Lecture 3 Quiz

ⓘ This is a preview of the published version of the quiz

Started: Apr 12 at 11:11pm

Quiz Instructions

Please select the best answer for each question. You may look back at notes and lectures, but only get one chance to do the quiz.

Question 1 **1 pts**

A 3x3 rotation matrix for an angle b about a major axis consists of:

- a 1, 4 zeros and 4 positive sines of angle b
- a 1, 4 zeros and 4 positive cosines of angle b
- a 1, 4 zeros, 2 positive sines and 2 positive cosines of angle b
- a 1, 4 zeros, a positive and negative sine of angle b and 2 positive cosines of angle b
- a 1, 4 zeros, 2 negative sines and 2 positive cosines of angle b

Question 2 **1 pts**

The 3x3 matrix operation for relaxation is:

- Addition of a recovery vector “B”
- Attenuation of the vector M

- Multiplication by a 3x3 matrix “A”
- Multiplication by a 3x3 matrix “A” and addition of a recovery vector “B”

Question 3

1 pts

Left handed rotations by a positive angle from equilibrium about Mx and My respectively lead to

- Negative My and Negative Mx
- Negative My and Positive Mx
- Positive My and Positive Mx
- Positive My and Negative Mx

Question 4

1 pts

To extract the 3x3 A and B from a 4x4 operation you should

- Take the bottom left 3x3 elements for A, and the top right 3x1 elements for B
- None of these
- Take the top left 3x3 elements for A, pre/post multiplying by T, and the top right 3x1 elements for B
- Take the top left 3x3 elements for A, and the top right 3x1 elements for B

Question 5

1 pts

If three successive sequence matrix operations are (A1,B1), (A2,B2) and (A3,B3), applied in order, 1,2,3, what are the overall A and B matrix/vector?

- ○ A= (A3)(A2)(A1), B = (A3)(A2)(B1) + (A3)(B2) + B3
- ○ A= (A1)(A2)(A3), B = (A2)(A3)(B1) + (A3)(B2) + B3
- ○ A= (A3)(A2)(A1), B = (A2)(A3)(B1) + (A3)(B2) + B3
- ○ A= (A1)(A2)(A3), B = (A2)(A1)(B3) + (A1)(B2) + B1

Question 6

1 pts

If a sequence of operations, including relaxation, is represented by M' = AM+B, and this sequence is repeated multiple times then

- ○ The magnetization may not ever reach a steady state
- ○ The magnetization reaches a steady state defined as Mss = inv(A)B where inv() is the matrix inverse
- ○ The magnetization reaches a steady state defined as Mss = inv(I-A)B where I is the identity matrix, inv() is the matrix inverse
- ○ The magnetization reaches a steady state defined as Mss = AM+B

Question 7

1 pts

With respect to an RF pulse played in the presence of a gradient, the hard-pulse approximation means

- ○ Breaking the RF and gradient into short-duration segments, and applying one then the other Keeping the RF constant for the entire duration
- ○ Assuming the Mxy (transverse) magnetization remains constant
- ○ Assuming the Mz (longitudinal) magnetization remains constant
- ○ Using the complex matrix representation to apply the gradient

Question 8

1 pts

An advantage of using the complex-valued matrix representation (where the first element of M is Mx+iMy), compared with the real-valued representation is

- ○ Rotation matrices are more easily formulated
- ○ There is no additive B vector term for any operations
- ○ The matrix eigenvalues are easily calculated
- ○ Transverse rotation by a gradient is easily applied as an element-wise multiplication

Question 9

1 pts

Given elements of the complex-valued matrix representation m1=Mx+iMy and m2=Mx-iMy, the values of Mx and My are determined as

- Mx = 0.5(m1+m2), My = 0.5i(-m1+m2)
- Mx = 0.5(m1-m2), My = 0.5i(m1+m2)
- Mx = 0.5(m1-m2), My = 0.5i(-m1+m2)
- Mx = 0.5(m1+m2), My = 0.5i(m1-m2)

Question 10 **1 pts**

To simulate an RF pulse applied with a constant gradient, you may

- Loop over spatial positions, for each determining the gradient rotation for each time point, then loop over all RF time points for that position, applying the RF rotation then the gradient rotation.
- Use the complex-valued representation, loop over time, while applying the gradient as element-wise multiplication
- Do none of these simulations
- Do any of these simulations
- Loop over time, applying a different RF rotation, while looping over space in an inner loop to apply the gradient

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