

Subject: **Bioinorganic Nanosystems**
Semester: **Spring**
ECTS: **2,5**
Professors: **Gabriel Aullón**
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Department / Faculty: **Dept. Inorganic Chemistry.**
Faculty of Chemistry. UB
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Objectives:

General:

- A.** To introduce in the role of metals in active centres of metalloenzymes.
- B.** To show the interest to understand mechanisms in metalloenzymes.
- C.** To present the relation between chemical behavior and the biological function of metalloenzymes, such as electron/oxygen carriers or catalytic activity.

Competencies:

By the end of the course the student should:

- A.** Be able to interpret the chemical/biological processes that happen in metalloenzymes.
- B.** Know some experimental methods to characterize these systems.
- C.** Interpret the information obtained by the characterization techniques.
- D.** Relate the specific physical/chemical properties of the active center with the biological activity of metalloenzymes.

Recommendations / Previous requisites:

Equivalent background in Physics, Chemistry or Pharmacy.

Topics:

- 1. Bioinorganic Chemistry.** Metal ions in biology. Classification of metallobiomolecules. **(1 hour).**
- 2. Principles of Coordination Chemistry.** Effect of metal ions in the reactivity of ligands. **(1 hour).**
- 3. Biological Ligands.** Proteins. Nucleic Acids. Other biomolecules. **(1.5 hours).**
- 4. Metalloenzymes in Acid-Base Reactions.** Hydrolases: carboxypeptidase, carboanhidrase. Alkaline phosphatase. Urease. **(3.5 hours).**

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Master Community: <http://campusvirtual.ub.edu/course/view.php?id=427>

Website: <http://www.ub.edu/nanotec/>

E-mail: nanotec@ub.edu

- 5. Electron Transfer Proteins.** Iron-sulfur proteins. Blue copper proteins. Cytochromes. **(3 hours).**
- 6. Dioxygen Molecule: Uptake, Transport and Storage.** Hemoglobin and myoglobin. Hemeritrine. Hemocyanin. **(2 hours).**
- 7. Activation and Oxotransference (I): Dioxygen.** Dioxygenases and monooxygenases. Oxidases. Oxotransferases. **(2 hours).**
- 8. Activation and Oxotransference (II):** Coenzymes B12. Hydrogenases. **(1.5 hours).**
- 9. Mechanisms Implicated in the Cellular Defense.** Superoxide dismutases. Catalases and peroxidases. **(1.5 hours).**
- 10. Dinitrogen Molecule: Fixation and Activation.** Biological nitrogen cycle. Molybdenum nitrogenase. Alternative nitrogenases. **(1.5 hours).**
- 11. Photochemical Reaction coupled to Redox Process.** Photosystem I and II. Role of magnesium and manganese in the center of photosynthesis. **(1.5 hours).**

Planning:

Lectures:	23 hours
Independent Work:	10 hours
Study:	36 hours

Bibliography:

Casas, J. S.; Moreno, V.; Sánchez, A.; Sánchez, J. L.; Sordo, J. *Química Bioinorgánica*. Síntesis, Madrid, 2002.

Kaim, W.; Schwederski, B. *Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life*. John Wiley & Sons, Chichester, 1994.

Frausto da Silva, J. J. R.; Williams, R. J. P. *The Biological Chemistry of the Elements*. (2nd Edition). Oxford University Press, Oxford, 2001.

Reedijk, J.; Bouwman, E. (Ed.) *Bioinorganic Catalysis* (2nd Edition). Marcel Dekker, New York, 1999.

Specific Articles for reviewing.