

ANALISI CHIMICO FARMACEUTICA E TOSSICOLOGICA CON LABORATORIO (ANALISI QUALITATIVA INORGANICA COMPOSTI DI FARMACOPEA UFFICIALE) (FV000021)

1. language

Italian

2. course contents

Coordinator: Prof. GIUSEPPE LA REGINA

Year Course: 3

Semester: First semester

UFC: 5

Modules and lecturers:

- ANALISI CHIMICO FARMACEUTICA E TOSSICOLOGICA (ANALISI QUALITATIVA INORGANICA COMPOSTI DI FARMACOPEA UFFICIALE) (FV000142) - 4 cfu - ssd CHIM/08

Prof. Giuseppe La Regina

- LABORATORIO DI ANALISI CHIMICO FARMACEUTICA E TOSSICOLOGICA (ANALISI QUALITATIVA INORGANICA COMPOSTI DI FARMACOPEA UFFICIALE) (FV000143) - 1 cfu - ssd CHIM/08

Prof. Vanessa Gentili, Giuseppe La Regina, Jessica Sebastiani

3. BIBLIOGRAPHY

Mandatory

F. Manna, Analisi dei medicinali, Guida pratica di laboratorio, prima edizione, CISU, 2000.

Consulting

Farmacopea Ufficiale Italiana, XII Edizione, Ministero del lavoro, della salute e delle politiche sociali, 2008.

European Pharmacopoeia, XI Edizione, Commissione della Farmacopea Europea, 2023.

4. LEARNING OBJECTIVES

The course aims to provide the students a theoretical and practical knowledge related to research and qualitative recognition of inorganic substances of pharmacological and toxicological interest. The aim of the course is also to provide the molecular mechanisms on the pharmaceutical and toxicological properties of the aforementioned substances.

Knowledge and understanding: the student will study all the aspects concerning the chemical reactions used for the separation and recognition of the cations included in the 6 groups of the classical systematic approach (group I: silver, lead and mercury; II group: lead, mercury, arsenic, antimony, tin, bismuth, copper, cadmium; III group: aluminium, iron, chrome, manganese; group IV: manganese, zinc, nickel, cobalt; V group: calcium,

barium, strontium; group VI: magnesium, sodium, lithium, potassium) as well as anions identifiable by the research in the alkaline solution (sulphate, nitrate, chloride, bromide, iodide and oxalate). Moreover, the student will be able to apply theoretically/practically the concepts concerning the acid-base equilibria, hydrolysis, complexation, precipitation, redox reduction and be able to evaluate all the related interdependencies for the purpose of the recognition of inorganic compounds. Additionally, the student will be able to understand the molecular biological mechanisms in which cations and inorganic anions take part.

Applying knowledge and understanding: at the end of the course, the student will be able to separate and analyse an inorganic cation or anion mixture through the application and interpretation of chemical essays. For this purpose it will be essential to know and apply the different chemical reactivity for the separation and identification of the ions (changes in pH, complexation, precipitation and redox). The practical laboratory exercises will allow the student to learn how to apply and observe what was already covered during the lectures. Knowledge of the properties and reactivity of inorganic substances will allow the student not only to understand the biological, pharmacological and toxicological functions of these substances, but also to design and / or identify possible approaches for solving relative problems. The knowledge of the most widespread therapeutic problems and pharmaceutical solutions of inorganic type (essential micronutrient elements integrators) available for the treatment of the main pathologies associated with deficiency or intoxication will make the student able to make the right decision and to give rational advice for the use of these pharmaceuticals in the field of human health.

Making judgements: the lecturer will stimulate the students to develop a logical-critical sense by asking frequent questions (brainstorming) in class with the aim of inducing them to acquire connection skills (correlative thinking) between the various concepts defined in the syllabus leading to the mastery of the subject, connecting the chemical pharmaceutical and toxicological analysis as an integral part with a link to other disciplines already studied (general and inorganic chemistry, physics, anatomy, biology) or to be followed in the future educational path (biochemistry, physiology, pathology, pharmacology, pharmacognosy, toxicology). The lecturer will periodically ask students to develop discussions/theses related to key topics discussed in class, in order to get them used to design scientific research.

At the end of the course the students will be able to formulate an analytical/critical judgment, interpret and correlate complex concepts, design a research related to the topics covered in order to expand scientific, ethical and social knowledge.

Communication skills: through the acquisition of knowledge and understanding, the ability to apply them and to propose a critical judgment on the topics dealt with, but also through the use of the relative scientific language used by the lecturer during the course and the frequent stimulation of the communication lesson, the student will be able to communicate with cognitive and linguistic-perceptive depth with his peers and/or with both the scientific and non-scientific community also of different cultural origin.

Learning skills: The student who has acquired the abilities described above will be able to undertake future studies in a more autonomous, self-managed and rapid manner, but also to propose social and/or working contexts useful for the scientific progress of society in the field of human health.

5. prerequisites

Mandatory to pass the examination of General and inorganic chemistry exam, with particular attention to the knowledge of: salt formation, balancing reactions, acid-base equilibria, pH calculation, hydrolysis reactions, redox reactions, solubility equilibria.

6. TEACHING METHODS

The course aims to provide the student with the theoretical and practical skills in the qualitative analysis of inorganic substances of pharmaceutical and toxicological interest through lectures and laboratory exercises. At the end of the course, the student must demonstrate that he has acquired the following objectives:

Knowledge and understanding (Dublino 1): the development of the knowledge defined in the educational objectives is obtained through theoretical lectures supported by practical laboratory lessons carried out individually.

Applying knowledge and understanding (Dublino 2): the theoretical and practical notions acquired during the course allow the student to autonomously identify the experimental methodology suitable for the qualitative recognition of compounds of pharmaceutical and toxicological interest.

Making judgements (Dublino 3): laboratory exercises carried out individually and supported by a theoretical knowledge gained in the frontal lessons allow the student to be able to autonomously and critically evaluate the experiments conducted and to autonomously carry out observations and experiments based on the laboratory activities learned.

Communication skills (Dublino 4): the preparation of a laboratory notebook containing the information relating to the exercises carried out together with the continuous comparison with the teacher and the other students during the exercises, will help the student to clearly and concisely illustrate the information obtained from the various experiments, also favouring the use of a suitable scientific technical language.

Learning skills (Dublino 5): theoretical lessons allow the student to create a solid foundation in terms of knowledge of the analytical methods of compounds of pharmaceutical and toxicological interest. The integration of this theoretical knowledge with the practical skills developed in the laboratory lessons will favour an increase in autonomy in the realization of future experiments, defining experimental protocols based on the consulted literature drawing on reference texts and bibliography, in Italian and English.

7. OTHER INFORMATIONS

Office hours: agreed by email.

8. METHODS FOR VERIFYING LEARNING AND FOR EVALUATION

The exam will be carried out through an oral interview. To pass the exam it is necessary to achieve a grade of not less than 18/30. The student must demonstrate that he has acquired sufficient knowledge of the main topics covered in the course, with particular relevance to the different fields of qualitative analysis of compounds of pharmaceutical and toxicological interest. Honors will be awarded, upon achievement of 30/30, to students who have demonstrated that they have reached a higher level of knowledge and in-depth study of the subjects with independent study, appropriateness of language and excellent communication skills. During the exam, the student's preparation will be verified through questions that require the

solution of an analytical problem that could occur in the laboratory. The solution of these problems requires the application of simple calculations. The laboratory exercises will be taken into account. The final grade will be a global evaluation of the practical activity and the oral interview.

Knowledge and understanding - The exam allows to evaluate the level of knowledge achieved by the student and deepen your understanding of the concepts.

Applying knowledge and understanding - In the oral interview, the student will present the laboratory notebook where he will have reported all the exercises carried out during the course and the ability to use the concepts learned during the course.

Making judgments - During the oral interview, the student will have to demonstrate that he is able to evaluate and define a methodological proposal suitable for the different analytical problems required.

Communication skills - During the oral interview, the student will have to argue and express the acquired knowledge using an appropriate technical-scientific language.

Learning skills - The presence of a solid scientific basis will be assessed in terms of knowledge of the analytical properties of compounds of pharmaceutical and toxicological interest and the ability to integrate this theoretical knowledge with the practical skills developed in laboratory lessons, to define the level of autonomy in conducting future experiments.

9. program

- I. Introduction to the course
- II. Laboratory safety
- III. Official reference texts for qualitative analysis
- IV. Qualitative inorganic analysis
- V. Compounds of pharmaceutical and toxicological interest
- VI. Laboratory practice