

## SCIENZE E TECNOLOGIE CHIMICHE

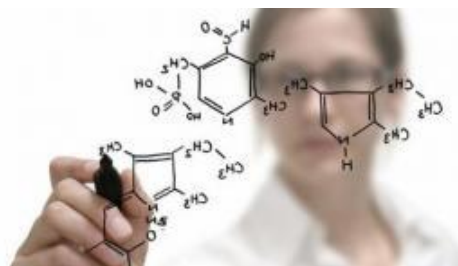
### CHEMICAL SCIENCE AND TECHNOLOGY

(in consortium with the University of Cagliari)

**Coordinatore:** Prof Stefano Enzo

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**Area disciplinare:** Scienze Chimiche

**Dipartimenti interessati:** Dipartimento di Chimica e Farmacia (Università degli Studi di Sassari) e Dipartimento di Scienze Chimiche e Geologiche (Università degli Studi di Cagliari)

**Costo:** rata unica annuale di 354,23 euro (per ogni anno di iscrizione)

**Scadenza bando:** 13/09/2018

**Breve descrizione:** La finalità del corso di Dottorato è quella di formare dottori di elevata qualificazione nell'ambito delle Scienze Chimiche attraverso la ricerca, offrendo a giovani laureati italiani e stranieri l'opportunità di impostare e condurre a termine in modo autonomo un progetto di ricerca originale nei settori più avanzati delle scienze e tecnologie chimiche. A tale fine, i dottorandi sono formati, nell'ambito di differenti tematiche, attraverso una costante attività di ricerca sperimentale ed un appropriato percorso didattico.

**Disciplinary area:** Chemical Sciences

**Departments involved:** Department of Chemical and Geological Sciences, Cagliari, and the Department of Chemistry and Pharmacy, Sassari.

**Cost:** annual fee of € 354,23

**Deadline for applicants:** 13/09/2018

**Brief description:** The aim of the PhD program is to train high-quality doctors of Chemical Sciences through research, to undertake an autonomously more advanced path of the chemical sciences and technologies. A fine story, the PhD students are trained, dealt with on different themes, through constant experimental research and an appropriate educational path.

[INFORMAZIONI SUL DOTTORATO](#)

[INFORMATION ON THE PH.D. COURSE](#)

### KEY INFORMATION

- **Disciplinary area:** Chemical Sciences
- **Department:** Department of Chemical and Geological Sciences, Cagliari, and the Department of Chemistry and Pharmacy, Sassari
- **Cost:** annual fee of € 354,23
- **Deadline for applicants:** 13/09/2018
- **Coordinator:** Prof. Stefano Enzo
- **Venue:** Department of Veterinary Medicine
- **Type of lessons:** frontal and practical lessons
- **Language:** Italian - English
- **Positions open:** 6
- **ECTS:** 180
- **Deadline for applicants:** from 03/08/2018 to 13/09/2018

### OVERVIEW

**Brief description:** The aim of the PhD program is to train highly qualified doctors in the field of chemical sciences through research, offering young Italian and foreign graduates the opportunity to set up and complete an original research project in the sectors in an autonomous manner. more advanced than the chemical sciences and technologies. To this end, the PhD students are trained, within different themes, through constant experimental research and an appropriate educational path.

This training path will allow the research doctor to obtain a profound specialization combined with the necessary cultural preparation that will enable him to contribute positively to the progress of the chemical sciences both in the industrial world, with the assumption of highly professional roles, both in the academic one in a context of international competition. In order to achieve these objectives, the PhD student is also offered the opportunity to collaborate with researchers and research institutions both in Italy and abroad in the context of research periods at highly qualified research centers.

**Educational goals:** The training of the research doctor provides a specific and personalized program, based on the issues briefly described in point C and in the framework of activities outlined in point D. Particular attention is dedicated to internationalization, to the organization of a structured, high quality teaching and the implementation of initiatives to strengthen the link between University, research and the world of work.

#### C) Brief description of the issues

Nanostructured innovative materials. Synthesis and characterization of new materials for applications (for example: catalytic, magnetic, optical, electrical and biological).

1. Nanostructured innovative materials. Synthesis and characterization of new materials for applications (for example: catalytic, magnetic, optical, electrical and biological).

2. Physical chemistry of biological systems. Experimental and theoretical study of complex biological systems and use of specialized techniques (NMR, diffraction, environmental microscopy).

3. Computational modeling and chemistry: Development of simulation techniques, computational studies of complex systems of chemical interest.
4. Industrial catalytic processes. Process chemical technologies. Study of catalytic processes (preparation, stability, regeneration).
5. Industrial biotechnology. Processes based on enzymatic catalysis; physical and chemical immobilization methodologies; industrial applications.
6. Analytical chemistry and surface technology Study of the reactivity of thin oxide layers on metallic materials with technological applications (for example: corrosion, heterogeneous catalysis, tribology and biocompatible materials); Reactivity of mineral surfaces, asbestos and atmospheric particulate in biotic and abiotic environments.
7. Surfactants and nanotechnological applications. Nanostructured surfactant based systems; applications in the preformation sector. (NMR studies of the local structure, SAXS morphological properties).
8. Conventional extraction technologies and by supercritical fluids. Technologies based on the use of fluids in supercritical conditions; extraction and separation of active plant ingredients and technological treatments.
9. Synthesis and reactivity of organic molecules. Study of metal-promoted reactions for enantio, diastereo- and regioselective synthesis of molecules with biological activity and natural products.
10. New organic synthesis methods: Development of unconventional synthetic methods with low environmental impact. A new way of thinking organic chemistry.
11. Synthesis, characterization, properties and reactivity of novel inorganic or organometallic compounds. Structural, spectroscopic, computational characterization and catalytic, biological and pharmacological properties of compounds of applicative interest
12. Precursors and molecular materials. Organic and inorganic synthesis of molecules rich in sulfur and / or selenium of intrinsic and applicative interest (extraction of noble metals, anticancerogens) and as precursors of materials of interest in optics and electronics. Synthesis and development of molecular fluorescence and redox sensors for metal ions and inorganic anions. Reactivity studies, molecular spectroscopies, equilibria in solution and calculation methodologies, solid state.
13. Analytical methods and applications. Synthesis and characterization of organic and metallorganic materials for technological applications (sensors, luminescence, photovoltaic devices). Methods for the determination of analytes of food, environmental, biomedical interest Design, synthesis and characterization of the complex-formation equilibria of toxic metal binders in human pathologies. Study of equilibria in solution: experimental techniques and calculation methods.14. Progettazione, sintesi e valutazione biologica di small molecules. Sintesi, caratterizzazione e valutazione biologica di nuove strutture chimiche a potenziale attività farmacologica.
14. Design, synthesis and biological evaluation of small molecules. Synthesis, characterization and biological evaluation of new chemical structures with potential pharmacological activity.

15. Pharmaceutical chemistry and technology. Design and development of nanosystems for site-specific delivery of bioactive molecules and for diagnostics / theranostics. Design and experimentation of innovative platforms for the delivery of drugs through different routes of administration.

16. Pharmaceutical and toxicological chemical analysis. Validation of analytical methodologies for the determination of drugs, designer drugs and metabolites in biological matrices.

17. Cultural heritage and conservation techniques: innovative strategies for conservation through kinetic control of mineralogical and inhibitory processes. Application of modern portable in-situ diagnostics

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## REQUIREMENTS

**Education:** master's degree

**Selection process:** Public call with evaluation of qualifications, research project and interview

**Language:** English knowledge is required (B2 level) for admission to the course.

## TEACHING

### Teaching schedule

D) Program of activities and offices

The teaching activity is planned with the aim of enhancing the individual themes, promoting multidisciplinary and the integration of the PhD students' competences;

The activity program is outlined as follows.

- Frequency of specialized courses activated in our PhD program and / or other PhD courses in the scientific field.
- Frequency of courses common to all PhD students of a technical / practical nature [e.g. Experimental techniques (NMR, FTIR, Diffraction, Microscopy ...), courses organized as part of university initiatives, courses or seminars held by Visiting Professors, attendance of courses during the period of research / training abroad, bibliographical research , Scientific English and Technical English, Writing and Research Presentation.

- Frequency of basic courses, activated in the Master's Degree courses in Chemical Sciences or in other LM courses in the scientific field, not included in the previous course of study of the doctoral student and that fill any formative debts ascertained by the Academic Board. (First and second year).
- The experimental activity is carried out according to a research project approved by the Academic Board, to be conducted also in other qualified structures in Italy or abroad (Triennium), with the aim of allowing the PhD student to acquire awareness in setting up and leading autonomously completes an original research project in the most advanced sectors of chemical science and technology. (Three year)
- In the training course, great importance is attached to the cultural preparation of doctoral candidates, allowing them to be placed in a context of international competition. To achieve this goal, the PhD student is offered the opportunity to come into contact with researchers, through the participation in conferences, seminars and schools at national and international level, and both national and foreign research institutions, to carry out a period of research activity. at foreign research institutions.

The PhD student's activity is certified through a system of research training credits (CFR), based on the following scheme.

- Specialist teaching:

5 hours of frontal lesson + 20 of individual study = 1 CFR;

(Attendance is followed by a final check and certificate or statement release of the teacher of each teaching).

- Basic teaching:

8 hours of frontal lesson + 17 of individual study = 1 CFR;

- Training activities (congresses, seminars, training internships, schools):

- National Congress: 1 CFR poster, oral presentation 2 CFR;
- International Congress: 2 CFR participation, 3 CFR presentation;
- Local Congress 1 CFR;
- Seminars in the local area: 0.25 / hour CFR, Seminars: 0.2 / hour CFR,
- Schools: 1 CFR / day;
- Foreign internship 2 CFR / month;
- Experimental activity related to the research project and drafting Thesis: 25 hours = 1 CFR;

A necessary condition for admission to the final exam is the achievement of 180 CFR.

22 CFU related to specialized courses activated in our PhD program and / or other PhD courses, courses organized as part of university initiatives, courses or seminars held by Visiting Professors, attendance of courses during the period of research / training abroad, a language course (max 4 credits of 22 CFU) and technical / practical courses. The final assessment is scheduled for the courses.

- There will also be 4 courses with final assessment borrowed from master's degree programs in the technical scientific field that doctoral students from master's degree courses other than the chemical one are required to attend. Participation in national and international conferences and a training / research internship at national and / or international level is required.
- Participation in schools and specialized courses organized at national and / or international level is strongly desired. In the case in which the student participates in schools for a total duration of 1 week, the teaching staff can (at the request of the student) check the possibility of replacing them with the educational didactic credits requested by the student.
- Experimental activity related to the Thesis research and drafting project (145 credits).
- It is also a necessary condition for obtaining the doctorate to have obtained the B2 level certification of English.

The research activities on site and off-site are carried out according to the lines proposed by the PhD student in his research project. The project is presented by the PhD student to the Academic Board for approval at the beginning of the cycle. In the same program the timing of the activities is planned both on-site and off-site and the methodological approach and the equipment to be used are described. The research activity of the doctoral student is carried out under the guidance of a supervisor.

The supervisor is a specialist in research subjects who are responsible for making the necessary equipment available to him and to provide him with the scientific and organizational support necessary for carrying out the project, by including him in his research group. In this way the PhD student's growth is promoted in terms of autonomy, inventiveness and spirit of cooperation. The Academic Board annually verifies the student's research activity in terms of quality, originality and independence.

The main branches of the training activity are the Department of Chemistry and Pharmacy of the University of Sassari. and the Department of Chemical and Geological Sciences of the University of Cagliari.

## CONTACTS

Ufficio Alta Formazione: Piazza Università, 11 - Palazzo Zirulia – First floor, rzallu@uniss.it, +39 079 229992, Monday – Wednesday and Friday from 10:00 to 12:30.

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