Final Exam RAD 433 Second Semester 2014/1434-1435

Student Name: _____

Student Number: _____

King Saud University

College of Applied Medical Science

Radiology Science Department

Final Exam second semester 2014/1434-1435

RAD 433 (Level 8)

Introduction of the Magnetic Resonance Imaging

Please write your name and student number in each page (you have 7 pages including coversheet)

Marking:

Questions	**1**	**2**	**Total**
Score	Out of 30	Out of 10	Out of 40
Comments			

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Q1 multiple choice questions (MCQs): circle the most correct answer:

1- The source of the NMR signal is:
(a) Spinning motion of the electron
(b) Spinning motion of the neutron
(c) Spinning motion of the proton
(d) All of the above

2- The active NMR nuclei usually have:
(a) Odd atomic number
(b) Even atomic number
(c) both a and b are correct
(d) none of the above

3- (3 Tesla equal)
(a) 300 Gauss
(b) 3000 Gauss
(c) 30000
(d) 10000

4- The nuclei which align parallel to the magnetic field have :
(a) Higher energy than the one parallel to the magnetic field
(b) less energy than the one parallel to the magnetic field
(c) none of the above
(d) both a and b are correct

5- The T2 relaxation time of the specific tissue is:
(a) Is the time to loss 63% of the magnetization in the transfer plane
(b) Is the time to recover 63% of the magnetization in the longitudinal plane
(c) Is the time to loss 37% of the magnetization in the transfer plane
(d) a and c

6- mainly, to do the special encoding process in the MRI we need to apply:
(a) 3 RF pulses
(b) 3 gradients
(c) 2 Rf pulses
(d) 2 gradients

7- Proton density value in the PD image _____ as the strength of the magnetic field increase:

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(a) Increase
(b) Decrease
(c) Remain the same
(d) No relation between them

8- Net magnetic moment (net magnetization) directs _____to the direction of the main magnetic field B0:
   (a) Parallel
   (b) Antiparallel
   (c) Parallel and anti-parallel but more anti parallel
   (d) Parallel and anti-parallel but more parallel

9- The longest type of the relaxation is:
   (a) T2* relaxation
   (b) T2 relaxation
   (c) T1 relaxation
   (d) All of them same with their length

10- Which one of the following gradient open during reading the signal:
   (a) Slice selection gradient
   (b) Phase encoding gradient
   (c) Frequency encoding gradient
   (d) All of them

11- Which one of the following gradient open during the RF excitation pulse:
   (a) Slice selection gradient
   (b) Phase encoding gradient
   (c) Frequency encoding gradient
   (d) All of them

12- Increasing the slice selection gradient means:
   (a) Exiting thicker slice
   (b) Exiting thinner slice
   (c) The slice thickness remain the same
   (d) All of the above

13- Which one of the following parameters give the best special resolution?
   (a) 512*256*10mm slice thickness, 14 cm FOV, 2NEX
   (b) 256*128*5mm slice thickness, 40 cm FOV, 3NEX

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(c) 256*256*2mm slice thickness, 10 cm FOV, 5NEX
(d) 256*256*2mm slice thicknes, 5 cm FOV, 10 NEX

14- The pulse sequence which need double hearing protection is:
(a) Spin echo pulse sequence
(b) Inversion recovery sequence
(c) Fast spin echo
(d) Gradient pulse sequence

15- The pulse sequence which produce the basic contrast concept and less distortion and less prone to the artifact but has longer scan time is:
(a) Spin echo pulse sequence
(b) Inversion recovery sequence
(c) Fast spin echo
(d) Gradient pulse sequence

16- Which one of the following types of the magnetic field provides low SNR field:
(a) Permanent magnet
(b) Resistive system
(c) Superconductive magnets
(d) a and b
(e) all of the above

17- which one of the following types of the magnetic field has a water cooling system:
(a) Permanent magnet
(b) Resistive system
(c) Superconductive magnets
(d) b and c
(e) all of the above

18- which one of the following types of the magnetic field has a risk of the quenching:
(a) Permanent magnet
(b) Resistive system
(c) Superconductive magnets
(e) All of the above

19- which one of the following provides to achieve a homogeneous field:
(a) fringe field
(b) shimming
(c) shielding

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(d) none of the above

20- In the RF frequency system, which of the following is condition that make RF applicable with conditions of the resonance:

(a) The RF should be perpendicular to the B0
(b) The RF should be parallel to the B0
(c) Frequency of the RF should be equal to the larmor frequency
(d) a and c
(e) b and c

21- volume coil type is:

(a) has higher SNR and uniform RF over the imaging area
(b) has lower SNR and uniform RF over the imaging area
(c) has higher SNR and non-uniform RF over the imaging area
(d) has lower SNR and non-uniform RF over the imaging area

22- phased array coil is:

(a) has higher SNR and uniform RF over the imaging area
(b) has lower SNR and uniform RF over the imaging area
(c) has higher SNR and non-uniform RF over the imaging area
(d) has lower SNR and non-uniform RF over the imaging area

23- which one of the following people can not be scanned with MRI field:

(a) people with cardiac pacemaker
(b) people with neuro-stimulators
(c) people with surgical clips
(d) all of the above

24- Stimulation of the nerves cells is one of the side effect of:

(a) Main magnetic field B0
(b) RF field B1
(c) Gradient field
(d) All of the above

25- helium will vent to the room and replace the oxygen with:

(a) quenching process
(b) shielding process
(c) failed of the quenching
(d) shimming process

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26- Increase the matrix size in the phase direction with same FOV leads to:

(a) Increase the scan time
(b) Increase the SNR
(c) Increase the resolution
(d) a and c
(e) a and b

27- The FLAIR in the inversion recovery is used to suppress the----------:

(a) Fluid
(b) Fat
(c) White mater
(d) Gray mater

28- We can decrease the scan time by decrease the following:

(a) TR
(b) NEX
(c) Matrix size in the phase direction
(d) All of the above

29- The effect of increase the TR in the contrast of the image that:

(a) Reduce the chance of the T1 weighted image
(b) Reduce the chance of the T2 weighted image
(c) Reduce the effect of the PD effect
(d) All of the above

30- Increase NEX will improve:

(a) SNR
(b) Resolution
(c) a and b
(d) None of the above

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Q2 Match the sentences in the column 1 with correct and appropriate sentences in the column 2 by writing the correct order (10 marks) (20 minutes):

Series	Column 1	Column 2	Correct order
1	T1 relaxation	The time between the 90 degree rf pulse to the next 90 degree excitation pulse	
2	T2 relaxation	Physical property of the active NMR nuclei to align with direction of the magnetic field (parallel or antiparallel)	
3	Magnetic moment	Spin-spin relaxation	
4	Relaxation	The time between the 90 degree rf pulse to the center of the echo	
5	Gradient field	Stray magnetic field outside the bore of the magnet	
6	TR	Spin- lattice relaxation	
7	TE	The way that system applies RF and gradient pulses with specific order to form the MR image	
8	Pulse sequence	Linear changing induce in the main magnetic field strength per unit of distance	
9	SAR	The process occurs after terminating the RF pulse where the spins return to the state they were before the application of the RF pulse	
10	Fringe field	It is the amount of the heating deposits in the 1 Kg of the tissue	

Thank You
Good luck
Ruba khushaim