

# Résonance magnétique nucléaire

**Lecturer**

Michel LUHMER (Coordinator)

**Course mnemonic**

CHIM-F457

**ECTS credits**

5 credits

**Language(s) of instruction**

French

**Course period**

Second term

**Campuses**

Solbosch and Plaine

## Course content

**Reminders and complements :**

- Basics of solution-state NMR spectroscopy
- Interpretation of usual one-dimensional (1D)  $^1\text{H}$  and  $^{13}\text{C}$  spectra
- Interpretation of usual two-dimensional (2D)  $^1\text{H}$  and  $^{13}\text{C}$  spectra

**Fourier transform NMR :**

- Instrumentation and sample for solution-state measurements
- Introduction to the acquisition and processing of 1D NMR spectra
- Simple sequences with multiple impulsions :
  - Inversion-Recovery –  $T^1$  Filter
  - Spin-Echo, CPMG –  $T^2$  Filtre
  - TOSCY-1D

**2D NMR complements****Introduction to the nuclear Overhauser effect (NOE)****Chemical Exchange**

- Lineshape analysis
- Incoherent longitudinal magnetization transfer experiments

**Self-diffusion coefficient measurements****Interpretation of relaxation times**

## Objectives (and/or specific learning outcomes)

Introduce students to :

- the principles of Fourier transform NMR spectroscopy, NMR data acquisition and processing;
- the determination of the molecular structure of (bio)organic compounds via high-resolution 1D and 2D NMR measurements;

- the thermodynamic and kinetic characterization of chemical equilibria;
- the characterization of translational and rotational dynamics of molecules.

## Teaching method and learning activities

The course consists alternately of theory lessons and practice with correction and discussion of exercises.

## References, bibliography and recommended reading

Claridge T.D.W.; High-Resolution NMR Techniques in Organic Chemistry, 1st ed. 1999 (ISBN 0080427987) or 2nd ed. 2008 (ISBN 0080548180).

Hore P.J.; Nuclear Magnetic Resonance, 1st ed. 1995 (ISBN 0198556829).

Kiemle D.J., Silverstein R.M., Webster F.X.; Identification spectrométrique de composés organiques, 2ème éd. 2007 (ISBN 2804155072).

## Course notes

Université virtuelle

## Other information

### Place(s) of teaching

Solbosch and Plaine

### Contact(s)

Prof. Michel Luhmer  
michel.luhmer@ulb.be

## Evaluation method(s)

Other

### Evaluation method(s) (additional information)

**A : Open-book written examination** (about 3h) - Exercise : determination of the molecular structure of an organic compound and assignment of the NMR signals.

**B : Oral examination** (about 45 min) : Questions of theory, which can be related to specific experimental observations.

### Determination of the mark (including the weighting of partial marks)

Weighting of about 50% for parts A and B.

Main language(s) of evaluation

French

Other language(s) of evaluation, if applicable

English

## Programmes

Programmes proposing this course at the faculty of Sciences

MA-CHIM | **Master in Chemistry** | finalité Research/unit 1, finalité Teaching/unit 1 and finalité Professional/unit 1

