

電腦斷層測驗

Computed Tomography

2023 年 8 月 27 日星期日

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 23XXX 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。

Q1. Implantable devices Safety (pacemakers, defibrillators...). Choose the wrong statement

1. Keep the device on while scanning to check performance
2. Minimize the x-ray exposure to the electronic medical device
3. Use the lowest possible x-ray tube current consistent with obtaining the required image quality
4. Try to move external devices out of the scan range if possible

Q2. Choose the right statements regarding table and gantry.

1. Upper Weight limit is just orientation.
2. Avoid any patient contact with the gantry during tilt or cradle movement (manual or software driven).
3. Physically assist all patients on and off the table and into position on the cradle.
4. The unlatched table can be used to speed up patient positioning
5. Answers b & c are correct

Q3. Choose the right statement regarding patient preparation before cardiac imaging.

1. Ensure the ECG patches are not past expiration date and that the gel on the pads is still moist for proper conduction of the ECG signal for successful gating.
2. Use breath hold technique for all the series in a cardiac exam. Practice the breath hold instructions with the patient prior to scanning.
3. When the patient is practicing breath holding, make sure to watch the ECG trigger monitor to determine the average heart rate, minimum heart rate, and ECG pattern during the breath hold.
4. All of the above

Q4. General Radiation Safety includes all of the following EXCEPT:

1. Never scan a patient with unauthorized personnel in scan room.
2. Never calibrate or test the scanner with patients or personnel present in the room.
3. A tube warm up is acceptable with a patient or personnel present in the room.
4. Stay behind a lead screen or a glass shield during each X-Ray exposure.

Q5. If the patient is NOT centered properly the image quality will be affected. What else will be affected?

1. Image Noise
2. Contrast
3. Density
4. Low contrast detectability

Q6. Which type of stroke occurs as a result of an obstruction within a blood vessel supplying blood to the brain?

1. Hemorrhagic
2. Ischemic
3. Metabolic
4. Holistic

Q7. Which functional map displays results as cc per 100 grams of tissue per minute?

1. Cerebral Blood Flow
2. Cerebral Blood Volume
3. Mean Transit Time
4. Transit Time to Impulse residue function Peak

Q8. Which of the following is not true for Stroke acquisition?

1. Non-contrast scan is performed to help physicians to rule out hemorrhagic stroke.
2. ASPECTS score, it is possible to determine tissue at risk (aka penumbra).
3. ASPECTS score > 7 is a predictor for good outcomes.
4. ASPECT score is used to evaluate early ischemia in the territory of the middle cerebral artery in scan examinations of the cranium.

Q9. Which of the following statement for functional imaging of Brain perfusion CT is wrong?

1. $rCBF = rCBV/MTT$
2. $T_{Max} = \frac{MTT}{2} + IRFT0$
3. Infarct core = CBV lesion size
4. ischemic penumbra = CBF or MTT lesion volume

Q10. According to the concept of cerebral vascular autoregulation, choose the wrong answer.

1. Within the infarct core autoregulation is lost and CBV is decreased.
2. In the ischemic penumbra, the MTT or Tmax are increased.
3. In the infarct core, the MTT or Tmax are decreased.
4. Tmax and CBF have the greater sensitivity to predict what the infarcted area will be.

Q11. The left anterior descending (LAD) typically originates from this vessel.

1. left marginal artery , LMA
2. right coronary artery, RCA
3. posterior descending artery, PDA
4. left circumflex coronary artery, LCX

Q12. The diagonal branches come off of which of this coronary artery?

1. left marginal artery, LMA
2. Right coronary artery, CA
3. left circumflex coronary artery, LCX
4. left anterior descending, LAD

Q13. If the Posterior Descending Artery branches from the Circumflex artery this means the heart is a _____ dominant system.

1. left
2. right
3. anterior
4. posterior

Q14. About the liver anatomy, the left functional lobe is divided into medial and lateral segments, the medial superior is _____ and the medial inferior is _____.

1. the caudate lobe / the quadrate lobe
2. the quadrate lobe / the caudate lobe
3. segment 5 / segment 8
4. segment 8 / segment 5

Q15. During a liver perfusion study, which vessel is required to be part of the imaged volume?

1. Aorta
2. Hepatic Arteries
3. Inferior Vena Cava
4. Portal Vein

Q16. What value do Effective-Z image types represent & display?

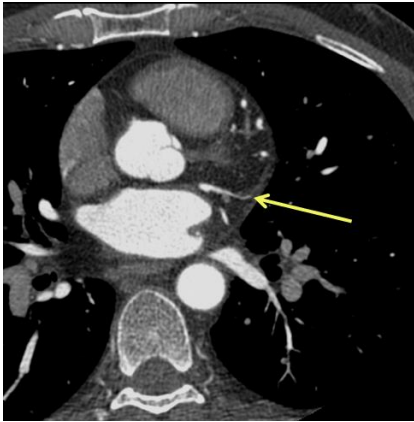
1. Atomic number
2. Effective material density
3. Kilo electron Volts
4. Effective atomic number

Q17. Why do you see bone on Iodine and Water Material Density images on spectral CT?

1. Both materials share common elements
2. Too dense to remove
3. Error in material selection
4. Bone left as landmark

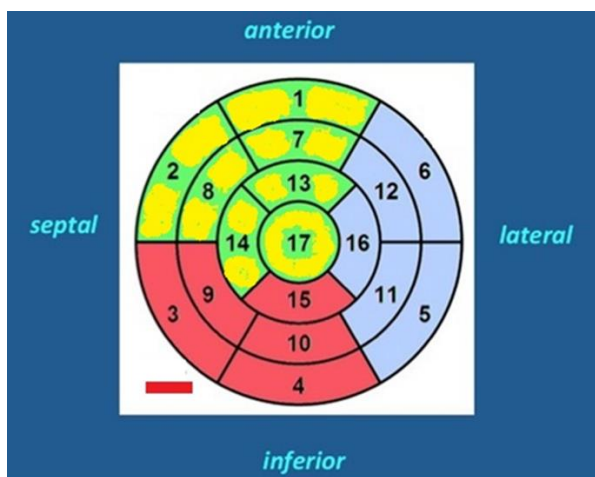
Q18. On the cardiac CTA image below, which blood vessel is pointed by the yellow arrow?

1. left anterior descending, LAD
2. left circumflex coronary artery, LCX
3. first diagonal branch, D1
4. first obtuse marginal arteries, OM1



Q19. Each coronary artery “feeds” a specific part of the myocardium. The red block is supplied by _____.

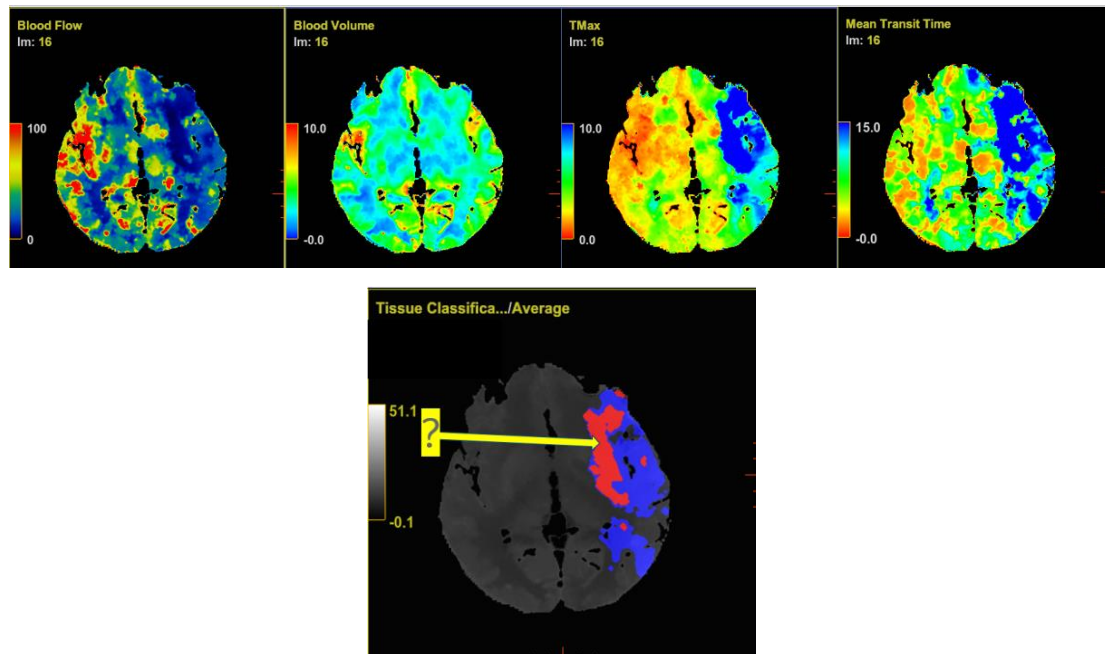
1. left anterior descending, LAD
2. left circumflex coronary artery, LCX
3. right coronary artery, RCA
4. Aorta



Myocardial 17 Segment Definition

Q20. Below is the functional images of brain ct perfusion, starting with blood flow, blood volume, TMax and Mean Transit Time in order, according to the information given, what is the red area (Yellow arrow) on the Tissue Classification map.

1. Infarct core
2. ischemic penumbra
3. Hemorrhage
4. IRFT0



Q21. Which lesion is most visible during the artery phase of CT?

1. hepatic cyst
2. liver cirrhosis
3. hepatocellular carcinoma
4. cholangiocarcinoma

Q22. Below is a CT image of patient with head trauma, What type of hemorrhage can be observed?

1. epidural hematoma, EDH
2. contusion intracerebral hemorrhage , ICH
3. subarachnoid hemorrhage, SAH + epidural hematoma, EDH

4. subdural hematoma, SDH + subarachnoid hemorrhage , SAH



Q23. Continuing from the previous question, which window level pair is most suitable to present the location of hemorrhage?

1. 2000/350
2. 350/40
3. 1500/-700
4. 100/35

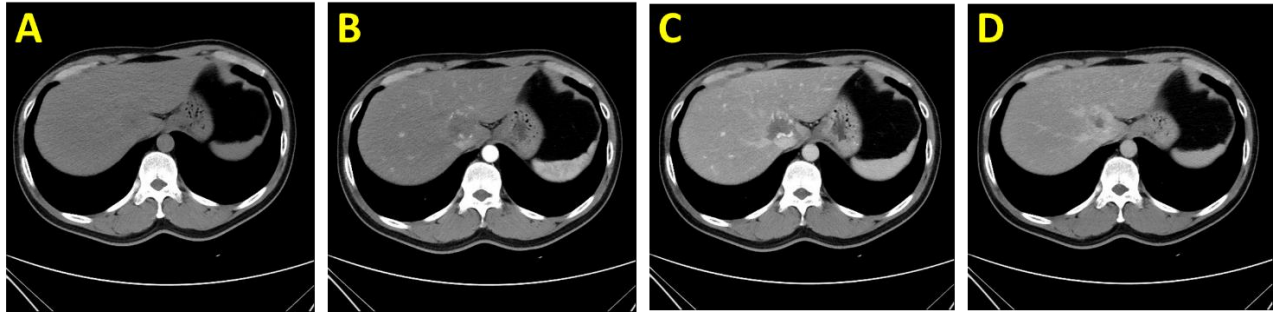
Q24. Which of the following is not a common complication of lung CT guided biopsy and cryotherapy?

1. pneumothorax
2. pulmonary hemorrhage
3. hemoptysis
4. air embolism

Q25. Figure below is a series of images of dynamic contrast-enhanced CT of the abdomen, what would it most likely be?

1. Hepatocellular carcinoma
2. liver hemangioma
3. cirrhosis

4. hepatic cyst



Q26. Continuing from the previous question, what is the time gap between A and C?

1. 100~120
2. 70~85
3. 45~60
4. 17~25

Q27. According to the CT scan of the abdomen below, it is most likely to be:

1. ectopic kidney
2. floating kidney
3. horseshoe kidney
4. renal cell carcinoma



Q28. For low dose CT, which of the following is commonly used for noise reduction?

1. using FBP (filtered back projection) algorithm combined with a standard reconstruction kernel
2. IR (iterative reconstruction) algorithm
3. using low kVp, high mAs scan parameter

4. smoothing digital filter

Q29. During a CT scan, which of the following is commonly used to assist with the assessment of the staging of gastric tumor?

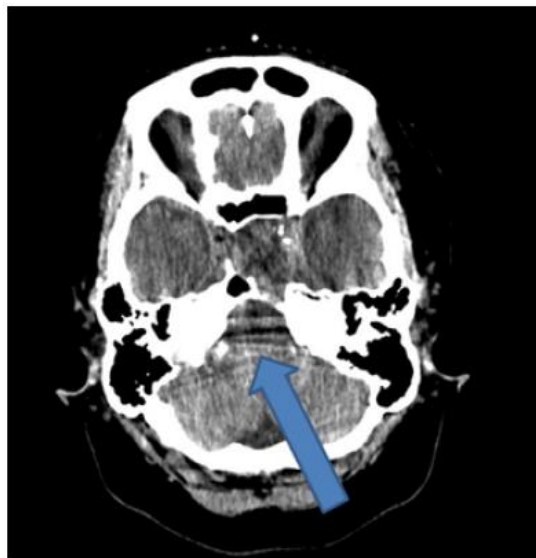
1. drinking high concentration of barium based contrast agent
2. expansion of stomach by drinking water
3. immediate checkup after meal
4. injecting low concentration of iodine based contrast agent

Q30. During coronary artery calcium (CAC) test with multi-slice CT, CT value of the pixel should be more than ___ HU to be considered as calcification.

1. 50
2. 75
3. 130
4. 85

Q31. From the brain CT image below, what is the main cause of the artifact pointed by the arrow?

1. Beam Hardening
2. Motion artifact caused by patient
3. Breakdown of detector
4. Ring artifact



Q32. Which of the following is correct regarding the relationship between the average dose in the volume scanned by helical CT (or spiral CT) and pitch setting?

1. The dose is directly proportional to pitch.
2. The dose is proportional to the square of pitch.
3. The dose is inversely proportional to pitch.
4. The dose is inversely proportional to the square of pitch.

Q33. Which of the following statements about the function of collimators in computed tomography (CT) is incorrect?

1. The predetector collimator is used to control X-ray scatter.
2. The predetector collimator is used to control slice thickness.
3. The predetector collimator is used to control the size of image pixels.
4. The prepatient collimator is used to determine dose distribution.

Q34. When using spiral/helical CT for examination, if the length of the body axis irradiated is 50 cm, the scan time is 25 seconds, and the X-ray tube rotates once every 0.5 seconds with a slice thickness of 5 mm, what is the pitch value?

1. 1:1
2. 1.5:1
3. 2:1
4. 3:1

Q35. The following statements about CT values are incorrect?

1. The definition of CT value is the attenuation coefficient ratio of various tissues relative to water.
2. The higher the tissue attenuation coefficient, the larger the CT value.
3. When K value is 1000, CT value is defined as Hounsfield unit.
4. The difference in CT values affects spatial resolution of images.

Q36. The pitch of spiral/helical CT is usually between 0.75 and 1.5. Choosing a pitch of 1.5 is for:

1. fast scanning,
2. improved spatial resolution of images,
3. children, or
4. women.

Q37. When setting the fan angle of a 180° LI (linear interpolation) spiral/helical CT with a fan-shaped beam to be 60°, if it is necessary to establish the projection value at the 90° position during data interpolation (because the X-ray tube does not project at this position), which angles of projection data from the X-ray tube should be used?

1. 90°~150°
2. 210°~330°
3. 30°~150°

4. $60^{\circ} \sim 120^{\circ}$

Q38. A CT scanner uses high-resolution chest CT (HRCT chest) scanning conditions to test image quality. If the resolution of a simulated image is 8 lp/cm, what is the smallest discernible object that can be achieved theoretically by this CT scanner?

1. 1.25 mm
2. 2.50 mm
3. 0.625 mm
4. 0.31 mm

Q39. During CT examination, if the slice thickness is set to 4 mm, the field of view (FOV) of the image reconstruction area is 25 cm, and the image matrix is 512×512 . What are the approximate pixel size and voxel size?

1. Pixel: 4 mm; Voxel: 0.95 mm^3
2. Pixel: 0.49 mm; Voxel: 7.84 mm^3
3. Pixel: 4mm; Voxel: 7.84 mm^3
4. Pixel: 0.49mm; Voxel : 0.95 mm^3

Q40. What is the main contribution of technology that enables continuous rapid scanning through mechanical rotation in modern CT?

1. X-ray photon counting detector
2. slip ring
3. coherent X-ray laser
4. iterative image reconstruction

Q41. Which of the following is not an advantage of multi-slice spiral CT?

1. Shorten scanning time and reduce motion artifacts.
2. Reduce partial volume effect.
3. Image a larger volume of tissue.
4. Reduce image reconstruction time

Q42. Which mode is most likely to produce ring artifacts in a CT scanning system?

1. Translate-rotate type with moving source and detector.
2. Rotate-rotate type with synchronized rotation of source and detector.
3. Target ring with stationary detector.
4. Rotate-stationary type with rotating source and fixed detector

Q43. There is a CT scanner that uses a 4-row detector array and incorporates z-z-flying focal spot

technology. The X-ray tube moves the patient table forward by 6 mm per rotation. When the slice pitch value is set to 1.3, what is the approximate beam width of the X-ray beam?

1. 6 mm
2. 12 mm
3. 18 mm
4. 37 mm

Q44. Performing quality assurance measurements on CT scanners, modulation transfer function (MTF) and point spread function (PSF) are common projects. Which of the following statements about MTF is incorrect?

1. It is an important evaluation image and measurement item for CT image quality.
2. It needs to be converted to Fourier frequency space.
3. MTF and PSF are a pair of functions that transform between Fourier domain and spatial domain.
4. Measuring the size directly on pixels in CT images.

Q45. Regarding multiple-slice helical CT, if the beam width of X-ray is 5mm, it takes 1 second for the X-ray tube to rotate 360 degrees and the examination bed moves 10mm. If the scanning time is set to be 10 seconds, what is the total length of patient's scan in cm?

1. 250
2. 100
3. 10
4. 2.5

Q46. During a CT examination, it was found that a certain substance has a linear attenuation coefficient of 0.528 cm^{-1} at 100 kVp. What substance could it be? (The linear attenuation coefficient of water at 100 kVp is 0.206 cm^{-1})

1. Fat
2. Air
3. Blood
4. Bone

Q47. Regarding the radiation dose of CT, CTDI (computed tomography dose index) is usually used as a reference report. Which of the following descriptions about CTDI is correct?

1. It is the dose to a phantom.
2. It is the actual irradiation dose to patient organs.
3. It is the average irradiation dose to patient organs.
4. It is the surface dose received by patients

Q48. Regarding multiple-slice helical CT, which of the following pitch settings can reduce patient

radiation dose while maintaining the same scanning conditions?

1. 0.5:1
2. 1.0:1
3. 1.5:1
4. 2.0:1

Q49. If a multi-slice CT with a multidetector array of 16 rows of detectors is used, and each row has a width of 1.25mm, and the X-ray tube rotates once every 0.5 seconds, and the slice thickness is set to 4x2.5mm with an X-ray exposure time of 25 seconds, what is the length in cm that the patient's body axis will be exposed to during X-ray irradiation when pitch = 0.8?

1. 40
2. 50
3. 80
4. 100

Q50. Which CT image quality assurance item involves testing the relationship between the linear attenuation coefficient and CT value of a test organization, as well as whether the CT value of water is 0?

1. Linearity
2. Spatial resolution and contrast resolution
3. Noise and uniformity
4. Patient dose

Q51. If the CTDIvol is 12 mGy and the scan length is 500 millimeters, what is the dose-length product in mGy-cm?

1. 1200
2. 600
3. 300
4. 150

Q52. What is the vessel indicated by the arrow in the figure below?

1. Left circumflex
2. Left anterior descending
3. Right coronary artery
4. Left main artery



Q53. Which statement of brain CT scan is **incorrect**?

1. Eye lens should be avoided from X-ray
2. Due to the effect of beam hardening in posterior fossa, the lower kVp is used.
3. To diagnose stroke or bone fracture, the contrast media is not necessary
4. Due to the difference between gray and white matter is little (5 to 10 HU), the small window width is used (WW:80-120)

Q54. Which of the following is not suitable for maximum intensity projection (MIP) reconstruction to better interpretation.

1. Aneurysm of the brain
2. Lung nodule detection
3. Urinary tract obstruction
4. Bronchial stenosis

Q55. What is the portion indicated by the arrow in the figure below?

1. Head of the pancreas
2. Neck of the pancreas
3. Body of the pancreas
4. Tail of the pancreas



Q56. Which statement of CT Angiography is incorrect?

1. Test bolus should be tested with some contrast agent first to acquire the time curve of contrast agent
2. Saline is usually used to advance the contrast agent.
3. Test bolus tracking requires setting the ROI to track its HU value to determine the time to scan.
4. The ROI in bolus tracking should be set after the examination of the organ flow.

Q57. How long does it normally take for a patient to reach the aorta when contrast is injected from the right dorsal metacarpal vein?

1. 6-10 seconds
2. 12-15 seconds
3. 16-20 seconds
4. 21-25 seconds

Q58. What is the vessel indicated by the arrow in the figure below?

1. Inferior vena cava
2. common bile duct
3. portal vein
4. Superior mesenteric artery



Q59. Which descriptions of calcium score of cardiac CTA is **incorrect**?

1. A lesion with a coronary artery CT value $\geq 130\text{HU}$ and an area $\geq 1\text{ mm}^2$ is defined as calcification.
2. The calcium score is calculated as f calcium density factor $\times$ calcium area
3. The larger the HU value of calcium, the smaller the f calcium density factor
4. The calcium score is the sum of calcium score in LM, LAD, LCX and RCA vessels.

Q60. Which is not the necessary factor of performing cardiac CTA?

1. Low temporal resolution
2. High spatial resolution
3. Breath-hold
4. Fast coverage

Q61. Which is not the necessary factor of performing cardiac CTA?

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2. High spatial resolution
3. Breath-hold
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Q62. What is the cause of phase shift artifact in cardiac CTA?

1. Fast breathing rate
2. Patient's high heartbeat
3. Arrhythmia
4. The patient has a coronary artery fistula

Q63. Which artifact can be seen in CT ?

①aliasing artifact ②beam hardening artifact ③chemical shift artifact ④metal artifact ⑤ streak artifact

1. ①②③⑤
2. ①②④⑤
3. ②③④⑤
4. ①③④⑤

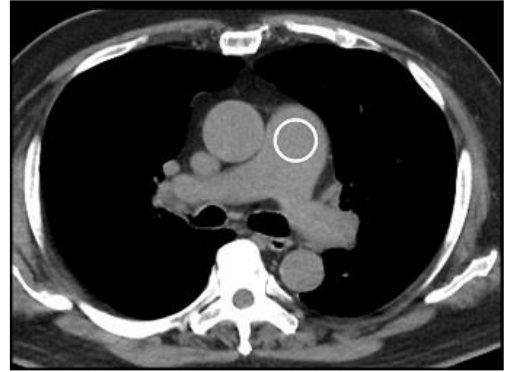
Q64. Please list the radiation dose from high to low in the three ECG-gating methods.

① Retrospective ECG-triggered, ② Prospective ECG-triggered,
③ Retrospective ECG-triggered Tube modulation

1. ①②③
2. ③②①
3. ②①③
4. ①③②

Q65. What is the vessel indicated by the arrow in the figure below?

1. Pulmonary artery
2. Ascending aorta
3. Descending aorta
4. Aortic arch



Q66. Which CT examination below need multi-phase protocol?

1. Liver tumor
2. Gastric cancer
3. Pancreatic cancer
4. All of above

Q67. Which diagnostic tool below is the best method to screen lung cancer?

1. Chest X-ray
2. Standard dose of chest CT
3. Low dose chest CT
4. High resolution chest CT

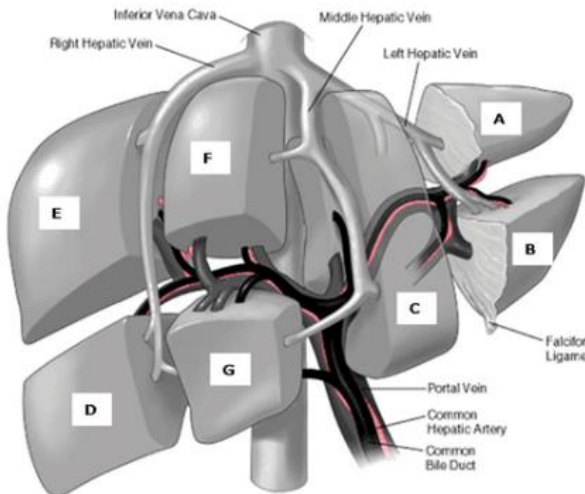
Q68. What is the diagnosis of the figure below?

1. Intracerebral hemorrhage (ICH)
2. Epidural Hematoma (EDH)
3. Subdural hematoma (SDH)
4. Subarachnoid hemorrhage (SAH)



Q69. According to the Couinaud segmentation of liver, which description is correct ?

1. B→2nd, G→ 4th, E→ 6th
2. B→2nd, G→ 5th, E→ 7th
3. B→3rd, G→ 7th, E→ 6th
4. B→3rd, G→ 5th, E→ 7th



Q70. Which description of extremity CT below is **incorrect**?

1. Soft tissue and bone window reconstruction are necessary for extremity CT.
2. The positioning of shoulder CT should adjust both shoulders in the same level, even in examining unilateral shoulder.
3. When performing wrist CT, patients can supine on or stand near the CT couch.
4. Multiplanar reconstruction (MPR) can be applied for diagnose complicated bone fracture

Q71. What is the diagnosis of the figure below?

1. Cavernous hemangioma
2. Hepatocellular Carcinoma (HCC)
3. Metastatic Tumors of Liver
4. Cirrhosis of Liver



Q72. Given a field of view (FOV) of 36 cm, a matrix size of 128×128 , and a slice thickness of 5 mm, the pixel dimensions and voxel size of the CT image are:

1. 2.8 mm, 39.2 mm^3
2. 0.28 mm, 14 mm^3
3. 1.4 mm, 9.8 mm^3
4. 0.35 mm, 14 mm^3

Q73. In computed tomography (CT) imaging, which of the following parameters directly affects the brightness level of the image?

1. Low-pass filter
2. Window level
3. Window width
4. Pixel size

Q74. If a high-density material causes a low X-ray penetration and results in false images during image reconstruction using filtered back projection, it is referred to as:

1. Motion artifact
2. Streak artifact
3. Partial-volume artifact
4. Ring artifact

Q75. What is the parameter most commonly used to describe spatial resolution in CT scanners?

1. Edge-response function (ERF)
2. Modulation transfer function (MTF)
3. Fourier transfer function (FTF)
4. Special modulation function (SMF)

Q76. What is the main advantage of using a bowtie filter in computed tomography (CT)?

1. Reducing patient radiation dose
2. Improving spatial resolution of the image
3. Decreasing photon scatter
4. Enhancing detector efficiency

Q77. Which of the following is not an algorithm for multiplanar reformation (MPR)?

1. Filtered backprojection
2. Maximum intensity projection
3. Shaded surface display
4. Shaded volume display

Q78. If the equivalent atomic numbers for each tissue are as follows: fat: 6.3, soft tissue: 7.4, lung:

7.4, and bone: 13.8, and the X-ray energy is 40 keV, with each tissue having a volume of 1 cm³, which tissue is most likely to produce photoelectric effect?

1. Fat
2. Soft tissue
3. Lung
4. Bone

Q79. When the CT detector size becomes smaller, which of the following statements is incorrect?

1. It generates higher spatial resolution images.
2. It generates images with higher noise.
3. It results in smaller pixels.
4. The scanning time becomes shorter.

Q80. At 125 kVp, if the attenuation coefficient of fat is 0.162 and the attenuation coefficient of water is 0.18, what is the CT value of fat in Hounsfield Units (HU)?

1. 111
2. -111
3. 100
4. -100