VNIVERSITAT DE VALÈNCIA

Course Guide
34185 Chemistry laboratory I

COURSE DATA

Data Subject	
Code	34185
Name	Chemistry laboratory I
Cycle	Grade
ECTS Credits	6.0
Academic year	2016 - 2017

Study (s)

Degree	Center	Acad. year	Period
1108 - Degree in Chemistry	Faculty of Chemistry	1	First term

Subject-matter

Degree	Subject-matter	Character
1108 - Degree in Chemistry	1 - Chemistry	Basic Training

Coordination

Name	Department
OCHANDO GOMEZ, LUIS E.	315 - Physical Chemistry

SUMMARY

Chemistry Laboratory I is a core 6 ECTS credit course taught during the first semester of the first academic year of the Degree in Chemistry.

Both Chemistry Laboratory I and Chemistry Laboratory II (a core course taught during the second semester of the first academic year) aim essentially to teach students how chemical laboratories work, what basic techniques are used in them, and how to prepare, record, analyse and present the results of an experiment. This will establish the essential foundations to enable students to later successfully conduct laboratory experiments in several branches of chemistry.

The course deals with aspects such as safety, analysis, interpretation of the data needed for any chemical experiment, and the data management and processing procedures that are carried out in all chemical laboratories. Experiments are conducted in which students are required to develop the basic techniques they will need to apply later in more complex experiments.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

Students are expected to know and to be able to clearly apply the concepts taught on their last High School Chemistry course, albeit at a basic level. However, all scripts will include a theoretical introduction and, when required, extra teaching materials will be provided.

OUTCOMES

1108 - Degree in Chemistry

- Develop capacity for analysis, synthesis and critical thinking.
- Show inductive and deductive reasoning ability.
- Demonstrate leadership and management skills, entrepreneurship, initiative, creativity, organization, planning, control, leadership, decision making and negotiation.
- Demonstrate ability to work in teams both in interdisciplinary teams and in an international context.
- Demonstrate ability to communicate information, ideas, problems and solutions to both specialist and non-specialist audiences and using information technology, as appropriate.
- Demonstrate a commitment to ethics, equality values and social responsibility as a citizen and as a professional.
- Acquire a permanent sensitivity to quality, the environment, sustainable development and the prevention of occupational hazards.
- Demonstrate knowledge of the main aspects of chemical terminology, nomenclature, conventions and units.
- Interpret the variation of the characteristic properties of chemical elements according to the periodic table.
- Demonstrate knowledge of the characteristics and behaviour of the different states of matter and the theories used to describe them.
- Demonstrate knowledge of the principles of thermodynamics and kinetics and their applications in chemistry.
- Relate the macroscopic properties and the properties of individual atoms and molecules, including macromolecules (natural and synthetic), polymers, colloids and other materials.

- Demonstrate knowledge and understanding of essential facts, concepts, principles and theories related to the areas of chemistry.
- Solve qualitative and quantitative problems following previously developed models.
- Evaluate, interpret and synthesise chemical data and information.
- Handle chemicals safely.
- Carry out standard experimental procedures involved in synthetic and analytical work, in relation to organic and inorganic systems.
- Interpret data from observations and measurements in the laboratory in terms of their significance and the theories that underpin them.
- Evaluate the risks in the use of chemicals and laboratory procedures.
- Recognise and evaluate chemical processes in daily life.
- Understand the qualitative and quantitative aspects of chemical problems.
- Students must have acquired knowledge and understanding in a specific field of study, on the basis of general secondary education and at a level that includes mainly knowledge drawn from advanced textbooks, but also some cutting-edge knowledge in their field of study.
- Students must be able to apply their knowledge to their work or vocation in a professional manner and have acquired the competences required for the preparation and defence of arguments and for problem solving in their field of study.
- Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration.
- Students must be able to communicate information, ideas, problems and solutions to both expert and lay audiences.
- Students must have developed the learning skills needed to undertake further study with a high degree of autonomy.
- Express oneself correctly, both orally and in writing, in any of the official languages of the Valencian Community.
- Have basic skills in the use of information and communication technology and properly manage the information obtained.

LEARNING OUTCOMES

After completion of *Chemistry Laboratory I*, students should be able to:

- Name and formulate the inorganic and organic chemical compounds and express the composition of chemical substances and their mixtures in the established standard units. (CE1)
- Solve any basic problem concerning the amount of material involved in a chemical reaction. (CG10, CE14)
- Know the main types of chemical reactions and their main associated features. (CE4)
- Recognise and appreciate chemical processes in our daily lives. (CG5, CE23)
- Understand the qualitative and quantitative aspects of chemical problems. (CE24)
- Clearly explain phenomena and processes related to basic aspects of Chemistry. (CG1, CG2, CE13)

- Know the danger of chemicals, understand the meaning of labels and safety data sheets, and know the basic safety rules of a chemistry laboratory. (CG6, CE17)
- Have the knowledge and experimental skills needed to correctly and safely use the products, materials and basic experimental techniques in a chemistry laboratory. (CE17, CE21)
- Perform simple chemical analysis. (CE14, CE18)
- Analyse and process experimental data effectively. (CE16, CT3)
- Use Information and Communication Technologies effectively. (CG7, CT3)
- Manage information rigorously. (CG7, CT3)
- Show leadership ability. (CG3)
- Perform tasks as a member of a team effectively also from the gender perspective. (CG5)
- Demonstrate interpersonal skills also from the gender perspective. (CG6)
- Demonstrate sensitivity to environmental issues. (CG10)

DESCRIPTION OF CONTENTS

1. Seminar 1

Presentation.
Management and organisation of laboratory work.
Preparation of experimental work.

2. Practice 1. Safety and Laboratory Material.

Safety standards.
Simplified safety data sheets for compounds.
Pictograms. H and P phrases.
Laboratory material (glassware, electrical equipment, Bunsen burner, vacuum pump, etc.).
Waste. Waste minimisation programme.

3. Practice 2. Dissolution, precipitation and crystallization.

Solid-liquid separations: decantation and filtration.
Types of filtration.
Using balances. Direct weighing and weighing with tare.

4. Practice 3. Purification of Solids: Crystallisation.

Crystallisation with water and with organic solvent.
Vacuum and gravity filtration. Hot liquid filtration.
Effectiveness (yield) of a process.

5. Practice 4. Characterisation of Liquids and Solids.

Distillation. Boiling point determination.
Melting point determination.

6. Seminar 2

Presentation of results.
Physical magnitudes. Units system.
Measurement and experimental error.
Accuracy and precision. Significant figures.

7. Practice 5-1. Liquid-Liquid Extraction (1).

Separation and isolation of compounds.
Extracting solvents.
Aqueous phase and organic phase.

8. Practice 5-2. Liquid-Liquid Extraction (2).

Compound purification: crystallisation.
Characterisation and identification of compounds by melting point.
Thin-layer chromatography.

9. Seminar 3

Analysis and discussion of the results of practices P2 to P5.

10. Practice 6. Preparation of Solutions and Measurement of pH.

Acidity, alkalinity, equilibrium and pH.
Preparing solutions of different concentrations.
Solutions from commercial products (solid salts).
Use of the pH meter and pH measurements.

11. Practice 7. Acid-Base Titration.

Stoichiometry and neutralisation of acid-base reactions.
Indicators in acid-base titrations.
Use of primary and secondary standards.

12. Practice 8. Preparation of Solutions. Dilution Effect.

Aqueous solutions of CuSO4 by dilution.
Using the visible spectrophotometer and the spectrum plot.
Analytical wavelength.
Absorbance.

13. Practice 9. Distillation of Mixtures of Miscible Liquids

Distillation acetone-acetic acid.
Simple distillation and distillation with a fractionating column. Effectiveness of both processes.
Mixture density by weighing.

14. Practice 10. Stoichiometric Calculations.

Reaction between calcium carbonate and hydrochloric acid.
Molar mass determination of CaCO3.
Percentage purity of an unknown sample.
Gravimetric and volumetric methods.

15. Seminar 4

Analysis and discussion of the results of practices P6 to P10.

16. Evaluation

Final evaluation session.

WORKLOAD

ACTIVITY	Hours	% To be attended
Laboratory practices	48,00	100
Tutorials	12,00	100
Development of individual work	20,00	0
Study and independent work	50,00	0
Preparation of evaluation activities	10,00	0
Preparation of practical classes and problem	10,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

This course has two components: laboratory sessions and seminars. The laboratory sessions provide an overview of the basic work involved in a chemistry laboratory. Students acquire skills in the basic techniques of laboratory work and learn the pre- and post-experimental procedures they need to follow. Students must become familiar with: safety and management mechanisms; the handling of material and devices; the treatment and presentation of data both before and after the performance of a test; decision making and how to select the best procedure. In addition to pre-laboratory seminars, the laboratory sessions will be reinforced with four independent seminars in which specific topics will be discussed.

EVALUATION

Attendance at the laboratory sessions is compulsory. Two justified absences at these sessions will be permitted. However, it may be recommended that students recover these sessions by joining those of another group.

Evaluation will comprise the following two components:

a) Continuous assessment

Continuous assessment is made of the students' progress and the work they complete during the course. This will take into account their active participation in the seminars and their solutions to the questions and problems they will be set for working independently, as well as their handling of the laboratory, their following of the safety procedures, and their laboratory notebook.

As the students' work in the laboratory, their preparation for the experiments, and their laboratory notebooks are to be assessed continuously throughout the course, the score students obtain for these three items in the first call will be carried over for the second call. Therefore, it will not be possible to recover the following items or their percentage scores for the second call. With regard to the laboratory notebook, however, partial recovery will be permitted of aspects corresponding to the treatment and interpretation of the results.

i) Experiment preparation and laboratory work.

ii) Deliverables (pre-experimental, post-experimental, and results).

iii) Laboratory notebook.

Total for this section: 70 %

b) Evaluation of specific activities

Evaluation will also be made via examinations taken during the course. These include any questionnaires or other exercises completed during the seminars.

iv) Examinations, questionnaires and other exercises: 30 %

To pass the course, students must obtain a score of at least 4 on each of the above two components of the evaluation.

Distinctions

Students who obtain a final grade of excellent and whose lecturer considers their performance to merit the award of Distinction will have the opportunity to take a further examination consisting of a series of short questions or multiple-choice test covering aspects from all of the practice sessions held.

REFERENCES

Basic

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- OLBA, A. "Química General: equilibri i canvi". València: Publicacions de la Universitat de València, 2007 ISBN 9788437068435 (CI 54 OLB)

Additional

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