SUBJECT: INTEGRATED LABORATORY

MATTER: Integrated Laboratory
MODULE: Drug design and production Mention
STUDIES: Degree in Pharmacy

GENERAL CHARACTERISTICS*

Types: ☐Basic Training, ☒ Compulsory, ☐Elective
☐Final degree work, ☐Supervised practices
☐Practices oriented to the Mention

Duration: Semester
Semester / s: S9
Number of ECTS credits: 6
Languages: English

DESCRIPTION

BRIEF DESCRIPTION AND GROUNDS

The integrated laboratory is a fundamentally experimental subject in which the interaction with the teacher is in English. The student, by performing individual or small group practical work must acquire the ability to design and conduct synthetic transformations for producing organic compounds with pharmacological activity (drugs). The laboratory is oriented to deepen the understanding and management of experimental techniques necessary in organic synthesis, such as liquid-liquid extraction, drying, distillation, recrystallization, determination of physical constants, thin layer chromatography, column chromatography, spectroscopy IR and ^{1}H-NMR. These techniques are worked on special activities or as part of drug synthesis.

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POWERS *

General skills:

- G-1 Identify, design, obtain, analyze, control and produce drugs, medicines and other health products and raw materials of interest for human or veterinary use.
- G-4 Design, prepare, deliver and dispense medicines and other products of sanitary interest.
- G-16 Demonstrate ability for oral and written communication in English.

Specific skills:

- E-Q3 Carry out standard laboratory processes including the use of synthesis and analysis scientific equipment, appropriate instrumentation included.
- E-Q4 Estimate the risks associated with the use of chemicals and laboratory processes.
- E-Q9 Know the origin, nature, design, collection, analysis and control of drugs and medical devices.
- E-Q11 Know and apply the main techniques of structural investigation, including spectroscopy.

Transversal skills Master Level:

- T-1M Have advanced knowledge and demonstrate, in a scientific and technological research or a highly specialized context, a detailed and informed understanding of the theoretical and practical aspects and about the methodology of work in one or more fields of study.
- T-2M Being able to control and predict the evolution of complex situations and make judgments based on incomplete information by developing new and innovative working methodologies adapted to scientific/research, technological or professional, multidisciplinary in general, field in which the activity is developed.
- T-3M Demonstrate sufficient autonomy to participate in research projects and scientific or technological collaborations within its thematic scope, in interdisciplinary contexts and, where appropriate, with a high component of knowledge transfer.

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PREVIOUS REQUIREMENTS*

It is recommended to have previous knowledge in Organic Chemistry and Structural Determination

CONTENTS

1. *Safety and standards* in the laboratory of pharmaceutical chemistry.

2. *Synthesis of organic compounds with pharmacological activity* I: Chemical transformations that require a single synthetic step. Reactions at reflux temperature and controlled temperature.

3. *Synthesis of organic compounds with pharmacological activity* II: Chemical transformations requiring several synthetic steps. Reactions avoiding water presence.

4. *Synthesis of organic compounds with pharmacological activity* III: synthetic transformations mediated by transition metals.

5. *Isolation and purification of drugs*. Washing and recrystallization. Liquid-liquid extraction. Filtration. Drying.

6. *Characterization of organic compounds*. Determination of physical constants: melting point. Spectroscopy: IR and ^{1}H-NMR.

METHODOLOGY

TRAINING ACTIVITIES

Training activities * (GF Memory)	Training activities (Sigma)	ECTS credits *	Competences
Theoretical sessions	Sessions of exposition of concepts	-	-
Solving exercises and problems	-	-	-

* These characteristics can not be modified without the approval of the bodies responsible for top level academic estructures (subject, module and/or system).

Knowledge integrating activities: cases, seminars, directed work and cooperative learning	Seminars	-	-
Practical sessions: laboratory or simulations	Practical / laboratory work	5.8	G-1, G-4, G-16, E-Q3, E-Q4, E-Q9, E-Q11, T-1M, T-2M, T-3M
-	Presentations (3)	-	-
Personal study by students	Activities of personal study by students	-	-
Evaluation activities	Evaluation activities (testing, monitoring controls ...)	0.2	G-1, G-4, G-16, E-Q3, E-Q4, E-Q9, E-Q11, T-1M, T-2M, T-3M
	TOTAL	6.0	

GF: Degree in Pharmacy
(1) In the GF the "cases" epigraph of the subject file in Sigma is included in" Knowledge integrating activities"
(2) Does not apply to GF, activities to answer questions from the students are included in " Personal study by students"
(3) In the GF the "presentations" epigraph of the subject file in Sigma is included in" Knowledge integrating activities"

EXPLANATION OF TEACHING METHODS

2. **Laboratory Practices.** Conducting laboratory activities by the student in order to implement at a practical level the theory of a field of knowledge and always under the direct supervision of a teacher.

5. **Learning based on problems or cases,** allowing students to experience, test and inquire about the nature of situations, phenomena and daily activities promoting analysis, teamwork and decision-making.

7. **Evaluation activities.** Exercises to evaluate the degree of assumption of competencies (knowledge, skills, values) by students. Continuously or timely.

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EVALUATION

EVALUATION METHODS

Evaluantion Methods * (GF Memory)	Evaluation methods (Sigma)	Weight * (2)	Competences
Final exam	Final exam	30%	G-1, G-16, G-17, E-Q1, E-Q8, T-1M, T-2M, T-3M
-	Exam/s partial/s (1)	-	-
Monitoring of learning (including controls, cases, exercises, problems, participation, Online self-assessment)	Follow-up activities	-	-
Project and presentations	Project and presentations	-	-
Practical or experimental work	Experimental or field work	70%	G-1, G-16, G-17, E-Q1, E-Q8, T-1M, T-2M, T-3M
TFG evaluation	Projects	-	-
External practices (supervised practices and mention-oriented practices)	Evaluation from the company or institution	-	-
-	Participation (1)	-	-
		100%	

GF: Degree in Pharmacy
1) In the GF the "Examination / partial / is" and "Participation" epigraphs of the subject file in Sigma are included in "Monitoring of Learning"
(2) The values may range ± 5% from the value set in the GF memory (final sum 100%)

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LEARNING OUTCOMES

- Knowing how to use the experimentation techniques characteristic from Molecular Design, Organic Synthesis and Process Chemistry
- Knowing how to apply these techniques in integrated projects combining computational, synthetic, analytical, spectroscopic and documentary techniques.
- Knowing efficiently how to use the bibliographic information and interpret the spectroscopic data for the characterization of organic compounds
- Understanding the environmental and safety aspects (including how to handle chemical compounds)

QUALIFICATION

First convocatory:

The qualification of the course takes into account:

- **Final examination** (EF): 30%
  the qualification will be based on various evaluation activities throughout the course, one for each practice performed.
- **Experimental work** (TE): 70%

Practical or experimental work (TE) includes:

- Laboratory notebook evaluation (20%).
- **Evaluation of the results of the practices** through a brief report (reflection sheet) on each practice, which also contains questions related with the practices (50%).

These notes will be over 10 and have a maximum value of 10.

If the final exam qualification is less than 4 points and/or the qualification of the experimental work is less than 5 points, the final qualification of the subject will be the lowest of both and the first convocatory of the subject will be failed.

If the indicated conditions are met, the final qualification is obtained from.

NF = EF*0.3 + TE*0.7

The course is approved with a note (NF) equal to or greater than 5.

Second / following convocatories:

To pass the subject in the second/subsequent convocatories complementary activities (reflection sheet) (TE) and/or examination (EF) have to be done. The qualification of these activities will replace the previous qualification.

The course is approved with a note (NF) equal to or greater than 5.

SKILLS EVALUATION

For the evaluation of skills G-1, G-4, G-16, E-Q3, E-Q4, E-Q9, Q11-E, T-1M, T-2M, T-3M the qualification of the subject will be used as indicator.

BIBLIOGRAPHY

- Course materials (available in Moodle platform)
- Pavia, D. L., Lampman, G. M., Kriz, G. S. *Introduction to Organic Laboratory Techniques*, Harcourt Brace College Publishers, 3 ed, 2005.
- Wilson & Gisvold's *Textbook of Organic Medicinal and Pharmaceutical Chemistry*, Lippincott Williams & Wilkins, 11 ed, 2004.
- B. S. Furniss, A. J. Hannaford, P. W. G. Smith & A. R. Tatchell, *Vogel's Textbook of Practical Organic Chemistry*, 5th Edition. Longman Scientific & Technical, Essex, 1989.
- A. Delgado, C. Minguillón, J. Juglar, *Introduction to Drug Synthesis*, Synthesis Editorial, Madrid, 2002.
- JB Taylor, PD Kennewell, *Modern Medicinal Chemistry*, Ellis Horwood, New York, 1997.
- ICH Guideline (http://www.ich.org)
- European Pharmacopoeia (http://www.pheur.org)
- US Pharmacopeia (http://www.usp.org)

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DOCUMENT HISTORY

PREVIOUS CHANGES
Does not apply

LAST REVISION
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