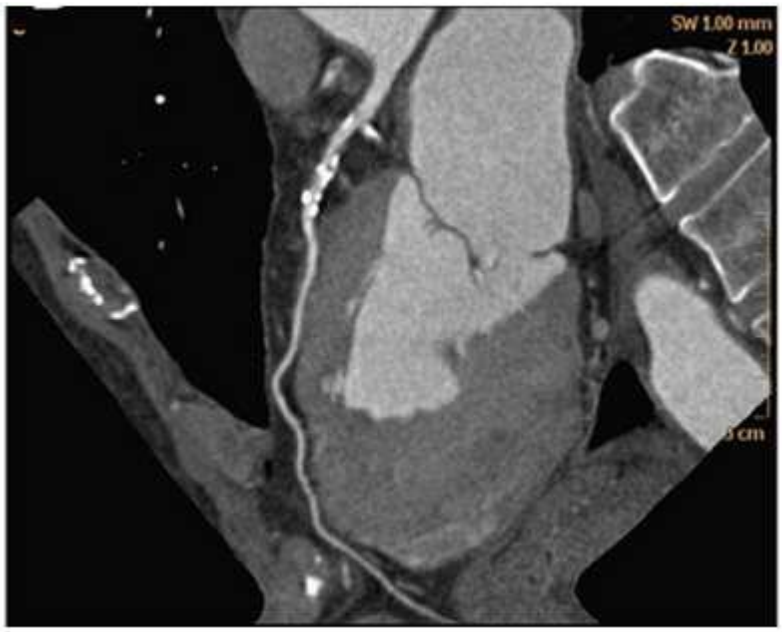
26. Which of the following examinations is not suitable for using CTDI (computed tomography dose index) as a radiation dose assessment?
    A. low dose lung CT
    B. lumbar CT
    C. brain perfusion CT
    D. lower limb CTA

27. What is the anatomical structure indicated by the arrow in the picture below?



    A. splenic artery
    B. renal vein
    C. superior mesenteric artery
    D. portal vein

28. What technology was used to produce the CT images shown in the figure?



A. maximum intensity projection（MIP）

B. shaded surface display（SSD）

C. multi-planar reformation（MPR）

D. volume rendering（VR）

29. Which of the following is not a step involved in forming CT images using a CT scanner?
A. projections
B. data acquisition
C. image reconstruction
D. image display

30. Changing the window level (WL) can mainly change the computer tomography image:
A. lightness and darkness
B. resolution
C. sharpness
D. slice thickness

31. The attached picture shows a dynamic computed tomography imaging of the liver. From the picture, we can judge which lesion is most likely to be in the liver?

A. hepatic cyst
B. cholangiocarcinoma
C. hepatocellular carcinoma
D. liver hemangioma

32. Which of the following technologies is the main key to the success of spiral/helical CT research and development?
A. slip-ring technology
B. pencil beam
C. fan beam
D. parallel beam

33. Which of the following is not an advantage of multi-slice spiral CT?
A. shorten scanning time and reduce movement artifacts
B. reduce partial volume effect
C. can image larger tissue volumes
D. reduce image reconstruction time

34. Which of the following X-ray tube voltages (kV) will result in the highest HU value for the iodine-containing contrast agent in the aorta?
A. 80
B. 120
C. 140
D. 160

35. On current commercial CT scanners, what is the X-ray tube voltage (kV) most commonly used to scan patients?
    A. 80
    B. 100
    C. 120
    D. 140

36. CT equipment produces 12-bit depth per pixel images. Approximately how many gray scale values are there?
    A. 256
    B. 512
    C. 1024
    D. 4096

37. Which of the following is not an artifact commonly seen in multiple-slice (multiple-detector) CT images?
    A. windmill artifacts
    B. viewing aliasing artifacts
    C. chemical shift artifacts
    D. streak and metal artifacts

38. The CT values of the following substances are arranged from large to small: ①Water ②Bone ③Fat ④Air

    A. ②③①④

    B. ④③①②

    C. ②①③④

    D. ②①④③

39. Which of the following is the main purpose of CT collimation?
    A. change slice thickness
    B. adjust FOV
    C. increase image contrast
    D. increase ray energy

40. Which of the following photography conditions should be used when performing CT number uniformity testing in CT quality assurance?
    A. adult head scan mode
    B. pediatric head scanning mode
    C. adult abdominal scan mode
    D. pediatric abdominal scan mode

41. In CT contrast enhancement, various interacting factors influence the process. The correct statements regarding the scanning factors are: 1. iodine concentration 2. iodine volume 3. rate 4. Saline flush 5. Injector duration
    A. 1+2+3+4+5
    B. 1+2+3+4
    C. 1+2+3
    D. 1+2

42. Contrast enhancement in CT is influenced by various interacting factors. Which of the following statements regarding contrast agent factors are correct? 1. iodine concentration 2. iodine volume 3. rate 4. Saline flush 5. Injector duration
    A. 1+2+3+4
    B. 1+2+3+4+5
    C. 1+2+3
    D. 1+2

43. Contrast enhancement in CT is influenced by various interacting factors. Which of the following statements regarding patient factors are correct? 1. patient weight 2. cardiac output 3. age 4. venous 5. renal function
    A. 1+2+3
    B. 1+2+3+4
    C. 1+2+3+4+5
    D. 1+2

44. (Regarding the use of X-ray contrast agents, which of the following statements is incorrect?
A. The atomic number (Z value) of the contrast agent should be higher than the average atomic number (Z value) of soft tissues.
B. Contrast agents can increase the relative brightness of vascular tissues in images.
C. Contrast agents should not remain in the human body for too long.
D. Considering chemical and biological effects, ionic contrast agents are more suitable for human use than non-ionic contrast agents.

45. Regarding the description of CT number, which of the following is incorrect?
A. The CT number of water is zero

B. The range of CT number is -1000～1000 HU

C.CT number is calculated and defined based on the linear attenuation coefficient of air
D. The larger the CT number, the larger the linear attenuation coefficient.

46. Regarding the scanning methods of Dual Energy CT systems, which of the following statements are correct?1.The CT system performs two consecutive scans at different energies (sequential scanning).2.The CT system consists of two pairs of tubes and detectors, operating at two different energies (dual-source).3.The CT system can rapidly switch between low and high tube voltages (fast kVp switching).4.The CT system is equipped with detectors that absorb both low and high energies (dual-layer detectors).
A. 1+2
B. 2+3+4
C. 1+3+4
D. 3+4
E. 1+2+3+4

47. What are the components of a CT gantry? 1.X-ray source (X-ray tube) 2.High-voltage generator 3. Detector array 4.Collimator assembly
    A. 1+2+3+4
    B. 2+3+4
    C. 1+3+4
    D. 3+4

48. Which of the following descriptions of CT tube characteristics are correct?
    1. Resistance to centrifugal force 2. Stability 3. Cooling rate 4. Anode heat capacity
    A. 1+2
    B. 1+3+4
    C. 1+2+3
    D. 1+2+3+4
    E. 1+4

49. Regarding CT bowtie filters, which of the following statements are correct?
    1. Filters out low-energy X-rays 2. Enhances average energy 3. Beam hardening effect is significant 4. Reduces metal artifacts 5. Allows the use of a smaller focal spot
    A. 1+2+3
    B. 1+2+3+4+5
    C. 1+3+4+5
    D. 1+4

50. If all other parameters remain constant, how does widening the CT collimator affect the output radiation?
    A. Increases the output radiation
    B. Decreases the output radiation
    C. No effect

51. Which of the following descriptions are correct for evaluating CT detector characteristics? 1.Efficiency 2. Stability 3. Response time 4. Dynamic range 5. Linearity 6. Pulse response characteristics
    A. 1+2+3+4
    B. 1+2+3
    C. 1+2+3+4+5+6
    D. 1+2+3+4+5

52. Which of the following descriptions are correct for CT detector "rows"?
    1.The number of physical arrangements of CT detectors in the Z-axis direction
    2.Primarily reflects the CT hardware structure
    3. The row is a hardware parameter
    4. Current CT systems are all multi-row CTs (MDCT), i.e., Multiple detector row CT
    A. 1+2+3
    B. 1+3+4
    C. 1+2+3+4
    D. 1+4
    E. 1+2

53. Which of the following descriptions are correct for DAS (Data Acquisition System)? 1. Low noise 2. High stability 3. High linearity 4. High spatial resolution
    A. 1+2+3
    B. 1+3+4
    C. 1+2+3+4
    D. 1+4

54. Which of the following descriptions about Slip Ring Technology are correct?
1.Signals are transmitted through electromechanical equipment using slip rings and brushes.
2.Power and electronic signals are transferred from a rotating surface to a fixed surface.
3.The slip ring system transmits power and electronic signals through fixed rings, replacing traditional cables.
4.Allows continuous rotation, increasing scanning speed.
A. 1+2
B. 1+3+4
C. 1+2+3
D. 1+2+3+4

55. Which of the following descriptions about Scan Projection Radiography (SPR) are correct?
1. Used for localization imaging
2. Determines the scan range
3. Basis for AEC (Automatic Exposure Control) adjustment
4. Enhances average energy
A. 1+2+3+4
B. 1+2+3
C. 1+3+4
D. 1+4

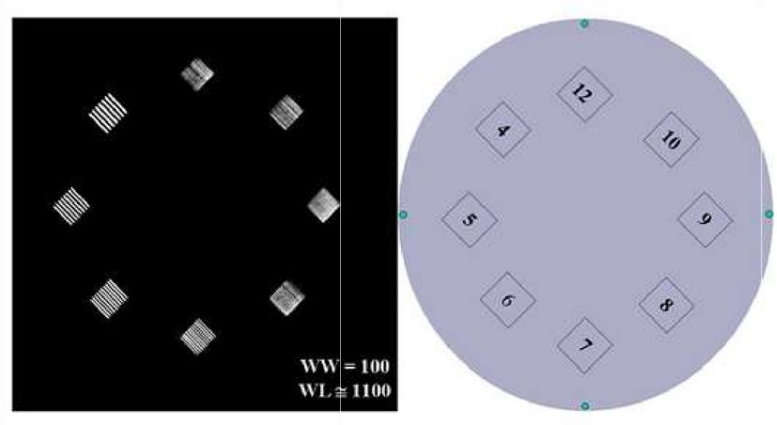
56. Which of the following descriptions about Automatic Exposure Control (AEC) are correct?
1. constant CT image quality with lower radiation dose
2. angular AEC
3. z-axis AEC
4. combined AEC
5. age AEC
A. 1+2+3+4+5
B. 1+2+3+4
C. 1+2+3
D. 2+3+4+5
E. 3+4+5

57. Which of the following descriptions about Helical mode are correct?
1.Performs dynamic scanning while moving the examination table at a constant speed, resulting in a helical trajectory of the X-ray.
2. SSP (Slice Sensitivity Profile) decreases.
3.Radiation dose increases.
4. Allows more accurate reconstruction.
5. Shorter scan time.
A. 2+3+4+5
B. 3+4+5
C. 1+2+3+4
D. 1+2+3+4+5

58. Which of the following descriptions about pitch are correct?
1. Pitch size is inversely related to scan time.
2. The larger the pitch, the faster the table moves, the shorter the scan time, and the lower the radiation dose.
3. Pitch size is inversely related to patient dose.
4. Pitch size is inversely related to image quality.
5. Shorter scan time.
A. 2+3+4
B. 1+2+3
C. 1+2+3+4+5
D. 3+4+5

59. Which of the following descriptions about CT number are correct?
1. Represents the calculated value corresponding to the attenuation of X-rays after passing through tissue.
2. Unit: CT number or Hounsfield Unit (HU).
3. The attenuation coefficient of water is 0.206, resulting in a CT value of 0.
4. The attenuation coefficient of bone is 0.528, resulting in a CT value of 1000.
5. The attenuation coefficient of air is 0.0004, resulting in a CT value of -500.
A. 2+3+4+5
B. 3+4+5
C. 1+2+3+4
D. 1+2+3+4+5

60. Which quality control test item for CT is shown in the image?



A. Slice thickness accuracy
B. High contrast resolution
C. Low contrast detectability
D. Linearity

61. Regarding the relationship between image quality and radiation dose in computed tomography, which of the following statements is incorrect?
A. When the slice thickness is halved, the radiation dose will increase by 2 times.
B. When the tube current is halved, the radiation dose will be halved.
C. When the pixel size is halved, the radiation dose will increase by 4 times.
D. When image noise is halved, the radiation dose will increase by 4 times.

62. Which of the following description is correct about the relationship between the average radiation dose in the pitch setting of helical CT?
A. Dose is directly proportional to the first power of pitch.
B. Dose is directly proportional to the second power of pitch.
C. Dose is directly proportional to the first power of 1/pitch.
D. Dose is directly proportional to the second power of 1/pitch.

63. In CT quality assurance, which following parameter do not change the HU of ROI in a CT image?
    A. Effective atomic density
    B. Beam filtration
    C. Tube voltage (kVp)
    D. Tube current (mAs)

64. Which artifact may appear in CT iterative reconstruction?
    A. Beam hardening artifact
    B. Zipper artifact
    C. Partial volume artifact
    D. Cartoon

65. Regarding the comparison of CT values of normal human tissues, which of the following is incorrect?
    A. Fat > Water
    B. Blood > Water
    C. Muscle > Water
    D. Liver parenchyma > Water

66. A patient with hypertensive intracerebral hemorrhage two weeks ago undergoes a follow-up CT scan. Which of the following is the most likely imaging presentation?
    A. A medium-low density mass (below 70 HU) with surrounding enhancement
    B. A medium-low density mass (below 70 HU) without enhancement
    C. A high-density mass (above 70 HU) with surrounding enhancement
    D. A high-density mass (above 70 HU) without enhancement

67. Regarding the precautions for CT scans in newborns, which of the following is the least appropriate?
    A. Ensure proper temperature maintenance
    B. Sedatives must be administered
    C. Wash hands before touching the patient
    D. Monitor vital signs

68. For unilateral hearing loss caused by trauma, which imaging examination is recommended for evaluation?
A. routine brain CT with bone window
B. Stenver's view
C. Temporal bone high resolution CT（HRCT）
D. MRI of internal auditory canal

69. A CT scanner uses a 4-row detector array with z-flying focal spot technology, and the table advances 6 mm per rotation of the X-ray tube. When the slice pitch is set to 1.3, what is the approximate beam width?
A. 18 mm
B. 6 mm
C. 12 mm
D. 37 mm

70. The following image shows a dynamic contrast-enhanced CT of the liver. Based on the image, which liver lesion is most likely?

Pre-contrast	**Arterial phase**
	
Venous phase	**Delay phase**
	

A. Liver hemangioma
B. Hepatocellular carcinoma
C. Cholangiocarcinoma
D. Hepatic cyst

71. Which of the following is incorrect about contrast resolution of CT images?
    A. Increasing kV from 100 to 120 can improve contrast resolution of CT images with other setting fixed.
    B. Increasing slice thickness from 2.5 mm to 5.0 mm can improve contrast resolution of CT images with other setting fixed.
    C. The filter settings used in image reconstruction technology do not affect contrast resolution
    D. Increasing tube current and exposure time can improve contrast resolution of CT images with other setting fixed.

72. Which of the following description of CT virtual endoscopy is more appropriate?
    A. It uses the concept of CTA
    B. It's for tubular construction
    C. It's a 2D image.
    D. It's mainly for interpreting the appearance of visible objects

73. Which of the following indications for brain computed tomography angiography (CTA) is the most correct?
    A. Brain aneurysm
    B. Foreign body in the brain
    C. Tumors in the brain
    D. Meningitis

74. Which of the following algorithm has the most image noise? ① Standard algorithm ② Smoothing algorithm ③ Edge enhancement algorithm
    A. ①
    B. ②
    C. ③
    D. It equals in ①②③.

75. Which of the following is the best method in resolving the partial volume artifact of CT?
A. Increase mAs
B. Decrease the matrix size
C. Reduce the slice thickness of the scans
D. Increase kVp

76. Which of the following is the most likely diagnosis in the CT image of Cervical spine?
A. Fracture of the fifth Cervical vertebra
B. Tumor of the fifth Cervical vertebrae
C. Fracture of the sixth Cervical vertebra
D. Tumor of the sixth Cervical vertebrae

77. Which of the following description is false regarding the field of view (FOV)?
A. The slice thickness of CT is not affected by FOV.
B. The display FOV can be equal to smaller than the scan FOV.
C. The voxel size is determined by the slice thickness, FOV, and matrix size.
D. For the same matrix size, the larger the scan FOV, the smaller the pixel size.

78. Which of the following descriptions of computed tomography-guided biopsy is most correct?
A. The patient must be in the supine position for tissue sectioning.
B. Local anesthesia is not required before the patient can be sectioned.
C. The patient must undergo a renal function test prior to sectioning.
D. Patients may experience complications such as bleeding.

79. Which of the following tests is best used to diagnose traumatic aortic arch rupture?
A. Chest MRI
B. Transesophageal sonography
C. Chest CT with contrast
D. Cardiac sonography

80. If CT noise is to be reduced to 1/3 of the original value, how many times does the dose need to be increased?
A. 3
B. 6
C. 9
D. 27