磁振造影測驗

Magnetic Resonance Imaging

2014年8月31日 星期日

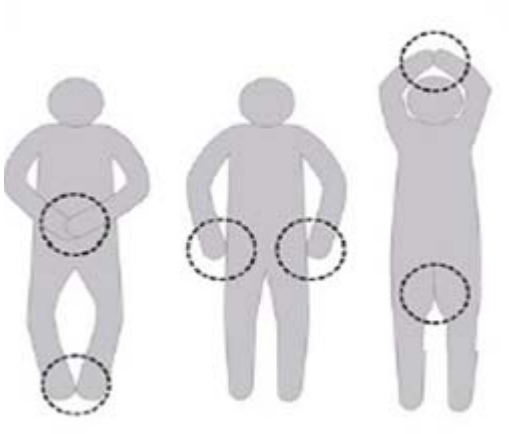
1. 除題意不清楚或是圖片有問題，禁止詢問與試題有關的問題。

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	MRI 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 2”000**” 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解答番號1。Q2 = 解答番號2，Q3 = 解答番號3…Q90 = 解答番號90。

1. What does the following picture show?



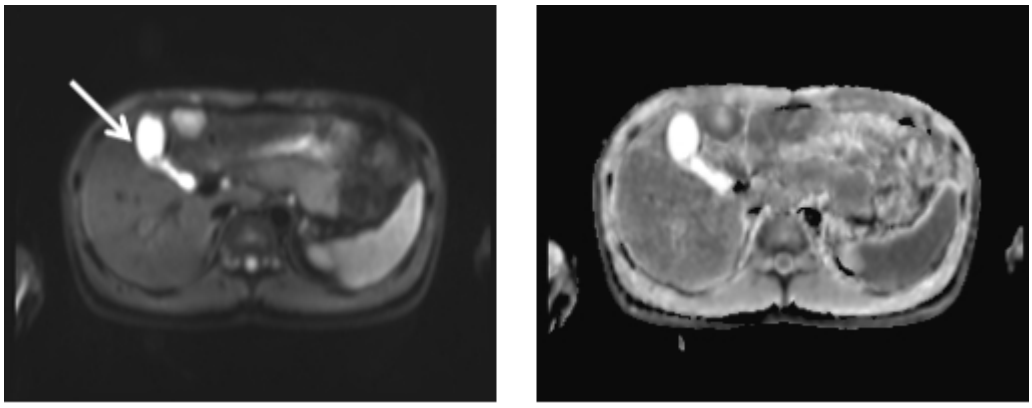
1) The position of like picture for patient rest
2) In is picture expresses Fringe field.
3) Be caution the burn to made a ring shape induction
4) For position to pregnancy possible

2. Which of following is not correct explaining of SAR effect parameter?

1) RF pulse form.
2) RF pulse type
3) Structure volume in coil
4) TE(echo time)

3. DWI (a) and ADC map (b) are seen on this image. Which of the following is all correct?

a b



A. on (a) exam b-value increase and then SNR increase

B. on (b) image need to different b-value not less than two

C. White arrow show anatomical structure for relatively lower diffusion coefficient

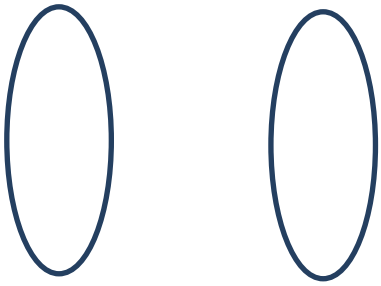
D. on (b) image involve T2 tissue contrast

1) A, B
2) B, C
3) A, B, C
4) A, C, D

4. Matrix size 4 X 4, slice thickness 10mm, FOV 40mm. When FOV is changed from 40mm to 20mm, how to SNR ?
1) Increased 50%.
2) Decreased 50%
3) Decreased 25%
4) Decreased 75%.

5. Which of the following is not a correct about short gantry?
1) Feel the opening
2) Stiff to magnet inhomogeneity
3) Magnet weight light and cost to manufacture low
4) Hard to wide FOV exam

6. Which of the following is a correct about artifact on this image?



1) Magnetic susceptibility
2) Occur to exam region size small than FOV
3) Mainly occur to frequency-encoding direction
4) Prevent artifact for oversampling phase-encoding direction

7. What is the proper for SNR and spatial resolution relation?
1) Increased voxel size, improve spatial resolution
2) When FOV fixed, increased matrix and then improve spatial resolution
3) SNR and spatial resolution are proportion relation
4) There is no concern partial volume artifact because of increased slice thickness and then improve SNR

8. What is the proper for Fast Spin-Echo technique?

1) Get several time echo signal in TR, no relation scan time
2) Higher fat signal than conventional spin-echo because of accelerate fat signal decay
3) Filled K-space last outline that control contrast echo of various echo
4) Reducing SAR because of used several times 180^0 RF in short during time.

9. There is MR spectroscopy explanation. What is true?

A. Chemical shift main factor is shielding effect, same a nucleus different appear spectrum
B. Multi voxel spectrum method is long time but resolution excellent than single voxel spectrum.
C. In vivo analyze method metabolism in human body
D. Electron shielding effect is a molecule or atom adjacency orbital electrons that build up electron cloud and change local nuclear magnetic momnet.

1) A, B
2) A, B, C
3) A, C, D.
4) A, B

10. There is MR spectroscopy in main metabolic agent explanation. Which of the following is correct?

A. ^{13}C(carbon) is metabolic tracer.
B. ^{1}H(hydrogen) exam not observe metabolic agent which not do water suppression
C. No present Glx(Glutamate) and Lac(lactate) in normal brain but hypoxia, ischemia is damaged brain metabolic agent
D. When damaged nerve cell, Increased strength and density that NAA(N-acetylaspartate-2.01ppm) has large peak in brain

1) A, B
2) A, B, C.
3) A, B, C, D
4) B, C, D

11. Which of the following is correct about the explanation of fMRI ?
Specific stimulate cerebral cortex

A. Need EPI technique main magnet strength higher, increased signal intensity
B. If it stimulate Increased Deoxyhemoglobin and then signal maximum increased.
C. Deoxyhemoglobin is paramagnetic

1) A, B
2) A, B, C
3) A, B, D
4) B, C, D

12. Which of the following is correct about the explanation of perfusion MRI?

A. ASL(arterial spin labeling) technique is imaging technique that in arterial magnetic susceptibility of change for lesion contrast agent
B. Reducing imaging distortion and chemical shift used fat suppression
C. In MR general rCBV(regional cerebral flow), rCBF(regional cerebral blood volume), TTP(time to peak), MTT(mean transit time), TO(time of arrival) mapping
D. Represent blood flow direction when reconstruction color map to each image slice color mapping

1) A, B
2) A, C
3) B, C
4) B, D

13. Which of the following is correct about the explanation of contrast agent in MRI?

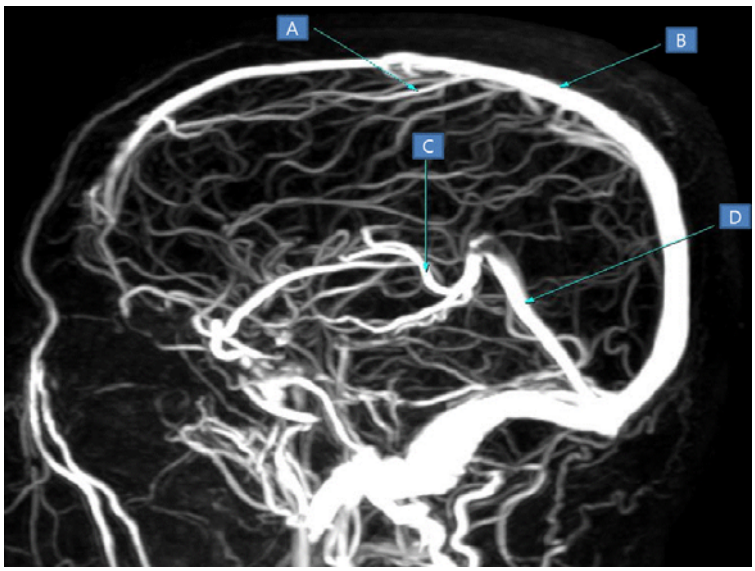
A. T1 contrast agent is T1 recovery time decreased that T1 effect increased
B. T2 contrast agent is T2 decay time decreased that T2 effect increased
C. A series of Gadoliniun rare earthelement of metal element that ligand and chelation for stability in human body

1) A, B
2) A, B, C
3) B, C,
4) A,

14. Which of the following is correct about the explanation of NSF(nephrogenic systemic fibrosis), NSD(nephrogenic systemic dermopathy) in MRI contrast agent side effect?

1) Prohibited iodine contrast agent side effect of historical patient
2) Prohibited acute, chronic renal failure patient.
3) Revealed extrarenal dialysis patient for inject contrast agent in 24 hours.
4) Recommend under eGFR $30_{mL/mn/1.73m2}$ patient for not side effect

15. The following image is Brain MR Venography. What is the correct anatomical structure?



1) Cortical vein
2) Superior sagittal sinus
3) Internal cerebral vein.
4) Precentral vein

16. There is receive bandwidth and SNR explanation. What is true?

1) $\text{SNR} \propto \sqrt{\text{old bandwidth} / \text{new bandwidth}}$
2) Widen receive bandwidth, higher SNR
3) Widen receive bandwidth, higher TE(echo time)
4) Widen receive bandwidth, increased chemical artifact

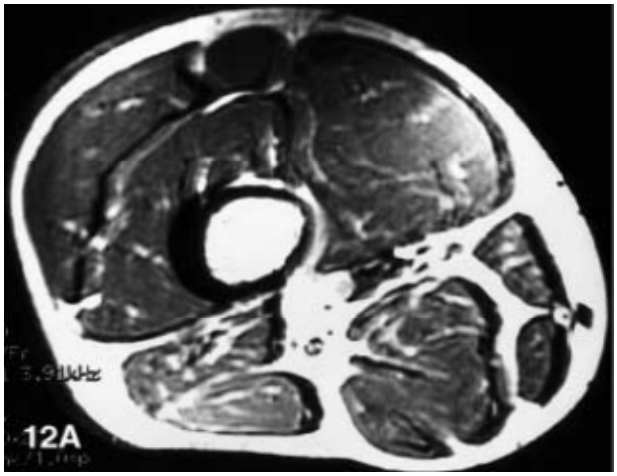
17. There is FID(free induction decay). What is true?

1) RF pulse stop, magnetization value decrease and electromotive force increase
2) FID signal not affect static magnet field of inhomogeneity or susceptibility ratio
3) FID signal decided first time of signal to nuclear spin density
4) FID signal relative nuclear magnetic moment and T2* effect more increased

18. Ernst angle is _____?

1) increasing SNR in low flip angle.
2) the flip angle making maximum signal.
3) almost T2WI (flip angle>Ernst angle)
4) almost T1WI (flip angle>Ernst angle)

19. Chemical shift artifacts are seen on this image. What is not true?



1) it is occur to interface in bone, water, fat
2) reduced used high magnet field
3) reduced used fat suppression
4) reduced wide receive bandwidth

20. There is spin and spin quantum number explanation. What is not true?

1) ^{1}H has spin quantum number 1/2
2) ^{1}H has 1/2 and -1/2 a dipole energy state, a nucleus spin 2
3) ^{1}H ,^{13}C, ^{19}F, ^{31}P has integral spin
4) A nucleus of quantum number 1 has -1, 0, 1 of three energy state

21. There is magnetic susceptibility explanation. What is not true?

1) Magnetic susceptibility effect is stronger because of shorten T2* relaxation time.
2) Susceptibility(X)= M/H. M=induced magnetization, H= magnetic field strength
3) The artifact of relating with Magnetic susceptibility is happened in accordance with external magnetic field direction.
4) The artifact is taking place in margin of air to tissue and bone to tissue

22. There is K-space explanation. What is true?

1) The center of K-space is relative to resolution in MR image
2) The outer line of K-space is relative to signal to noise ratio in MR image
3) The center of K-space is relative to contrast in MR image.
4) K-space possible filling full negative and positive data

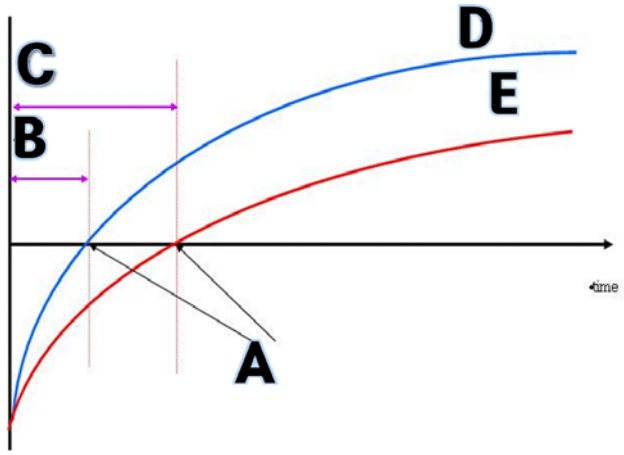
23. In the following EPI(Echo Planar Image) Description, what is the wrong thing?

1) Fat suppression is needed because of Chemical Shift Artifact in EPI.
2) Once RF use, half size of frequency step move upward and downward gradient and upward and downward gradient total is same.
3) High slew rate gradient is required.
4) Multi-shot EPI fill K-space used several time high frequency.

24. There is gradient waveform explanation. What is true?

1) Gradient amplitude unit measure mT/m or G/m and the maximum amplitude is relative to maximum resolution of image.
2) Gradient slew rate unit is T/m/sec and effect in TR but not TE.
3) Increasing receive bandwidth is increasing SNR but decreasing sampling time.
4) Maximum gradient duty cycle is gradient off time.

25. There is picture explanation. What is true?



1) Inversion recovery graph represent recovery type of fat and water
2) a is null point(90^0 RF pulse, magnetization=0)
3) b is T1 fat value include recovery time 160~180msec
4) d is represent fat recovery time, e is water recovery time

26. Which is not cause of FID (Free induction decay)?

1) Larmor frequency
2) chemical shift
3) Magnetic susceptibility
4) Magnetic field inhomogeneity

27. Which of following is not a correct explaining about relaxation T2*?

1) T2* is T2 relaxation and cause of transverse magnetization decay on inhomogeneity in magnetic field
2) T2* is differential of irregular magnetic field
3) For inhomogeneity of magnetic field is decrease, used spin echo
4) T2* is longer than T2

28. There is relaxation tissue explanation. What is true?

1) Malignancy tissue almost short T1 relaxation time.
2) Macro molecular of proton difficult signal detection because of decay T1 relaxation time and transverse magnetization too fast.
3) Likely CSF(central spinal Fluid) very short T1 relaxation time 100~200msec
4) Soft tissue T1 relaxation time longer than CSF(central spinal Fluid)

29. Which is method to decrease SAR(Specific Absorption Rate)?

1) decrease flip angle.
2) shorten TE.
3) increase the number of excitations
4) shorten TR

30. Which of the following is a wrong explaining about diffusion weighted imaging?

1) Diffusion motion has isotropy and anisotropy
2) Acute cerebral infarction diagnosis used isotropy
3) Nerve pathway fiber tracking used isotropy
4) The more b-value the more diffusion effect emphasized

31. Which is true of statement reducing magnetic susceptibility?

1) It is used of Long TE
2) It is used of narrowing of receive bandwidth
3) It is used of 3D more than 2D
4) It is used of gradient echo more than spin echo

32. which is true of statement parallel imaging?

1) Reduce of scan time caused phase-encoding number increase
2) Increase of SAR
3) It is used phase array coil
4) Reduction factor not relate SNR

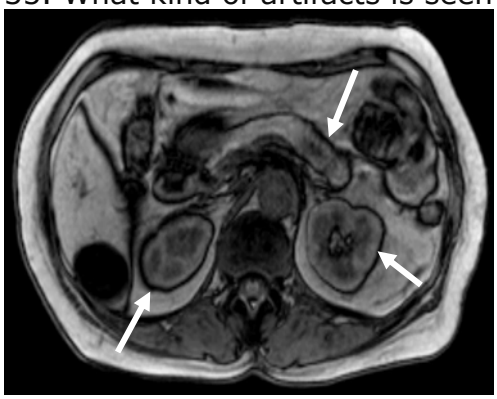
33. What fat suppression technique is combined and used with frequency selective excitation and chemical shift between water proton and fat?

1) CHESS
2) Dixon
3) Chopper
4) STIR

34. Which of the following is correctly connected from number 1 to 3 on this image?

1) Fourth ventricle - Cerebral aqueduct -Lateral ventricles
2) Lateral ventricles - Fourth ventricle - Cerebral aqueduct
3) Fourth ventricle - Lateral ventricles - Cerebral aqueduct
4) Lateral ventricles - Cerebral aqueduct - Fourth ventricle

35. What kind of artifacts is seen in this image (arrow) and what is this image?



1) Motion Artifact, In phase
2) Truncation Artifact, Out of phase
3) Partial Volume Artifact, In phase
4) Chemical Shift Artifact, Out of phase

36. Which of the following is a wrong explaining about fat suppression technique?

1) Technique of Frequency selective excitation
2) Technique of Phase evolution.
3) Technique of Inversion recovery.
4) Technique of pre suppression

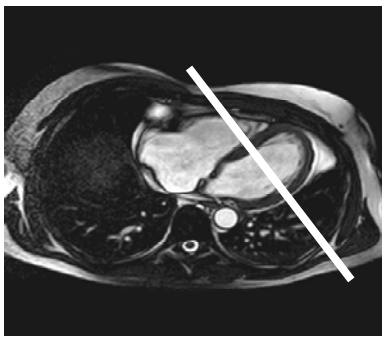
37. Which is not contrast enhancement in the anatomical structure in below?

1) Dura mater
2) Pituitary gland
3) Choroid plexus
4) pons

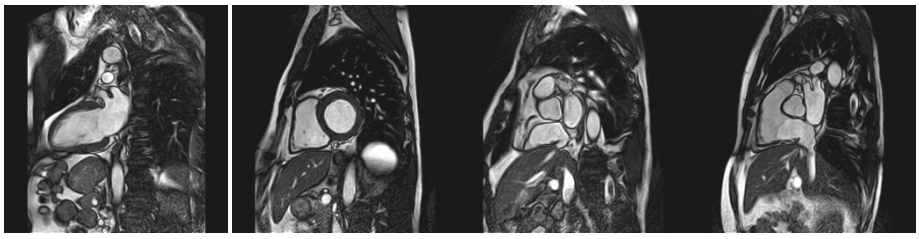
38. Which of the following is a wrong explaining about magnetization transfer(MT)?

1) MT is energy chemical exchange between free water of tissue proton and fat proton
2) It is used of reduce for background noise at TOF
3) contrast increase of 3D TOF
4) It is reduced of free water of tissue proton signal

39. What image can be acquired by scanning as the line on this image?



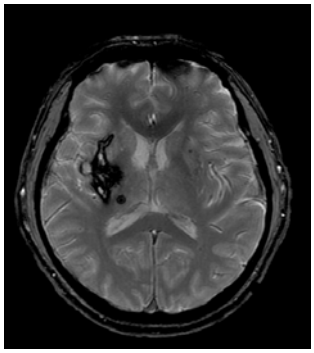
A B C D



40. Which is correct in Frequency encoding and phase encoding of the description?
1) Frequency encoding is changed in every TR.
2) The increase in the number of frequency encoding, the spatial resolution increases.
3) The frequency is used to find out the position of the magnetic resonance signal in phase encoding.
4) The size of phase encoding is always fixed.

41. Which is the residual spin spoiling method with strong gradient spoiler without refocusing Mxy component that remains in the xy plane?
1) FLASH(Fast Low Angle Shot)
2) SE(spin echo)
3) FISP(Fast Imaging with Steady Precession)
4) TSE(Turbo spin echo)

42. What is this kind of effect increased?



1) Reduced TE
2) High magnetic field is more effective
3) FSE technique efficient more than GRE
4) Thin slice thickness

43. Which of the following is a true explaining about wash-out effect?
1) Blood signal is darken at T2 spin echo
2) Blood signal is brighten at GE echo
3) Blood signal is darken at T1, brighten at T2
4) Blood vessel signal is not relate of slice thickness

44. Which of the following is a wrong explaining about superconductive magnet cooling refrigerator?

1) It is use of He, N
2) It is use of water cooling refrigerator
3) It is use of anti-freezing solution
4) It is use of a thermo-hygrostat

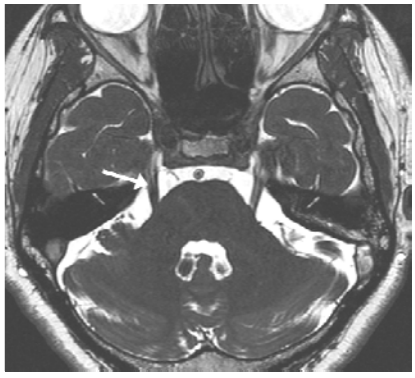
45. Which of the following is factor of not increasement wash-out effect in spin echo?

1) Increase of blood velocity
2) Increase of TR
3) Increase of TE
4) decrease of slice thickness

46. What is name of gradient, which is variable amplitude in TR ?

1) Slice selective gradient
2) Frequency encoding gradient
3) Phase encoding gradient
4) Phase and Frequency encoding gradient

47. Which is true statement of white arrow pointed nerve?



1) Sense of smell
2) Sense of visual
3) Sense of audible
4) Sense of masticate

48. What is effect of reduced from 32kHz to 16kHz in receive bandwidth?
1) Same effect of SNR
2) 1.41 times more increase of SNR.
3) 2 times more increase of SNR.
4) 2 times more decrease of SNR

49. Which is correctly connected to statement?
1) It is proportion to FOV and spatial resolution
2) FOV-> 1/2, SNR->1/2
3) It is proportion to FOV and SNR
4) Cross talk artifact is happen occur to small FOV

50. Which is the metabolic material hypoxic ischemic encephalopathy in brain MR spectroscopy?
1) N-acetylaspartate
2) Creatine
3) Glutamate
4) Choline

51. What is formula T1 tissue TI value in STIR?
1) 1.44T1 (fat)
2) (1/√2) T1 (fat)
3) 2T1 (fat)
4) (1/0.693) T1 (fat)

52. Which is true statement of magnetic flux density unit?
1) Gauss(G) means magnetic field when 1 A of magnetic flux flows per $1m^2$ with occurrence 1N of force
2) Tesla(T) means measured force when 5 A of electric current flows on straight wire
3) 1T Tesla(T) = $1wb/cm^2$
4) 1Gauss(G) = $10^{-4}wb/m^2$

53. Which is true statement of brain function area and anatomical structure?

1) Visual –Superior Temporal gyrus
2) Speech- Broca's area
3) Sensory- Precentral gyrus
4) Motor- Postcentral gyrus

54. Which of the following is a correct about round circle?

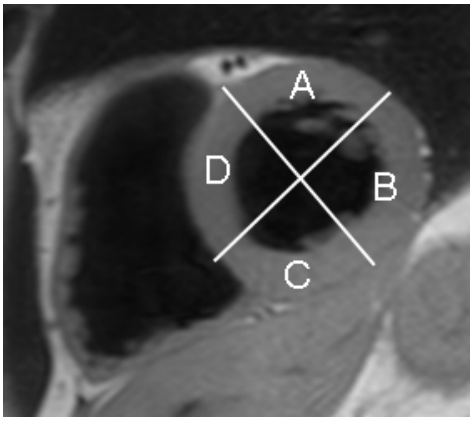
A. It shows Sciatic nerve
B. Highest thick nerve
C. Gathering of Bifurcated nerve L4-S3
D. Separated tibial nerve and common pernoeal nerve

1) A, B, C
2) B, C, D
3) A, C. D.
4) ALL

55. Which is true statement of precession frequnecy?

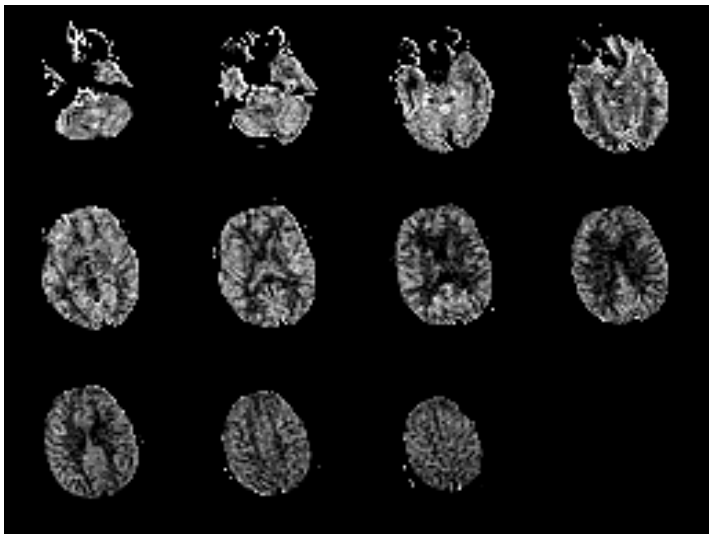
1) $\omega_o = \mathbf{B_0} + \gamma$
2) Hydrogen is spin and precession which is not external magnetic field effect
3) Gyro magnetic ratio(γ) is atom magnetic ratio of procession
4) Hz/gauss or MHz/T

56.Which of the following is not a correct about the following anatomical name?



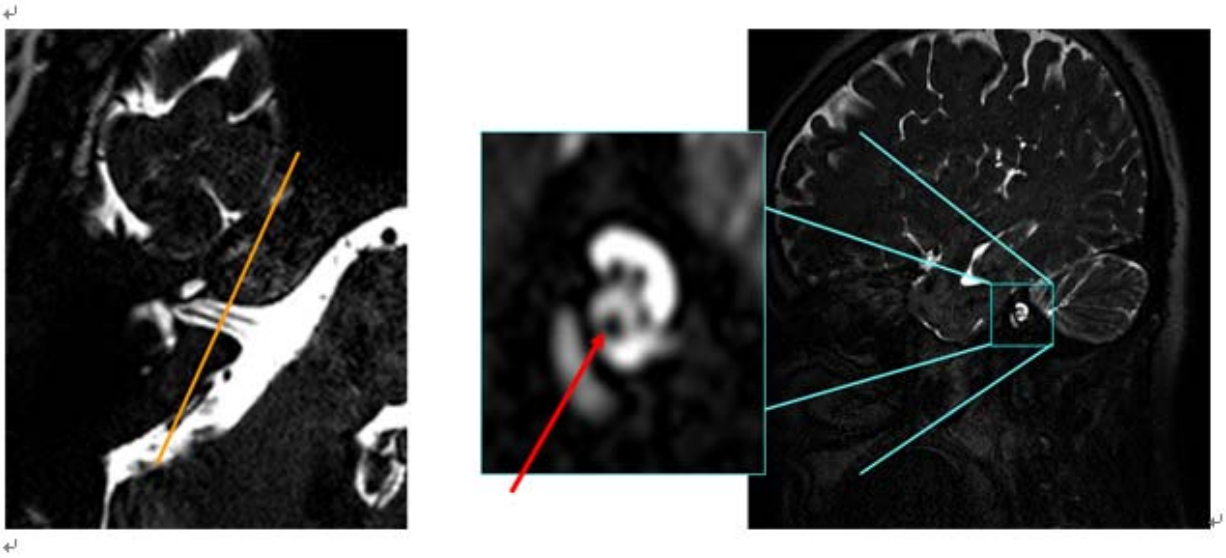
1) A - anterior
2) B - lateral
3) C - inferior
4) D - apex

57. Which is true statement of ASL(arterial spin labeling)?



1) Endogenous perfusion MR images
2) CBV, CBF, TO, TTP, and MTT can be acquired.
3) CRF or pediatric patients are not recommended.
4) It can be acquired with bolus injection of gadolinium contrast media.

58. What is this (arrow)?



1) Facial nerve
2) Superior vestibular nerve
3) Inferior vestibular nerve
4) Cranial nerve VII, VIII

59. Which is not happened to decrease SNR?
1) Partial echo
2) Keyhole imaging
3) Partial fourier
4) Parallel imaging

60. Which is the statement of appropriate time for frequency encoding(read out)?
1) After 90^0 RF pulse
2) After 180^0 RF pulse
3) During appear echoes
4) After appear echoes

61. What is the concern about K-space of central line at fast spin echo?

1) Spatial resolution
2) ETL
3) TR
4) Effective TE

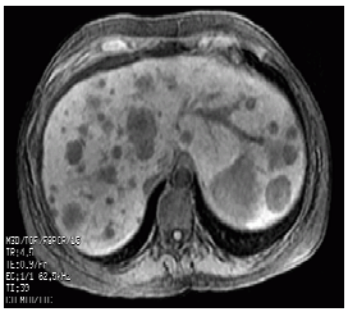
62. We are going to make TSE imaging using 256x256 matrix. How many number of K-space segment(ETL=16, TR=3500ms, TE= 100ms, NEX=2)?

1) 8
2) 16.
3) 32
4) 64

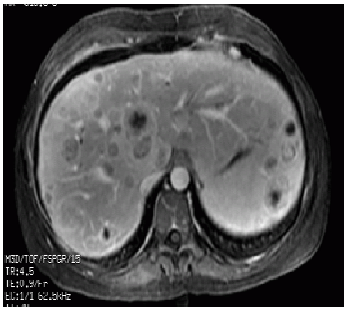
63. What is the not concern about CE-MRA?

1) Bolus track
2) Time resolved MRA
3) Test dose
4) Flow related enhancement

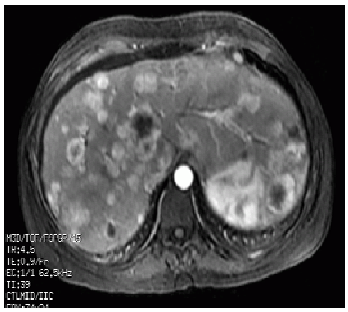
64. Which of the following is correct order of dynamic study with contrast media?



(A)



(B)



(C)

1) (A)-(B)-(C)
2) (A)-(C)-(B)
3) (B)-(C)-(A)
4) (B)-(A)-(C)

65. What is name of artifact used to small FOV in over loaded gradient echo?
1).Zebra stripe Artifact
2) Aliasing Artifact
3) Shading Artifact
4) Magnetic susceptibility Artifact

66. What is the suitable VENC velocity encoding at circle of willis(3D PC MRA)?
1) 5cm/s
2) 10~30cm/s
3) 30~45cm/s
4) 60~80cm/s

67. Which is true in Relaxation time?
1) If external magnetic field is increasing, T2 relaxation time is longer.
2) If external magnetic field is increasing, T1 relaxation time is longer.
3) If external magnetic field is increasing, T1 relaxation time is shorter.
4) The relaxation is that the spin will go back to the equilibrium in the excited state.

68. What is the value of Nyquist frequency at 512 frequency encoding step?

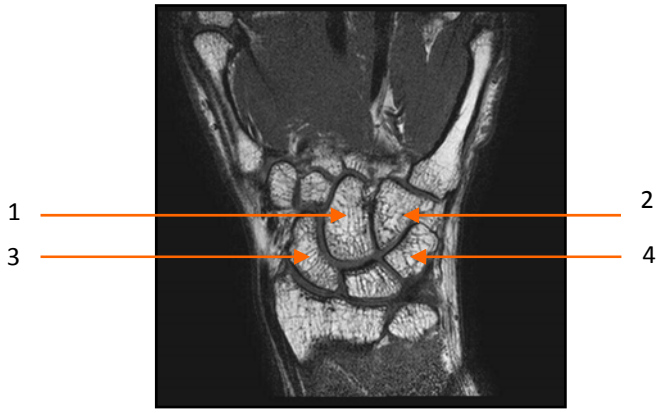
1) 64 Hz
2) 128 Hz
3) 256 Hz
4) 512Hz

69. In the following spoiled GRE Description, what is the wrong thing?
1) If you are use long flip angle, short TR and TE, T1WI is obtained.
2) If you are use short flip angle, long TR and TE, T1WI is obtained.
3) Spoiling removes the horizontal component of the magnetization in the steady state before each RF pulse.
4) Proton density images should show a spin density of the image, the filp angle should be used slightly larger than Ernst angle.

70. Which is not true about flow enhancement effect?
(V : velocity, Dz: Slice thickness, Mz: transverse magnetization)
1) In V = 0, produce a signal lesser than the saturated Mz.
2) In V<Dz/TR, some part of the signal is larger than Mz and some other part of the signal is smaller.
3) In V=Dz/TR, produce a signal greater than Mz.
4) In V>Dz/TR, produce a greater signal in proportion than those of V = dz / TR

71. Which is the true in 3D method?
1) Phase encoding gradient is added to the direction of slice selection gradient.
2) Slice selection gradient is added to the direction of slice encoding gradient.
3) Frequency encoding gradient is added to the direction of slice encoding gradient.
4) Phase encoding gradient is added to the direction of frequency encoding gradient.

72. What structure is seen on this image (arrow)?



1) Hamate
2) Capitate
3) Scaphoid
4) Pisiform

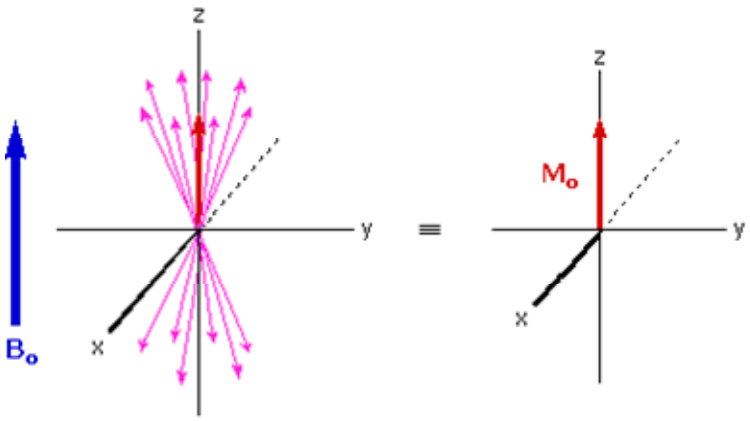
73. Which of the following is a wrong explaining about diffusion weighted at early acute brain ischemia ?

1) Diffusion image early detect cellulite edema of acute brain ischemia
2) DWI of acute brain ischemia shows high signal intensity
3) It is not informative diagnosis on T2WI
4) If high signal is show on DWI, means of early acute brain ischemia

74. Which of the following explanation is not correct about magic angle artifact?

1) It is phenomenon which is occurred at specific angle in main magnetic field.
2) Ligament and tendon signals are emphasized in weighted and PD weight image.
3) Signal intensity of structure increase at magic angle.
4) It is able to be improved by broading receive bandwidth

75. Which of the following is correct below picture?

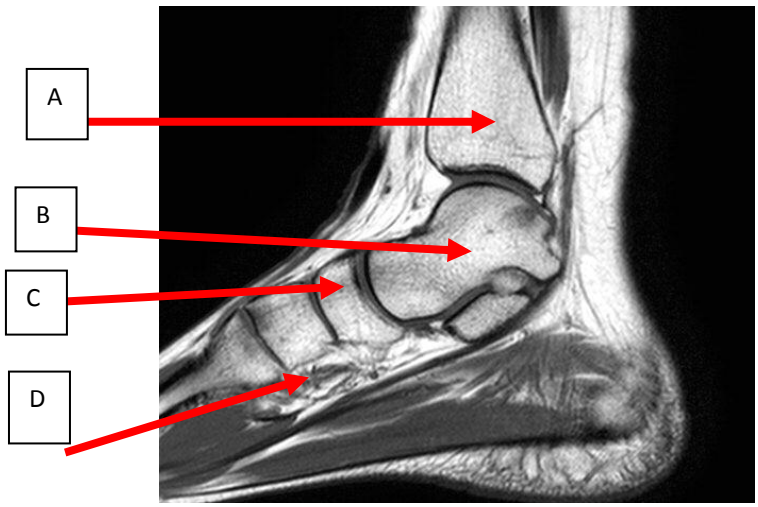


1) Z axis→ 180^0 RF pulse→ XY axis
2) External magnet field ↑, Net magnetization ↓, signal intensity → Low
3) RF pulse strength, time ↑, magnetic rotate angle changed
4) Excitation → transverse magnetization

76. Which of the following is not correct about reduced artifact below shown image?

1) SE < FSE
2) SE < GRE
3) High bandwidth
4) 3T>1.5T

77. Which of the following is not correct about anatomical name of arrowhead?



1) Tibia
2) Talus
3) Cuboid
4) Cuneiform

78. How much time image acquisition on HASTE(512x521 matrix, ETL=132, echo spacing=3.2ms)?

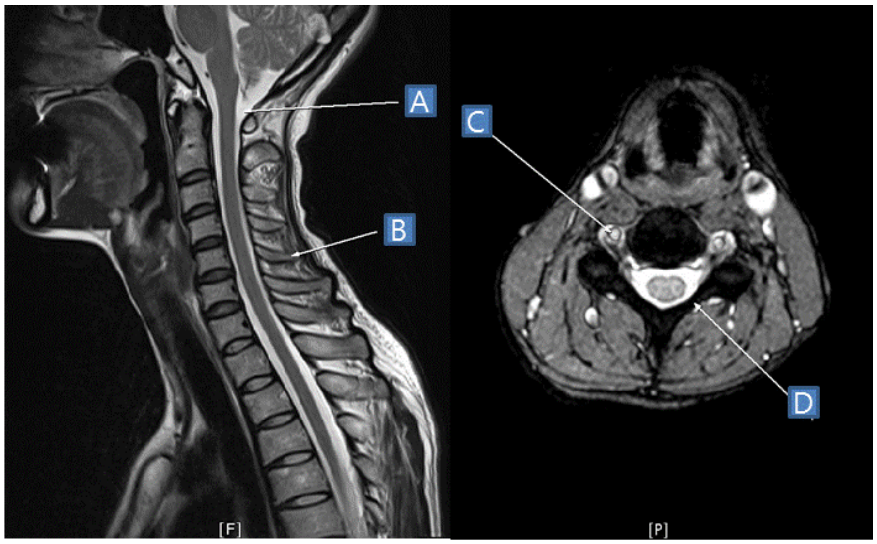
1) 409.6msec

2) 422.4msec

3) 819.2msec

4) 1638.4msec

79. Which of the following is not correct about anatomical name of arrowhead?



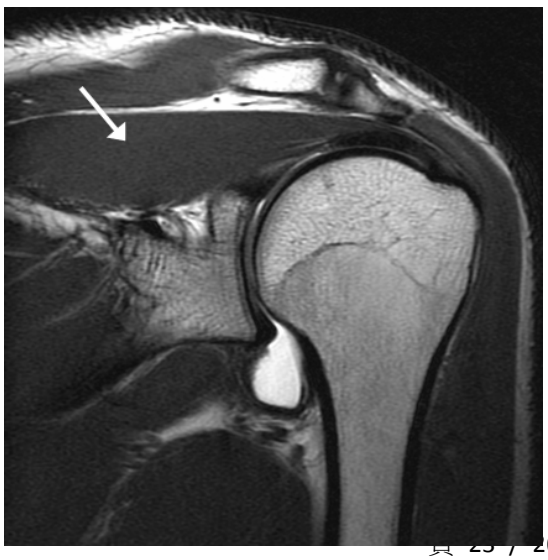
1) A- cerebro-spinal fluid

2) B- transverse process

3) C-Vetebral artery in transverse foramen

4) D-Lamina

80. Which of the following is a correct explanation about below images?



1) Trapezius muscle
2) Deltoid muscle
3) Supraspinatus muscle
4) Biceps muscle

81 Slew rate is _____?

1) maximum amplitude / increasing time to maximum amplitude
2) maximum amplitude / area of maximum gradient
3) area of maximum gradient / increasing time to maximum amplitude
4) maximum amplitude / area of minimum gradient

82. Which of the following is not correct explanation about T2*?

1) Mainly influence of T2* decay is dephase
2) T2* is appear before than T2 relaxation
3) The more increase magnetic inhomogeneity, the more increase T2* effect
4) T2* effect is well defined spin echo

83. A number of minimal diffusion direction for acquiring DTI ?

1) 1 2) 3
3) 6 4) 12

84. Which of the following is not correct about TE(repetition time)?

1) TE ↑, SNR ↑
2) TE ↑, scan time ↑
3) TE ↑, slice ↑
4) TE ↑, spatial resolution ↑

85. Which of the following is not correct about explanation?

1) Pixel size ↑, SNR ↑
2) Pixel size ↑, spatial resolution ↑
3) Pixel size = FOV/matrix
4) FOV ↑, Pixel size ↑

86. Which of the following is correct about explanation?

A. Slice thickness ↑, voxel size ↑

B. Slice thickness ↑, SNR ↑

C. Slice thickness ↑, spatial resolution ↑

D. Slice thickness ↑ → partial volume artifact

1) A, C

2) B, D

3) A, B, D

4) A

Code 1-1-2 low

87. There is super conductive magnet explanation. What is true?

A. Super conductive is the zero state of electric resistance.

B. High price refrigerant liquid Helium is used for making super conductive condition.

C. The quenching is loosing super conductive condition and then making paramagnetic condition.

D. Liquid nitrogen is used for preventing evaporation liquid Helium and holding super conductive condition.

1) A

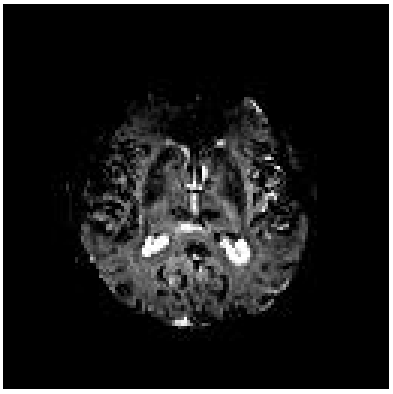
2) A, B

3) A, B, C

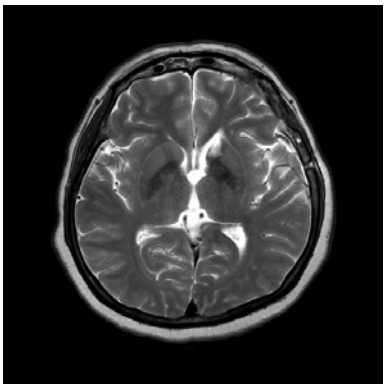
4) A, B, C, D

88. Which of the not concerned correct spin echo sequence image?

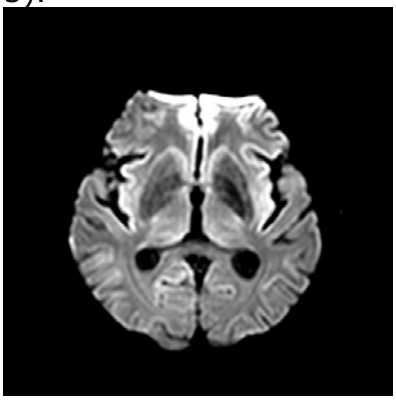
1)



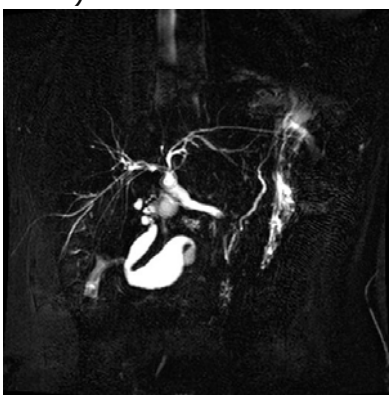
2)



3).



4).



89. Which of the following is not correct about shielding?

1) RF shielding should be attenuated under 20dB in all kind of electromagnetic wave

2) Copper and aluminum are used for high frequency shielding

3) Artifact can be observed in image on improper shielding

4) Iron plate is used for magnetic field shielding

90. Which of the following is not correct about resonance?

1) Right after resonance, spin become in the same phase

2) After giving 90^0 RF pulse, low energy proton changes into high energy status

3) Energy transmission occurs when frequency difference but precession frequency and RF pulse frequency

4) Direction of net magnetization and that of out magnet field is same