Quiz 6

TOTAL POINTS 16

1. Which of the following is not a method for "spoiling" the effects of residual transverse magnetization in gradient echo imaging? 1 point

- ○ Long TR
- ◉ Data acquisition with reversed readout gradient polarity
- ○ Slice-selective gradients with random intensity at the end of each TR
- ○ RF pulse with phase offset

2. Which statement about Fast Spin Echo (FSE) is not correct? 1 point

- ○ FSE can reduce scan time greatly compared to conventional spin echo.
- ○ Each echo of FSE fills different phase encoding lines.
- ◉ The echo filling the k-space edge region determines the image contrast and thus the effective echo time.
- ○ FSE having long echo train causes image blurring.

3. If the image matrix size is 128*128 ($N_{RO} * N_{PE}$) and the number of segment is 4 for multi-shot EPI, the number of lines per segment is _____. 1 point

- ○ 16
- ◉ 32
- ○ 64
- ○ 128

4. Among reconstruction techniques for non-Cartesian imaging, radial K-space sampling is from the method of Computed Tomography (CT) reconstruction. 1 point

- ○ False
- ◉ True

5. Short TR is necessary for 3D imaging, because the same volume is excited by every excitation RF pulse. 1 point

- ◉ True
- ○ False

6. In multi-slice 2D imaging, the slice loop can be located either inside or outside the phase-encoding loop. When number of slices, field of view, resolution, and total scan time are the same, which option can provide higher signal to noise ratio (SNR)? 1 point

- ◉ When the slice loop is located inside the phase-encoding loop
- ○ The answer is different depending on sequence type (gradient echo, spin echo).
- ○ There is no difference in SNR between the two approaches.
- ○ When the slice loop is located outside the phase-encoding loop

7. Assume a spike noise instantaneously affected an echo in 2D multi-slice imaging and also in 3D imaging. Which images are affected by the noise in a spatially wider area? 1 point

- ○ 2D multi-slice images
- ○ None of the images are not affected by the spike noise because it happened instantaneously.
- ◉ 3D images
- ○ No difference

8. Which of the following statements is true regarding image contrast using gradient echo sequences? 1 point

- (●) The optimal condition for acquiring T1-weighted image is using large flip angle, short TE, and short TR.
- ( ) The optimal condition for acquiring PD-weighted image is using large flip angle, long TE, and short TR.
- ( ) The optimal condition for acquiring T2*-weighted image is using small flip angle, short TE, and long TR.
- ( ) The optimal condition for acquiring T2-weighted image is using small flip angle, long TE, and long TR.

9. What flip angle value must be used to obtain the highest signal for gray matter tissue using spoiled GRE sequence with TR = 50 ms at 3T (assume perfect spoiling)? 1 point

Table 1. Brain Tissue T_1 at 3 *T*

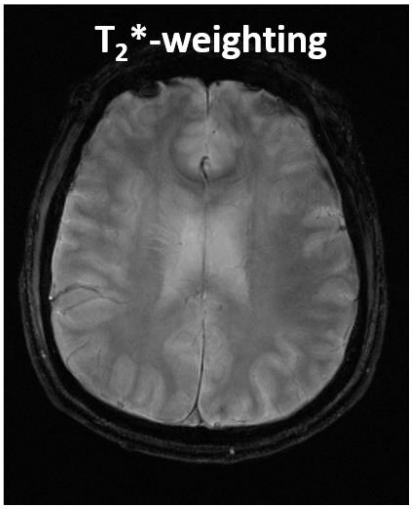
	Gray Matter	White Matter
T_1	1331 *ms*	832 *ms*

1 ms = 10^{-3} s

- ( ) 45.5°
- ( ) 30.4°
- ( ) 5.2°
- (●) 15.6°

10. Which of the follows shows the scan parameters that match the corresponding image contrast?

(●)



TR = 30 ms
TE = 20 ms
FA = 5°

11. Which statement about spin echo is true? 1 point

- ○ The time between the 90° and 180° RF pulses is identical to the time between the 180° RF and the next 90° RF.
- ○ Spin echo sequence can produce T1- and T2*-weighted images.
- ◉ It requires two successive RF pulses to form an echo.
- ○ After 90° excitation, spins in the transverse plane gain phase coherence by spin-spin interaction.

12. Which statement is true? 1 point

- ◉ Multiple 180° RF pulses allow us to get multiple spin echoes.
- ○ FSE is robust to flow and motion artifact.
- ○ Longer echo train length is not desired for reducing total scan time.
- ○ Applying 180° RF can recover random dephasing.

13. Which of the following statements is not correct regarding echo planar imaging? 1 point

- ○ The echoes filling the K-space center region determine the contrast of both gradient echo-EPI and spin echo-EPI.
- ○ Spin echo-EPI utilizes multiple frequency encoding gradients with alternating polarities.
- ○ Single-shot EPI can acquire a whole image with only one RF excitation.
- ◉ The polarities of phase encoding gradients are alternating every TR in case of multi-shot EPI.

14. Choose the correct expectations when the number of segments in echo planar imaging increases. 1 point

- ◉ The number of RF excitations increases
- ○ The number of lines per segment increases
- ○ The number of phase encoding lines increases
- ○ The scan time decreases

15. Which statement is not correct regarding non-Cartesian imaging? 1 point

- ○ Noncartesian imaging is robust to object movement.
- ◉ In radial K-space imaging, single or multiple trajectory acquisition is possible.
- ○ 2D Fast Fourier Transform cannot be directly used on acquired noncartesian K-space.
- ○ K-space central portion is oversampled.

16. What is the wrong decision to the situation described? 1 point

- ○ Significant artifacts are observed in single-shot echo planar imaging (EPI). Multi-shot EPI can resolve the problem.
- ○ For better temporal resolution, the number of trajectories in spiral imaging should be decreased.
- ○ To have very short TE, an echo-planar imaging sequence is replaced with a spiral imaging sequence because the k-space is sampled from the center right after the slice selection in spiral imaging.
- ◉ A fast spin echo sequence showed image blurring. Increasing the echo train length can resolve the problem.