

## Unit 3 - Introduction to NMR spectroscopy

### Course outline

How does an NPTEL online course work?

#### Week 0 Assignment

#### Introduction to NMR spectroscopy

- Introduction to NMR spectroscopy
- The alignment of nuclear spins in presence of magnetic field
- Introduction to rotating frame
- Free induction decay and Fourier transformation of FID

NMR Hardware

Quiz : Week 1 Assignment

#### Chemical shifts and J-coupling

#### One-dimensional proton NMR

One dimensional NMR of X-nuclei ( $^{13}\text{C}$ ,  $^{15}\text{N}$ ,  $^{31}\text{P}$  and  $^{19}\text{F}$ )

#### Homonuclear 2D NMR

#### Heteronuclear 2D NMR

#### Structure determination of molecules

Advanced topics (Solvent suppression, Drug Discovery, DOSY)

#### Text Transcripts

#### Weekly Feedback forms

#### Video download

## Week 1 Assignment

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

**Due on 2020-02-12, 23:59 IST.**

1) What is the natural abundance of  $^{13}\text{C}$ ? 1 point

- 0.01 %
- 0.3 %
- 0.5 %
- 1.1 %

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
1.1 %

2) What would be the magnetic field corresponding to  $^{13}\text{C}$  resonance frequency of 201 MHz? 1 point

- 9.4 T
- 11.7 T
- 16.4 T
- 18.8 T

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
18.8 T

3) Which of the following RF pulses will give the maximum positive signal at the detector? 1 point

- $90^\circ$  pulse
- $180^\circ$  pulse
- $270^\circ$  pulse
- $360^\circ$  pulse

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $90^\circ$  pulse

4) Under which of the conditions, the population will be 100% in lower (alpha) state? 1 point

- At infinitely high temperature
- At zero Kelvin
- At very low magnetic field ( $B_0$ )
- When the gyromagnetic ratio of the spin is 1

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
At zero Kelvin

5) Which of the following nuclei has an integral spin value? 1 point

- $^1\text{H}$
- $^{15}\text{N}$
- $^{10}\text{B}$
- $^{32}\text{S}$

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $^{10}\text{B}$

6) The FID of a sample was observed to have decayed by about 40% at 100 ms. Based on this, which of the following would most likely be the  $T_2$  relaxation value of the sample? 1 point

- 100 ms
- 200 ms
- 300 ms
- 400 ms

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
200 ms

7) The nuclear relaxation characterized by  $T_1$  relaxation is also called as 1 point

- Transverse relaxation
- spin-spin relaxation
- spin-lattice relaxation
- Relaxation in the X-Y plane

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
spin-lattice relaxation

8) After the application of 90 degrees RF pulse, the spins pointing in which direction? 1 point

- XY-plane
- Z axis
- +Z axis
- XZ plane

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
XY-plane

9) Which of the following will decrease the difference in population between the two energy levels 'a' and 'b' in a spin  $\frac{1}{2}$  system? 1 point

- Increasing the temperature
- Increasing the external magnetic field ( $B_0$ )
- Increasing the sample concentration
- Increasing the gyromagnetic ratio

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
Increasing the temperature

10) The FID of a sample was observed to have decayed by about 40% at 100 ms. Based on this, which of the following would most likely be the  $T_2$  relaxation value of the sample? 1 point

- 100 ms
- 200 ms
- 300 ms
- 400 ms

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
200 ms