磁振造影測驗

Magnetic Resonance Imaging

2017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	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 **17XXX** 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的答案於Answer Choices1填入答案卷。Q2 = Answer Choices2，Q3 = Answer Choices3…….Q90 = Answer Choices90。

MRI 2017

Q1. The function of gradient coil is not relative to _____?
(A) Slice thickness
(B) Flip angle
(C) Spatial encoding
(D) Frequency encoding
(E) Spatial encoding

Q2. Slew rate is _____?
(A) maximum amplitude / increasing time to maximum amplitude
(B) maximum amplitude / area of maximum gradient
(C) area of maximum gradient / increasing time to maximum amplitude
(D) maximum amplitude / area of minimum gradient
(E) hight of maximum gradient / increasing time to minium amplitude

Q3. Which is NOT true in BOLD (Blood Oxygenation Level Dependent)?
(A) There is a method with T1 contrast.
(B) There is a method with magnetic susceptibility of oxyhemoglobin and Deoxyhemoglobin
(C) Deoxyhemoglobin is paramagnetic material.
(D) Signal is changed by blood volume.
(E) Often used in functional MRI studies

Q4. We acquired spin echo with 2 NEX. Which one of the following is true?
(A) The signals by changing the size of the slice selection gradient are obtained twice every TR.
(B) The data is filled in the same k-space line twice.
(C) The signal is acquired twice when the amplitude of frequency encoding is increasing during continuous TR.
(D) The phase encoding is performed twice matrix size.
(E) Effective TE doubled.

Q5. When matrix is changed from 128×128 to 256×256, _____.
1) spatial resolution is decreased.
2) scan time make twice.
3) pixel size is increased.
4) SNR is reduced by 1/ √2
(A) 1, 2
(B) 2, 4
(C) 1, 2, 3
(D) 1, 3, 4
(E) 2, 3, 4

Q6. RR interval should be calculated to acquire the image acquisition time and the time resolution in Cardiac Cine MR imaging. If the heart rate per minute is 60, what is the RR interval?

(A) 600 ms
(B) 800 ms
(C) 1000 ms2
(D) 2000 ms.
(E) 4000 ms.

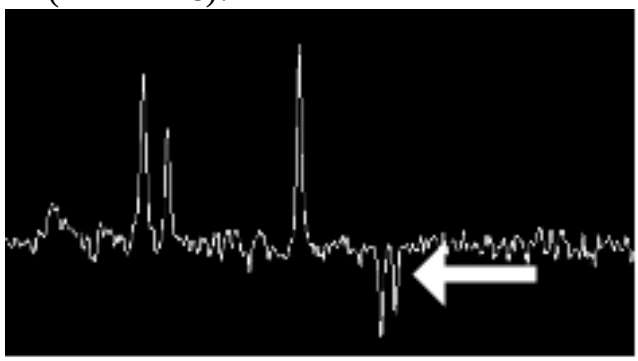
Q7. Which of the following can be used to describe the gradient strength in a MRI system?

(A) mT/m
(B) G/s
(C) s/m/mT
(D) T/m/s
(E) μs

Q8. What is the suitable VENC velocity encoding at circle of willis (3D PC MRA)?

(A) 5 cm/sec
(B) 10~30 cm/min
(C) 30~45 cm/min
(D) 100~130 m/sec
(E) 60~80 cm/sec

Q9. Which is the metabolic material indicated by the arrow in brain MR spectroscopy (TE-144ms)?



(A) Lactate
(B) Creatine
(C) Choline
(D) NAA
(E) Citrate

Q10. Which is true in SAR (Specific Absorption Rate)?

(A) SAR is proportional to the square of tissue density.
(B) SAR is proportional to gradient.
(C) SAR is proportional to TR.
(D) SAR is inversely proportional to the RF duty cycle.

(E) SAR is proportional to the squarer of magnetic strength.

Q11.Which is NOT true in parallel imaging?

(A) When the phase-encoding is decreased, the scan time is reduced.
(B) increase SNR
(C) use multiple receive coil
(D) increase scan time
(E) not relative to reduction factor.

Q12.Which of the following arrow indicates?

(A) Oculomotor nerve

(B) Optic chiasm

(C) Vestibulocochlear nerve

(D) Trigeminal nerve

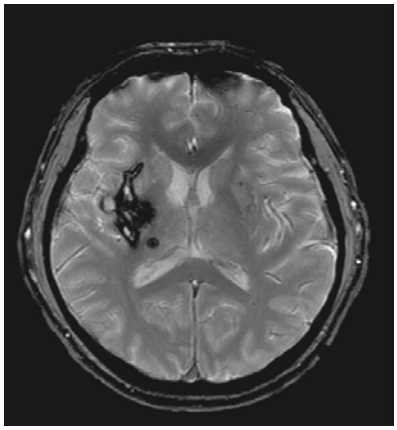
(E) Ver

(F) Tebral artery

Q13.What is a metabolic material which is used in brain proton MRS as a neuronal marker?

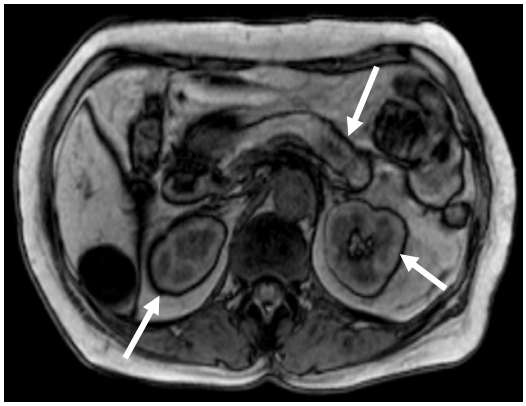
(A) NAA
(B) Choline
(C) Creative
(D) Citraste
(E) Lactate

Q14.How can the kind of effect increase?



(A) Reduced TE
(B) Increase TR
(C) Increase magnetic field
(D) Use FSE technique instead of GRE
(E) Reduce slice thickness

Q15.What kind of artifacts is seen in this image (arrow) and what is this image?



(A) Motion Artifact, In phase
(B) Truncation Artifact, Out of phase
(C) Partial Volume Artifact, In phase
(D) Zipper artifact, In phase
(E) Chemical Shift Artifact, Out of phase

Q16.Which one is true for Magnetic Resonance Image?

(A) B1 inconsistency, which is caused by the reduced length of RF waves, occurs typically in high magnetic fields.
(B) Magnetic resonance increases when T1 is longer than TR.
(C) The contrast of magnetic resonance images increases when NEX increases.
(D) Spin Echo signals decrease faster than FID signals.
(E) TE is often longer than TR.

Q17.What is NOT true about Larmor frequency and radio frequency?

(A) The gyromagnetic ratio increases in proportion to the strength of the magnetic field.
(B) They adjust the amount of energy they deliver by controlling RF frequency.

(C) Resonance is influenced by the intensity of the external magnetic fields (B0).
(D) Resonance occurs only when the same radio frequency as the precessional frequency of a nucleus spin is applied.
(E) The precessional frequency of nuclei of a substance placed in a static magnetic field B0 is calculated from Larmor Equation.

Q18. DWI is influenced from diffusion and T2 relaxation time due to T2 relaxation time long tissue is even apparent diffusion coefficient is high, it may receive high signal intensity on DWI. What is it?
(A) Magic angle effect
(B) T2 shine-through effect
(C) Heel effect
(D) Peak shift effect
(E) T1 relaxation

Q19. Which of the following components is the B1 field of MRI system?
(A) Main magnet
(B) Gradient system
(C) Radiofrequency system
(D) Shim system
(E) Receiver coil

Q20. Which is correct to decrease SAR?
(A) FOV 20% increase
(B) Increase number of ETL
(C) Increase TR
(D) Increase flip angle
(E) Decrease TE

Q21. Which of the following is correct, when receiver bandwidth is reduced?
(A) Decreased SNR, decreased noise
(B) Increased SNR, decreased noise
(C) Decreased SNR, increased noise
(D) Increased SNR, increased noise
(E) Nothing changes

Q22. Which is NOT correct about the “Crosstalk artifact”?
(A) This artifact occurs when the RF profile is narrower than the slice profile.
(B) This artifact occurs a result of this the adjacent slices overlap.
(C) This artifact can be eliminated by using the sequential acquisition technique.
(D) Tissue in that overlapping region results in increased signal intensity.
(E) It may degrade the image quality

Q23. Which is the residual spin spoiling method with strong gradient spoiler without refocusing M_{xy} component that remains in the x-y plane?

(A) FLASH (Fast Low Angle Shot)
(B) SE (spin echo)
(C) FISP (Fast Imaging with Steady Precession)
(D) TSE (Turbo spin echo)
(E) EPI (echo planar imaging)

Q24. Which one is true for the 3D acquisition method?

(A) Phase encoding gradient is added to the direction of slice selection gradient.
(B) Slice selection gradient is added to the direction of slice encoding gradient.
(C) Frequency encoding gradient is added to the direction of slice encoding gradient.
(D) Phase encoding gradient is added to the direction of frequency encoding gradient.
(E) The imaging time is typically shorter than 2D acquisition method.

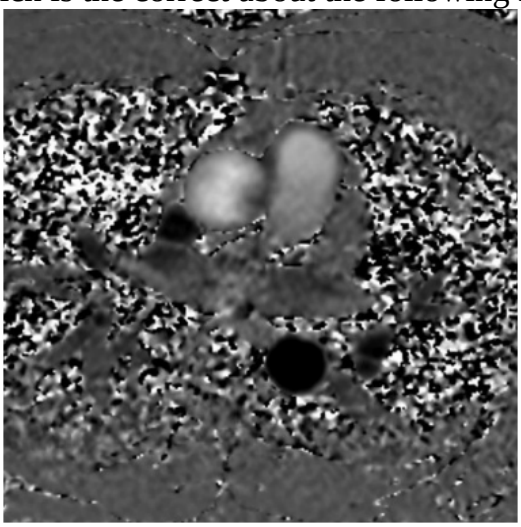
Q25. Ernst angle is _____?

(A) Increasing SNR in low flip angle.
(B) The flip angle making maximum signal.
(C) The flip angle with the balanced T2 and T1WI
(D) Almost T2WI (flip angle>Ernst angle)
(E) Almost T1WI (flip angle>Ernst angle)

Q26. How is the data acquired in phase contrast technique?

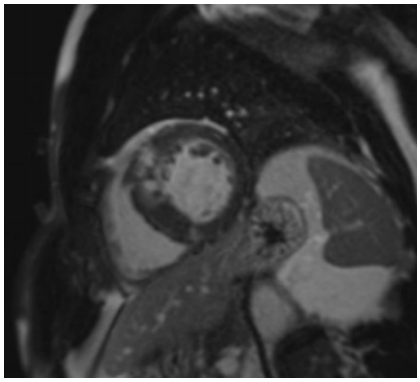
(A) Add a bipolar gradient.
(B) Add a diffusion gradient.
(C) Adding the ramped RF.
(D) Reduce flip angle
(E) Use subtraction

Q27. Which is the correct about the following image?



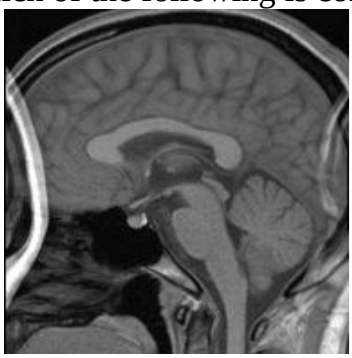
(A) Obtained by using TOF sequence
(B) Obtained by using PC sequence
(C) Obtained by using Spin Echo sequence
(D) Obtained by using Diffusion sequence
(E) Obtained by using EPI sequence

Q28.Which is the correct about the following image?



(A) Short axis
(B) Long axis
(C) LVOT (left ventricular outflow tract)
(D) RVOT (right ventricular outflow tract)
(E) Four chamber view

Q29.Which of the following is correct about the artifact on this image?



(A) Magnetic susceptibility
(B) Occur to exam region size small than FOV
(C) Mainly occur to frequency-encoding direction
(D) Caused due to motion from the patient
(E) The artifact can be eliminated by oversampling in phase-encoding direction

Q30. Which is NOT correct about the following image?

(A) The image can be obtained by TR=600ms, TE=12ms
(B) This is a T2 weighted image
(C) This image can be archived after contrast media
(D) Tumor can be seen at L3-4 level spinal canal
(E) Fat suppression was utilized

Q31. On a T1 weighted image of the brain, white matter appears _____ to gray matter.

(A) Hyperintensity
(B) Hypoinstensity
(C) Isointensity
(D) Subtracted
(E) None of the above

Q32. What is the Larmor frequency of proton in 1.5T MR scanner?

(A) 42.6 MHz
(B) 42.6 KHz
(C) 63.9 MHz
(D) 128 MHz
(E) 106.5 KHz

Q33. Echo planar imaging (EPI) technique cannot be used in _____?

(A) Functional MRI
(B) Perfusion weighted imaging
(C) Diffusion Image
(D) Cardiac imaging
(E) Chemical Shift Image

Q34. Define T1 relaxation:

(A) 60% transverse growth
(B) 36% longitudinal regrowth
(C) 63% of longitudinal magnetization regrowth
(D) 63% of transverse magnetization regrowth
(E) 90% transverse growth

Q35. What is this structure on the image (white arrow)?

(A) Central nervous of exercise function
(B) Lacking of diffusion effect
(C) Enhancement of contrast medium
(D) Sensitive part of susceptibility
(E) Hemorrhage

Q36. Which of the following is a correct about the center line of K-space in fast spin echo?

(A) Spatial resolution of Image
(B) ETL
(C) TR
(D) Effective TE

Q37. What fat suppression technique is combined and used with frequency selective excitation and chemical shift between water proton and fat?

(A) CHESS
(B) Dixon
(C) Chopper
(D) STIR
(E) Phase contrast

Q38. Which one of the following is NOT the characteristic of GRE technique?

(A) Use very short TR
(B) Short scan time
(C) Small flip angle
(D) Typically use short TE
(E) Use very long TE

Q39. Which one of the following is an advantage of GRE technique when compared with SE technique?

(A) Improved SNR
(B) Improved distortion artifact
(C) Increased T1 weighting
(D) Increased acquisition time

(E) Improved sensitivity to magnetic susceptibility effect of hemorrhage

Q40. Calculate the scan time for a 3D GRE technique in the C-spine with the following parameters: TR= 30ms/TE = 12ms/α = 5°/NEX = 2/N_x (frequency) = 256/N_y (phase matrix) = 100/N_z (slice) = 40.

(A) 2 min

(B) 4 min

(C) 8 min

(D) 16 min

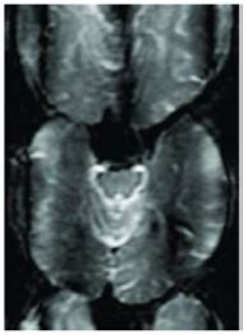
Q41. The gradient echo technique can be accelerated by using the following methods except :

(A) Fractional echo
(B) Fractional RF
(C) Reduced main magnetic field (B0)
(D) Fractional number of excitations (NEX)
(E) Parallel imaging techniques

Q42. Which direction does the phase error propagate along in an EPI sequence?

(A) Frequency axis
(B) Phase-encode axis
(C) Slice encoding direction
(D) Main magnetic field (B0)
(E) Flow direction

Q43. As illustrated in the following figure, in which imaging technique could the N/2 ghost be found?



(A) Spin echo
(B) Fast spin echo
(C) Gradient recalled echo
(D) Phase contrast
(E) Echo planar imaging (EPI)

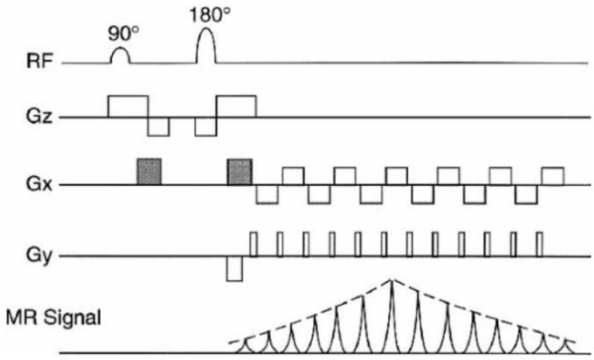
Q44. Which one is the advantage of multi-shot EPI over the single-shot EPI?

(A) Less phase errors
(B) Shorter scan time
(C) Less motion artifact
(D) More T1 weighted contrast
(E) More T2 weighted contrast

Q45. The apparent diffusion coefficient (ADC) can be calculated by using:

(A) Gradient recalled echo
(B) Diffusion weighted imaging
(C) MR spectroscopy
(D) BOLD functional MRI
(E) TOF MRA

Q46. What kind of imaging technique is it in the following figure? A pair of gradients is applied before and after the 180° pulse to dephase and eliminate signals caused by mobile protons.



(A) Fast spin echo (FSE)
(B) Diffusion-weighted SE-EPI
(C) Gradient recalled echo
(D) Inversion recovery FSE sequence
(E) TOF MRA

Q47. Which technique of the following is most sensitive in detecting acute stroke?

(A) Spoiled gradient echo sequence
(B) Spin echo sequence
(C) BOLD MRI
(D) Phase contrast
(E) Diffusion weighted imaging

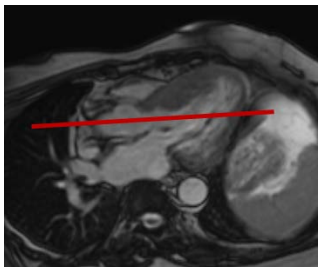
Q48. An asymmetric FOV may result in all of the following except:

(A) reduced SNR
(B) increased potential wraparound
(C) increased resolution
(D) increased scan time
(E) None of the above

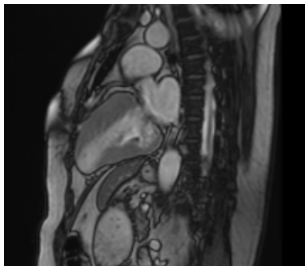
Q49. The slew rate is defined as:

(A) TR/Gmax
(B) Gmax/TR
(C) γ Gmax/TR
(D) FOV/Matrix size
(E) TR/TE

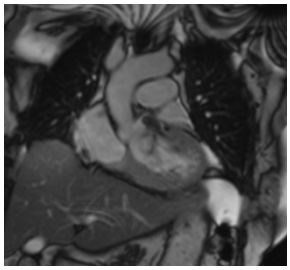
Q50. This is heart image of MRI. If you do image plan like red line, which image will appear?



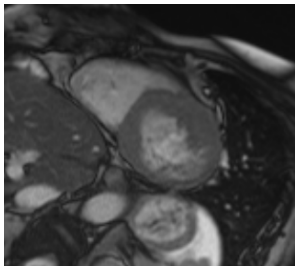
(A)



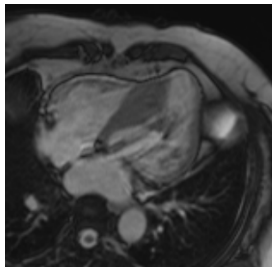
(B)



(C)



(D)



(F) None of the above

Q51. On a T1 weighted image of the brain, white matter appears _____ to gray matter.

(A) Hyperintensity
(B) Isointensity
(C) Hypointensity
(D) No signal
(E) None of the above

Q52. Chemical shift is decreased by all of the following except:

(A) using a fat suppression technique
(B) using a lower field magnet
(C) increased the bandwidth

(D) increased FOV

(E) none of the above

Q53. What is the gyromagnetic ratio of proton in 1.5T MR scanner?

(A) 42.6 MHz/T

(B) 42.6 kHz/T

(C) 63.9 MHz/T

(D) 63.9 kHz/T

(E) None of the above

Q54. What is true regarding the Gd-based contrast medium?

(A) It shorten the T1 value of the surrounding tissue

(B) It shorten the T2 value of surrounding tissue

(C) It shorten the T2* value of the surrounding tissue

(D) None of the above

(E) All of the above

Q55. What is true for Fast Spin-Echo technique?

(A) The SAR is lower than conventional Spin-Echo technique

(B) It use bipolar gradients to refocus the dephasing spins

(C) The MR signal is obtained from FID refocusing echo

(D) The length of scan time is depend on the echo train length

(E) All of the above

Q56. The diffusion weighting in DWI images is created by means of:

(A) Two balanced gradients spaced in time

(B) Triphasic flow compensation gradients

(C) An inversion pulse

(D) Two inversion pulses

(E) None of the above

Q57. What is the true for arterial spin labeling (ASL) technique?

(A) It is a method to assess the micro-circulation without contrast agent

(B) The MR signal is independent on the longitudinal magnetization

(C) By using 90-degree saturation pulse to tag the regional of interest

(D) Its signal is dependent on the magnitude of transverse relaxation

(E) None of the above

Q58. The MR imaging parameter that determines how much T1 (longitudinal) recovery is allowed to occur is the _____?

(A) TR

(B) TE

(C) Bandwidth (BW)

(D) Echo train length (ETL)

(E) Flip angle

Q59. The center frequency (resonance frequency) could be changed by:

(A) TE

(B) TR

(C) Flip angle

(D) Slew rate of gradient coil

(E) The strength of main magnetic field

Q60. Which parameter can affect the T1 effect?

(A) FOV

(B) TE

(C) TR

(D) NEX

(E) All of the above

Q61. Which imaging is sensitive to iron overload within the tissue and organ?

(A) T1 map

(B) T2 map
(C) DWI
(D) T2* map
(E) MRS

Q62.Which of the following statement is correct about dynamic perfusion MRI?
(A) ASL is the other alternative contrast agent based perfusion technique
(B) T1-weighted image is the most commonly used to identify the brain perfusion
(C) T2*-weighted image is the most commonly used to identify the myocardial perfusion
(D) Infusion drip is the most commonly used to accumulate the enough signal intensity during the first-pass circulation
(E) None of the above

Q63.Which of the following statement is correct about Gd-DTPA?
(A) The signal intensity of the image is not always linear proportional to the concentration of Gd-DTPA
(B) Gd-DTPA is water-solvable and can easy to pass through the capillary to intracellular space
(C) The decrease in relaxivities of the Gd-DTPA at 3T is higher than 1.5T
(D) All of the above
(E) None of the above

Q64.What is the optimized time delay for the late gadolinium enhancement (LGE) MRI for myocardium?
(A) 2-3 min
(B) 5-8 min
(C) 10-15 min
(D) Over 20 min
(E) None of the above

Q65. Which of the following statement is correct for the dark-blood cardiac MRI?

(A) Two inversion pulses are used, one is non-selective and the other is selective.

(B) This image contrast is very suitable to evaluate the cardiac function and regional wall motion.

(C) This technique is most commonly used to combine with dynamic perfusion MRI.

(D) All of the above

(E) None of the above

Q66. In conventional Spin-Echo (SE) pulse sequence, if TR = 3000ms, N_x = 256, N_y =128, N_{ex} = 1 and what is the total scan time?

(A) $TR*N_x*N_y$

(B) $TR*N_x*N_y*N_{ex}$

(C) $TR*N_y*N_{ex}$

(D) $N_x*N_y*N_{ex}$

(E) None of the above

Q67. At 1.5T MRI, which TE will result the opposed-phase between water and fat? (The chemical shift between water and fat is 3.4ppm)

(A) 1.2ms

(B) 2.3ms

(C) 4.5ms

(D) 8.9ms

(E) None of the above

Q68. What is the pixel spacing for matrix size = 256*256、sampling rate of frequency encoding = 8ms and gradient magnitude of frequency encoding = 5mT/m?

(A) 0.2 mm

(B) 0.6 mm

(C) 1.0 mm

(D) 1.4 mm

(E) 2.0 mm

Q69. Which of the following statement is correct if we reduced the sampling bandwidth in MRI?

(A) SNR decreased

(B) Chemical shift reduced

(C) TE increased

(D) All of the above

(E) None of the above

Q70. When main magnetic field strength is stronger, _____?

(A) SNR is decreased

(B) Chemical shift effect is decreased

(C) Filed inhomogeneity may increased

(D) All of the above

(E) None of the above

Q71. What is the arrow indicated (bright signal) on the below image (LEG MRI)?

(A) Myocarditis

(B) Myocardial edema

(C) Myocardial infarction or scar

(D) Artifact

(E) None of the above

Q72. When the bandwidth is reduced, _____.

(a) Chemical shift is increasing (b) the TR can be reduced

(c) Sampling time is increased (d) SNR is improved

(A) (a), (b), (c)

(B) (a), (c), (d)
(C) (b), (c), (d)
(D) (a), (b), (d)
(E) All of the above

Q73.Which of the following statement is correct if we increased the slice thickness?
(A) The SNR is improved
(B) The spatial resolution is improved
(C) The partial volume effect is reduced
(D) Increased scan time
(E) All of the above

Q74.RR interval should be calculated to acquire the image acquisition time and the time resolution in Cardiac Cine MR imaging. If the heart rate per minute is 80, what is the optimum acquisition window (TR)?
(A) 500
(B) 700
(C) 900
(D) 1000
(E) None of the above

Q75.What is the view of the heart on the below image?
(A) 2-chamber view
(B) 4-chamber view
(C) Short-axis view
(D) RVOT (right ventricular outflow track)
(E) LVOT (left ventricular outflow track)

Q76.Which one is the fast gradient echo method with residual gradient refocusing?
(A) FLASH (Fast Low Angle Shot)
(B) FISP (Fast Imaging with Steady Precession)
(C) EPI (Echo planar imaging)

(D) HASTE (half-Fourier acquisition single-shot turbo spin-echo)

(E) None of the above

Q77. Zipper artifact refers to a type of MRI artifact where one or more spurious bands of electronic noise extend perpendicular to the _____ direction and is present in all images of a series.

(A) Slice selection

(B) Phase encoding

(C) Frequency encoding

(D) Any of each

(E) None of the above

Q78. Which of the following statement is correct for diffusion weighted imaging (DWI)?

(A) Higher b value can detect larger diffusion status

(B) Higher b value can detect smaller diffusion status

(C) Bipolar diffusion gradients are used to compensate the flow effect

(D) Tractography is performed using data from DWI

(E) All of the above

Q79. Which of the following statement is correct for diffusion weighted imaging (DWI)?

(A) Apparent diffusion coefficient (ADC) is a measure of the magnitude of diffusion (of water molecules) within tissue

(B) ADC of a tissue is expressed in units of mm3/s

(C) ADC value: CSF > White matter > Grey matter

(D) Lesions bright on DWI means all restrict diffusion

(E) All of the above

Q80. Which of the following statement is correct for diffusion tensor imaging (DTI)?

(A) It can be used to infer the white-matter connectivity of the brain

(B) Data can be used to perform tractography
(C) Six or more gradient directions are applied
(D) All of the above
(E) None of the above

Q81.Which of the following statement is correct for functional MRI (fMRI)?
(A) BOLD is a Heavily T2 weighted sequences used to generate images in functional MRI (fMRI) studies
(B) In fMRI, CBF increases in response to increased activity simultaneously.
(C) Deoxygenated hemoglobin is paramagnetic whereas oxygenated hemoglobin is not
(D) All of the above
(E) None of the above

Q82.Flip angle is NOT associated which parameter as below:
(A) Gyromagnetic ratio
(B) Amplitude of RF pulse
(C) Time duration of RF pulse
(D) Strength of gradient field
(E) None of the above

Q83.In dark-blood cardiac MRI, the selective inversion preparation pulse is used to _____?
(A) Invert all spins into negative magnetization
(B) Invert all spin within the slice of image back to net magnetization
(C) Refocus the dephased spins to generate a spin echo
(D) To suppress the fat high signal
(E) None of the above

Q84.If 256 frequency samples are collected and the readout or sampling period is 8 ms at 1.5T, the receiver bandwidth would be _____?

(A) 8 kHz
(B) 16 kHz
(C) 8 MHz
(D) 16 MHz
(E) None of the above

Q85. Inversion-recovery (IR) sequences are helpful to _____?
(A) Improve T2 weighting
(B) Improve signal-to-noise (SNR)
(C) Shorten scan time
(D) Improve tissue contrast
(E) None of the above

Q86. To null the signal from a particular tissue with an IR sequence, TI should be chosen based on _____?
(A) The T1 value of the tissue
(B) The T2 value of the tissue
(C) The T2* value of the tissue
(D) The precession frequency of the tissue
(E) None of the above

Q87. Fat-water phase differences in an MR image are determined by what imaging parameter
(A) TR in a spin echo (SE) sequence
(B) TE in a spin echo (SE) sequence
(C) TR in a gradient echo (GRE) sequence
(D) TE in a gradient echo (GRE) sequence
(E) None of the above

Q88.Diffusion is typically NOT restricted by

(A) Intracellular water

(B) Extracellular water

(C) Pus

(D) Tumor cells

(E) All of the above

Q89.Typical pathology as seen on DWI and ADC images is

(A) Bright on DWI and bright on ADC

(B) Bright on DWI and dark on ADC

(C) Dark on DWI and bright on ADC

(D) Dark on DWI and dark on ADC

(E) None of the above

Q90."False-positive" findings on DWI are often attributed to

(A) T1 effects

(B) T2 effects

(C) Anisotropy

(D) Poor signal to noise

(E) None of the above