UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

# COURSE SYLLABUS

# Laboratory of Organic Chemistry

**2324-2-E2701Q041**

## Aims

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The aim of course is to provide the student with the essential practical skills for a safe and corrected approach to experimental organic chemistry. The course also provides the student with the suitable knowledge about the basic techniques for purification and characterization of organic compounds. Aspects on the chemical behaviour and reactivity of alcohols, amines, tiols, ethers, tioether, carbonylic derivatives (ketones and aldehydes) and carboxylic acids and their derivatives will be also provided.

*Knowledge and understanding*

At the end of the course, the student knows:

- The main purification methods of organic compounds (separation, extraction, crystallization and chromatography)

- Characterization methods for organic molecules (melting point and chromatographic methods);

- Principal synthetic approach to organic compounds (condensation, reduction and diazonium salt reactions);

- Knowledge about the chemical behavior and reactivity of alcohols, amines, tiols, ethers, tioether, carbonylic derivatives (ketones and aldehydes) and carboxylic acids and their derivatives.

*Applying knowledge and understanding*

At the end of the course, the student is able to:

- Perform an easy synthesis of an organic compound starting from commercially available materials;

- Purify and characterize the synthesized organic materials.

*Making judgements*

At the end of the course, the student is able to:

- choose the most appropriate synthetic approach, purification and characterization methods to prepare and analyse an organic compound.

*Communication skills*

To be able to describe in a technical report in a clear and concise way and to explain orally with a suitable

*Learning skills*

To be able to apply the acquired knowledge to contexts different from those presented during the course.

## Contents

The course constitutes in two parts:

The first part deal with the chemical behavior and reactivity of alcohols, amines, tiols, ethers, tioether, carbonylic derivatives (ketones and aldehydes) and carboxylic acids and their derivatives

The second part to provide the student with the safety and behavior aspects for conducting correctly an organic chemistry experiment. Some experiments carried out in the laboratory aim to familiarize the students with the basic technical operations in organic chemistry (crystallization, distillation, selective solvent extraction and chromatographic techniques). The other experiments represent second examples of single and/or multi step organic reactions involving functional group transformations (aldol condensation, carbonyl reduction, diazocopulation reaction).

## Detailed program

The course constitutes in two parts:

The first part deal with the chemical behavior and reactivity of alcohols, amines, tiols, ethers, tioether, carbonylic derivatives (ketones and aldehydes) and carboxylic acids and their derivatives. In particular, the physical properties, nomenclature rules, reactivity towards specific reagents and specific experimental conditions will be illustrated.

The second part provides the student with the safety and behavior aspects for conducting correctly an organic chemistry experiment. Some experiments carried out in the laboratory aim to familiarize the students with the basic technical operations in organic chemistry (crystallization, distillation, selective solvent extraction and chromatographic techniques). The other experiments represent second examples of single and/or multi step organic reactions involving functional group transformations.

In particular, the experiments conducted in laboratory are:

- Identification of organic compounds by Thin Layer Chromatography (TLC).

- Separation of a mixture of benzoic acid and benzylamine by selective solvent extraction. Benzoic acid purification

by crystallization and benzylamine purification by reduced-pressure distillation.

- Reduction of benzophenone with sodium borohydride.

- Aldol condensation.

- Synthesis of methyl orange dye.

- Separation of two organic dyes by column chromatography.

## Prerequisites

Basic knowledge of elementary organic chemistry

## Teaching form

Lectures and laboratory held in italian

## Textbook and teaching resource

Course notes.

Other: D. L. Pavia, G. M. Lampman e G. S. Kriz, Il Laboratorio di Chimica Organica, Edizioni Sorbona – Milano

## Semester

II year, I semester

## Assessment method

The assessment method employed to check the level of understanding of the concepts taught during the course constitutes of two parts:

The first part is a written exam where the student have to answer to questions on the aspects concerning the chemical characteristics and reactivity of alcohols, amines, tiols, ethers, tioether, carbonylic derivatives (ketones and aldehydes) and carboxylic acids and their derivatives.

The second is the evaluation of the student behaviour in the laboratory and on the basis of the reports produced by the student on the experiments carried out in the laboratory and the compilation of the laboratory notebook. The final mark proposed to the student is in thirtieths, which represent the weighted average between the mark

obtained in the written exam and that from the laboratory part. A final minimum mark of 18/30 is necessary to pass the examination. On request, the assessment can be held in English.

## Office hours

Prof. Papagni receives students Friday from 14.30 to 16.30. Students must fix an appointment in advance

Prof. Manfredi and Dr Mattiell receive students from 10:30 alle 16:30. Students must arrange an appointment in advance.

## Sustainable Development Goals