

# Unit 8 - Heteronuclear 2D NMR

## Course outline

How does an NPTEL online course work?

### Week 0 Assignment

Introduction to NMR spectroscopy

Chemical shifts and J-coupling

One-dimensional proton NMR

One dimensional NMR of X-nuclei (<sup>13</sup>C, <sup>15</sup>N, <sup>31</sup>P and <sup>19</sup>F)

Homonuclear 2D NMR

Heteronuclear 2D NMR

What is heteronuclear correlation NMR spectroscopy

Sensitivity enhancement of heteronuclei via polarization transfer

Heteronuclear multiple quantum NMR spectroscopy 2D HMQC and Heteronuclear single quantum NMR sp

Practical aspects of recording and processing 2D HMQC or HSQC

2D HMBC and its utility

Quiz : Week 6 Assignment

Structure determination of molecules

Advanced topics (Solvent suppression, Drug Discovery, DOSY)

Text Transcripts

Weekly Feedback forms

Video download

## Week 6 Assignment

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

**Due on 2020-03-11, 23:59 IST.**

1) How is polarization transferred from <sup>1</sup>H to <sup>13</sup>C in 2D HSQC? 1 point

- Using the J-coupling between <sup>1</sup>H and <sup>13</sup>C
- Using the dipolar coupling between <sup>1</sup>H and <sup>13</sup>C
- Using J-coupling between <sup>1</sup>H and <sup>1</sup>H
- Using 90° pulses

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
Using the J-coupling between <sup>1</sup>H and <sup>13</sup>C

2) Which of the following 2D experiment gives chemical shift correlation between a proton and a directly, one-bond attached carbon 1 point

- 2D HETCOR
- 2D HMBC
- 2D INADEQUATE
- 2D TOCSY

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
2D HETCOR

3) Which of the following 2D experiments do not contain any diagonal peak 1 point

- 2D COSY
- 2D HSQC
- 2D TOCSY
- 2D NOESY

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
2D HSQC

4) In a molecule acquired at natural abundance of <sup>13</sup>C, which of the following will be least likely to occur and can be ignored? 1 point

- Proton-Proton J-coupling
- Proton-Carbon J-coupling
- <sup>13</sup>C-<sup>13</sup>C J-coupling
- Long range proton-carbon J-coupling

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
**13C-13C J-coupling**

5) What is the value of the total INEPT delay period in a 2D HSQC if the proton-carbon J-coupling is 125 Hz? 1 point

- 1.5 ms
- 2.5 ms
- 3.5 ms
- 4 ms

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
4 ms

6) Which of the following is true for 2D HSQC and 2D HMQC experiment? 1 point

- In both the experiments, the same number of peaks are observed
- 2D HSQC takes longer time to record than 2D HMQC
- In 2D HSQC, INEPT is used but not in 2D HMQC
- In 2D HMQC long range proton-carbon couplings are observed but not in 2D HSQC

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
In both the experiments, the same number of peaks are observed

7) How many peaks will be observed in a 2D HSQC spectrum of: CH<sub>3</sub>-CH<sub>2</sub>-CO-CH<sub>2</sub>-CH<sub>3</sub> 1 point

- 1
- 2
- 3
- 4

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
2

8) How many peaks will be observed in 2D HMQC of (CH<sub>3</sub>)<sub>2</sub>-CH-CO-CH<sub>3</sub> 1 point

- 2
- 3
- 4
- 5

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
3

9) How many peaks will be observed in 2D HMBC spectrum of CH<sub>3</sub>-CH<sub>2</sub>-Cl if only two-bond <sup>1</sup>H-<sup>13</sup>C J-couplings are expected? 1 point

- 1
- 2
- 3
- 4

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
2

10) For which of the following molecules, 2D HSQC will have same number of peaks as 2D HMBC, if the long range <sup>1</sup>H-<sup>13</sup>C J-couplings are restricted to two-bonds 1 point

- CH<sub>3</sub>-CH<sub>2</sub>-CH<sub>2</sub>-CH<sub>2</sub>-OH
- CH<sub>3</sub>-CH<sub>2</sub>-CH<sub>2</sub>-OH
- CH<sub>3</sub>-CO-CH<sub>2</sub>-CH<sub>3</sub>
- CH<sub>3</sub>-CH<sub>2</sub>-OH

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
**CH<sub>3</sub>-CH<sub>2</sub>-OH**