Assignment 8

The due date for submitting this assignment has passed. As such, we won't grade what you have submitted this assignment.

Week 1 - Basic Concepts in QED
Week 2 - High-Resolution NMR Spectra of Molecules
Week 3 - Fourier Transform NMR
Week 4 - Relaxation Transfer NMR
Week 5 - Polarization Transfer NMR
Week 6 - Product Operator Formations
Week 7 - Basic Concepts and Spin Echoes

Week 8: Two Dimensional NMR Spectra
Week 9 - Two Dimensional Correlation Experiments
Week 10 - Pulse-Sequence Construction and Extension
Week 11 - 2D Spectroscopy
Week 12 - NMR Spectroscopy and Beyond

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Unit 9 - Week 8 - Basis Operators and Spin Echo

Due on 2019-09-25, 22:09 IST.

The spin states of a two-level system are described by the Pauli operators, \( \sigma_x \), \( \sigma_y \), and \( \sigma_z \).

1. If you pass through the y axis causes
   - Impart a net change in the system's spin state
   - Rotation of the magnetic field in the xy plane
   - Rotation of the magnetic field in the xz plane
   - No general answer is needed.

2. The following operators form a complex group:
   - \( \sigma_x, \sigma_y, \sigma_z \)
   - No general answer is needed.

3. Which of the following statements is correct?
   - \( \sigma_x \) represents pure discrete quantum coherence
   - \( \sigma_y \) is an observable operator
   - \( \sigma_z \) acts under coupling to positions \( B_0 \), \( L_z \), and \( L_y \)
   - No general answer is needed.

4. Why is the following statement correct?
   - No general answer is needed.

5. In the spin echo sequence, at the beginning of the detection which of the following statement is true?
   - No general answer is needed.

6. If a spin system is prepared and then subjected to an external magnetic field, the resulting magnetic moment is aligned parallel to the field.
   - No general answer is needed.

7. In an NMR experiment, magnetic field is transferred from proton to carbon, which of the following operation transformation is valid?
   - No general answer is needed.

8. In an NMR experiment, which of the following statement is correct?
   - Carbon and proton are decoupled during the spin echo elements
   - Proton and proton are decoupled during the spin echo elements
   - Proton magnetization is detected
   - No general answer is needed.

9. In an NMR experiment, carbon and proton are decoupled during the spin echo elements.
   - No general answer is needed.

10. The sensitivity enhancement in an NMR unstable NMR experiment is by a factor of
    - No general answer is needed.

11. In the spin echo experiment, which of the following statement is correct?
    - No general answer is needed.