Unit 3 - Concepts of NMR spin physics - 2

Week 2 Assignment 2

The due date for submitting this assignment has passed.

As per our records you have not submitted this assignment.

1) The population ratio between the two energy states can be enhanced by
   - increasing both external magnetic field B0 and the temperature
   - increasing the temperature and decreasing the external magnetic field B0
   - decreasing both external magnetic field B0 and the temperature
   - increasing the magnetic field and decreasing the temperature

   **Re: the answer is incorrect**

   Increasing the magnetic field and decreasing the temperature

2) In a magnetic field of 14 T, the proton precesses at 600 MHz, then which of the following statements is correct?
   - Both 1H and 13C precess at the same frequency and their directions of precession is same
   - 1H precesses at 600 MHz and 13C precesses at 63.5 MHz and their directions of precession is same
   - Both 1H and 13C precess at the same frequency and their directions of precession are opposite
   - 1H precesses at 600 MHz and 13C precesses at 6.3 MHz and their directions of precession are opposite

   **Re: the answer is incorrect**

   The proton precesses at 600 MHz and the proton of 13C precesses at 63.5 MHz and their directions of precession are opposite

3) While detecting the 1H resonance, it was noticed that the linewidth was excessively broad. It can be attributed to
   - Very high Larmor frequency of 1H
   - Very short relaxation time of 1H spins in the excited state
   - Very long relaxation time of 1H spins in the excited state
   - None of the above

   **Re: the answer is incorrect**

   Very short relaxation time of 1H spins in the excited state

4) Which of the following statements are correct regarding the gyromagnetic ratio (γ)?
   - Higher the gyromagnetic ratio, higher the sensitivity
   - In a given magnetic field, higher the gyromagnetic ratio, higher the separation between the energy states
   - The units of gyromagnetic ratio is Hz/T or s/A
   - None of the above

   **Re: the answer is incorrect**

   Higher the gyromagnetic ratio, higher the sensitivity

5) Under thermal equilibrium and with relaxation phenomena considered, the bulk magnetization, M0
   - Is aligned with the external magnetic field and oscillates at the Larmor frequency
   - Is aligned with a direction perpendicular to the external magnetic field and is static
   - Is at right angle components for Mx and My equal
   - Is aligned with the external magnetic field, static, Mx=M0=My=0

   **Re: the answer is incorrect**

   Is aligned with the external magnetic field, static, Mx=M0=My=0

6) In the rotating frame, when we are all "on resonance" identify all the statements given below that correctly explain the situation
   - The effect of B1 field will disappear
   - The B1 field is static
   - Rotating frame coincides with the laboratory frame
   - Magnetization process around smaller field B1

   **Re: the answer is incorrect**

   The effect of B1 field will disappear

7) The application of 90° pulse along Y-axis will make the spins to precess around
   - YZ Plane
   - Y2 Plane
   - XY plane
   - None of the above

   **Re: the answer is incorrect**

   None of the above

8) The duration of the excitation pulse applied in a direction perpendicular to the static field B0 is usually of the order of
   - Nanoseconds
   - Picoseconds
   - Milliseconds
   - Microseconds

   **Re: the answer is incorrect**

   Picoseconds

9) The NMR transitions are detected between the two energy states, when the difference in the magnetic quantum number between there is
   - 1
   - 1
   - 0
   - ±1

   **Re: the answer is incorrect**

   ±1

10) The total magnetic quantum number of the four energy states of two interacting spins will be
    - 0, 1, 2, 3
    - 1, 2, 3, 4
    - 1, 2, 3, 4, 5
    - 1, 2, 3, 4

   **Re: the answer is incorrect**

   1, 2, 3, 4