SUBJECT: PHARMACOLOGY FOR CHEMISTS

MATTER: Pharmacology for chemists
MODULE: Optional Matters
STUDIES: Master in Pharmaceutical Chemistry

GENERAL CHARACTERISTICS *

Type: ☐ Basic training, ☐ Compulsory ☑ Optional
☐ Final Project Work, ☐ External Practices

Duration: Semester ☑ Semester / s: 2
Number of ECTS credits: 5
Language: Spanish, Catalan and English

DESCRIPTION

BRIEF DESCRIPTION AND JUSTIFICATION (The sense of the subject in relation to the studies. Between 100 and 200 words.)

R & D in the pharmaceutical industry is a multidisciplinary process that includes chemical professionals, pharmacists, physicians and biologists among others. The particular structure of this process requires the integration of new professionals in highly multidisciplinary teams. In order to guarantee the success of this incorporation, it is necessary to provide the master learners with a series of information, tools and language that facilitate the understanding of the mechanism of action of a drug in the organism: pharmacology. This is the main objective of this course: to deliver the minimum bases towards the understanding of the drug-target interaction process applied to the development and design of new bioactive molecules.

COMPETENCES (Of the course in relation with preassigned competencies in this area.)

- Knowledge and understanding that provide a basis or opportunity for originality in developing and / or applying ideas, often in a research context (CB6).
- That the students can apply their knowledge and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study (CB7).
- That the students are able to integrate knowledge and handle complexity, and formulate judgments based on information that was incomplete or limited, includes reflections on social and ethical responsibilities linked to the application of their knowledge and judgments (CB8).
- Students can communicate their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously (CB9).
- Students must possess the learning skills that enable them to continue studying in a way that will be largely self-directed or autonomous (CB10).
- Possess complementary skills useful for the practice of pharmaceutical chemistry (E20).

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• Ability to recognize or related in some way with the practice of pharmaceutical chemistry that will be useful for the development of professional practice related disciplines (E21).
• Ability to communicate in English and use English as a working language (T1).
• Ability to assess the impact of the use of chemistry in sustainable development of society (T3).

PREREQUISITES * (Modules, materials, subjects or skills necessary to follow the course. Subjects can be stated that should have been completed.)

The specific competences of the subjects like pharmaceutical chemistry, organic chemistry, biochemistry and physical chemistry.

CONTENTS

Chapter 1: Chemical and biological bases of pharmacology
1.- General concepts. 2.- Pharmacological targets. 3.- Dosage-response curves.

Chapter 2: Efficacy and affinity of a drug
1.- Terminology. 2.- Agonist activity. 3.- Affinity. 4.- Efficiency. 5.- Drugs with multiple efficacy.

Chapter 3: Receptors
1.- Antagonism. 2.- Antagonistic. 3.- Antagonist receptors. 4.- Ortho-steric effects. 5.- Non-competitive antagonism. 6.- Reverse and partial agonists. 7.- Allosterism. 8.- Types of allosteric modulators.

Chapter 4: Enzymes as drug targets
1.- Enzymatic kinetics. 2. Enzymatic inhibition. 3.- Intracellular effects of the enzyme-drug interaction.

Chapter 5: Transporters
1.- Passive transport. 2.- Active transport. 3.- Permeation. 4.- Endocytosis.

Chapter 6: Chemical bases of the mechanism of action of therapeutic groups: selected examples

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METODOLOGY

TRAINING ACTIVITIES * (Complete the table relating activities, workload in ECTS credits and skills.)

<table>
<thead>
<tr>
<th>Training activities</th>
<th>Hours / ECTS</th>
<th>Competences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>31 / 1,15</td>
<td>E20, E21, T1, T3, CB6, CB7, CB10</td>
</tr>
<tr>
<td>Cases of Study</td>
<td>4 / 0,15</td>
<td>E20, E21, T1, T3, CB6, CB7</td>
</tr>
<tr>
<td>Seminars</td>
<td>2 / 0,07</td>
<td>E20, E21, T1, T3, CB7, CB8, CB9, CB10</td>
</tr>
<tr>
<td>Presentations</td>
<td>4 / 0,1</td>
<td>E20, E21, T1, T3, T6, CB7, CB8, CB9</td>
</tr>
<tr>
<td>Personal study activities</td>
<td>90 / 3,33</td>
<td>E20, E21, T1, T3, CB8, CB9</td>
</tr>
<tr>
<td>Evaluation activities</td>
<td>4 / 0,15</td>
<td>E20, E21, T1, T3, CB6, CB7, CB8</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>45 / 5</strong></td>
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</tbody>
</table>

EXPLANATION OF THE METHODOLOGY

The subject consists of about 40-45 hours of lectures. To the student is given all the material that the teacher uses for the lectures. The presentation of the different topics is complemented with the discussion and resolution of cases of study, as well as, expositions and analysis performed by the students.

EVALUATION

EVALUATION METHODS*

<table>
<thead>
<tr>
<th>Evaluation Methods</th>
<th>%</th>
<th>Competences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam</td>
<td>50</td>
<td>E20, E21, T1, T3 / CB6, CB7</td>
</tr>
<tr>
<td>In course evaluations</td>
<td>25</td>
<td>E20, E21, T1, T3 / CB6, CB7</td>
</tr>
<tr>
<td>Study cases and expositions</td>
<td>25</td>
<td>E20, E21, T1, T3 / CB8 CB9, CB10</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

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LEARNING OUTCOMES

- Demonstrate knowledge of the phases of the R & D of a drug.
- Possess the capacity to associate the structure of drugs with their mechanism of molecular action and their therapeutic activity.
- Propose chemical transformations of drugs aimed at optimizing their biological activity.
- Acquire the necessary bases about selected examples of therapeutic targets and their relationship with agonist drugs and antagonists thereof.

QUALIFICATION

The final grade (FG) depends on the following elements:

<table>
<thead>
<tr>
<th>Evaluation Methods</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam</td>
<td>50%</td>
</tr>
<tr>
<td>In course evaluations</td>
<td>25%</td>
</tr>
<tr>
<td>Study cases and expositions</td>
<td>25%</td>
</tr>
</tbody>
</table>

The final grade (FG) is calculated using the results obtained in the final exam (FE), the average of the scores of the in course evaluations (CE), study cases and expositions (SCE):

\[
\text{FG} = 50\% \text{ FE} + 25\% \text{ CE} + 25\% \text{ SCE}
\]

SKILLS ASSESMENT

<table>
<thead>
<tr>
<th>Competences</th>
<th>Evaluation Methods</th>
<th>Observations</th>
</tr>
</thead>
</table>
| Knowledge and understanding that provide a basis or opportunity for originality in developing and / or applying ideas, often in a research context (CB6). | Final exam
  In course evaluations | 50% FE + 50% CE |
| That the students can apply their knowledge and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study (CB7). | Final exam
  In course evaluations | 50% FE + 50% CE |
| That the students are able to integrate knowledge and handle complexity, and formulate judgments based on information that was incomplete or limited, includes reflections on social and ethical responsibilities linked to the application of their knowledge and judgments (CB8). | Study cases and expositions | SCE |
| Students can communicate their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously (CB9). | Study cases and expositions | SCE |

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Students must possess the learning skills that enable them to continue studying in a way that will be largely self-directed or autonomous (CB10).

Possess complementary skills useful for the practice of pharmaceutical chemistry (E20)

Ability to recognize or related in some way with the practice of pharmaceutical chemistry that will be useful for the development of professional practice related disciplines (E21)

Ability to communicate effectively both orally and in writing with specialized partners and non-specialized public (T1)

Ability to assess the impact of the use of chemistry in sustainable development of the Company (T3)

### Competences | Evaluation Methods | Observations
---|---|---
Students must possess the learning skills that enable them to continue studying in a way that will be largely self-directed or autonomous (CB10) | Study cases and expositions | SCE
Possess complementary skills useful for the practice of pharmaceutical chemistry (E20) | Final exam
In course evaluations
Study cases and expositions | 50% FE + 25% CE + 25% SCE
Ability to recognize or related in some way with the practice of pharmaceutical chemistry that will be useful for the development of professional practice related disciplines (E21) | Final exam
In course evaluations
Study cases and expositions | 50% FE + 25% CE + 25% SCE
Ability to communicate effectively both orally and in writing with specialized partners and non-specialized public (T1) | Study cases and expositions | 100% SCE
Ability to assess the impact of the use of chemistry in sustainable development of the Company (T3) | Study cases and expositions | SCE

### Bibliography

**Basic Bibliography:**

**Complementary Bibliography:**

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HISTORIC DOCUMENT

PREVIOUS CHANGES (Indicate date and author / s, the most recent first)
June 25th 2017, Dr. Ana Belén Cuenca

LAST REVISION (Indicate date and author / s, the most recent first)
November 04th 2017, Dr. Ana Belén Cuenca

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