Final Exam RAD 433 Second Semester 2014/1434-1435

Student Name: _____

Student Number: _____

King Saud University

College of Applied Medical Science

Radiology Science Department

Module answer of 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
c

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
a

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

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
b

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
a

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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
b

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

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

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
A

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
C

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
C

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
A

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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

B

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

D

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

C

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

A

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

d

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

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(d) b and c
(e) all of the above
b

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
C

19- which one of the following provides to achieve a homogeneous field:
(a) fringe field
(b) shimming
(c) shielding
(d) none of the above
b

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
d

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
b

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
a

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

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(d) all of the above

d

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

C

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

c

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

d

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

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

a

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

D

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

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a

30- Increase NEX will improve:

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

a

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

Thank You
Good luck
Ruba khushaim