

# STUDY GUIDE

## SCIENCE OF MATTER AND ENERGY

**Degree in Primary Teacher Training  
Bilingual Programme  
C.U. Cardenal Cisneros  
Universidad de Alcalá**

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**Academic Year 2020-21**  
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## STUDY GUIDE

Subject:	<b>SCIENCE OF MATTER AND ENERGY</b>
Code:	<b>520008</b>
Studies:	<b>PRIMARY EDUCATION TEACHER TRAINING DEGREE. BILINGUAL PROGRAMME</b>
Department:	<b>TEACHING SPECIFIC SCIENCES</b>
Character:	<b>COMPULSORY</b>
ECTS:	<b>8</b>
Year and term:	<b>2nd/ 2nd Term</b>
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Language:	<b>English</b>

### 1. INTRODUCTION

*El Centro Universitario Cardenal Cisneros, adscrito a la Universidad de Alcalá, garantiza a sus estudiantes que, si por exigencias sanitarias las autoridades competentes impidieran la presencialidad total o parcial de la actividad docente, los planes docentes alcanzarían sus objetivos a través de una metodología de enseñanza-aprendizaje y evaluación en formato online, que retornaría a la modalidad presencial en cuanto cesaran dichos impedimentos.*

Since bilingual education became popular in Spain, the learning of English as a Foreign Language has evolved dramatically from being a subject in the school curriculum to being considered as a real communication tool to create meaning in most content areas. This shift must be considered in the training of future Primary Education teachers.

The subject "Science of Matter and Energy" provides a valuable set of knowledge, resources and skills to future teachers, especially oriented towards the area of knowledge of Science in Primary education.

A solid foundation in the basics of matter and energy, both from a theoretical and experimental point of view, is an essential tool for future teachers of primary education so that they can develop both their professional skills and a basis for any Experimental Science.

#### Prerequisites and Recommendations

It is fundamental to be competent in Maths at a Bachillerato level. Students should have an A2 level of English. The subject will work on developing their competence in the English language (More information can be found here: [http://www.coe.int/T/DG4/Portfolio/?L=E&M=/main\\_pages/levels.html](http://www.coe.int/T/DG4/Portfolio/?L=E&M=/main_pages/levels.html))

## 2. COMPETENCES

### General competences:

This subject aims to impart a range of general and specific skills to students, as listed below:

- To effectively deal with language learning situations in multicultural and plurilingual contexts. Foster reading and critical commentary of a wide range of scientific and cultural texts contained in the school curriculum (Competencia nº 3 de las competencias propias del título de grado)
- To design and regulate learning spaces in contexts of diversity that pay attention to gender equality, fairness and respect of human rights that define the values of citizenship (Competencia nº 4 de las competencias propias del título de grado).
- Competence nº 5. To promote coexistence inside and outside the classroom, resolve discipline problems and contribute to resolving conflicts peacefully. To stimulate and value students' effort, consistency and personal discipline. (Competencia nº 5 de las competencias propias del título de grado)

### Specific competences:

In addition to the specific competences in the subject "TEACHING AND LEARNING THE EXPERIMENTAL SCIENCES", in this subject, the student must develop the following the following competences that appear in the table:

Competence nº 1	To understand the basic principles and fundamental laws of the experimental sciences (Biology, Geology, Physics and Chemistry).
Competence nº 3	To suggest and resolve problems associated with everyday sciences.
Competence nº 4	To value the sciences as a cultural phenomenon.
Competence nº 5	To recognise the mutual influence between science, society and technological development, as well as relevant civil conducts, with the aim of working towards a sustainable future..

### 3. CONTENTS





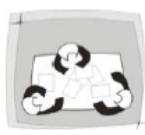

The contents are divided up as follows:

Content Blocks		Total number of classes, credits and hours
Content Blocks	Subjects	
Block 1: The study of the characteristics of Science	Subject 1. Scientific method and measurement: Measurement pattern, significant figures, scientific notation	0,5 ETCS
Block 2: The study of Matter	Subject 2. Matter: states of matter, main laws of conservation of mass, element, substances, mixtures.	0.5 ETCS
	Subject 3. The structure of matter: atomic theory, parts of the atom, atom, isotope and ions, periodic table of the elements	1 ETCS
	Subject 4. Chemical bonding: Metallic bonding, covalent bonding, ionic bonding and hydrogen bridges.	1 ETCS
	Subject 5: Chemical reactions: balancing chemical reactions, combustion reactions	1 ETCS
Block 3: The study of energy and its relationship with matter	Subject 6. Energy: types of energy, transformation of energy and conservation of energy	1 ETCS
	Subject 7. Motion in 1 and 2 dimensions: displacement and distance, velocity and acceleration	1 ETCS
	Subject 8. Newton's Laws: first Newton law, inertia, net force, second Newton law, third Newton law	1 ETCS
Block 4: Generic contents	Simple and complex machines, fluids pressure, light and its properties, sound and its properties	1 ETCS

## 4. METHODOLOGIES OF TEACHING-LEARNING-TRAINING ACTIVITIES

The total time that each student should dedicate in order to achieve the objectives of this study programme is 200 hours, of which 66 will be contact hours in the classroom or the laboratory, with the teacher. These 66 contact hours are divided into three modules following different teaching-learning methods that will help the student to develop the aforementioned competences:

- Theory classes (45 hours): Large group classes
- Practical classes (18 hours): Medium group classes
- Seminars (3 hours): Seminar group classes

P/A	Modality	Location	Description
<b>CLASS TIMETABLE</b>	Theory Classes	Different classrooms depending on the requirements of each session 	Classes are imparted by the teacher through a method of explanation with the support of multimedia and the digital board in order to facilitate assimilation of the contents. The classes will be based on magisterial presentations by the teacher, synthesis of the basic and fundamental contents of each topic, analysis activities, discussion, deepening and reinforcing theory.
	Practical Classes	Different classrooms depending on the requirements of each session 	Exercise and problem solving, practical laboratory classes, group work and oral presentations.
	Seminars/Workshops	Classroom 	Group and personalised tutorials, debates and collaborative learning activities.
	Tutorial	Office 	Individual advice and guidance
<b>SELF-STUDY</b>	Group Work		Group work of practical activities.
	Individual Work		Study, exam preparation, searching for resources, carrying out and studying activities.

This subject is linked to the “Plan de Destrezas Académicas” in which the academic research projects will be developed

#### 4.1. Distribution of credits

Total number of hours: 200	
Number of contact hours: 66	45 hours of theory class 18 hours of practical class 3 hours of seminars
Number of hours of student self-study: 134	134 hours of self-study

The remaining hours dedicated to this subject (134 hours) correspond both to student self-study, as well as individual study in group work outside of the class.

#### 4.2. Methodological strategies, teaching materials and resources

Links to online resources will be provided in each subject block and topic in order to reinforce and deepen knowledge.

In each topic when considered appropriate, different laboratory sessions will be provided aimed at completing the student's education.

In this subject, some classes will be conducted as interdisciplinary learning experiences in collaboration with other subjects from the semester study programme

#### 5. ASSESSMENT: assessment criteria, marking criteria and assessment procedures

1. Knowledge and comprehension of the basic concepts of the subject.
2. Undertaking practical activities both in the laboratory and the classroom or in any location, which are based on contents related to matter or energy for the acquisition and promotion of scientific methods and attitudes and respect for the environment.
3. Acquisition by the student of habits of observation and scientific motivation regarding natural chemical and physical phenomena, above all those related with matter and energy.
4. Development of abilities and skills enabling the student to use scientific material and instrument design to implement their experiences and practices.

5. Clear, precise and correct use of language and vocabulary in presentations and class work.
6. Interest in learning and active participation.
7. Ability to work in a group.
8. Ability to research, analyse and synthesise scientific information.

**Relationship between the specific competences and the assessment criteria:**

Competences	Assessment criteria
To understand the basic principles and fundamental laws of the experimental sciences (Biology, Geology, Physics and Chemistry).	<ul style="list-style-type: none"> <li>- Knowledge and comprehension of the basic concepts of the subject.</li> <li>- Interest in learning and active participation.</li> <li>- Clear, precise and correct use of language and vocabulary in presentations and class work.</li> </ul>
To suggest and solve problems associated with everyday sciences.	<ul style="list-style-type: none"> <li>- Undertaking practical activities both in the laboratory and the classroom or in any location, which are based on contents related to matter or energy for the acquisition and promotion of scientific methods and attitudes and respect for the environment.</li> <li>- Ability to work in a group.</li> <li>- Ability to research, analyse and synthesise scientific information.</li> <li>- Interest in learning and active participation.</li> <li>- Development of abilities and skills enabling the student to use scientific material and instrument design to implement their experiences and practices.</li> </ul>
To value the sciences as a cultural phenomenon.	<ul style="list-style-type: none"> <li>- Ability to research, analyse and synthesise scientific information.</li> <li>- Undertaking practical activities both in the laboratory and the classroom or in any location, which are based on contents related to matter or energy for the acquisition and promotion of scientific methods and attitudes and respect for the environment.</li> </ul>
To recognise the mutual influence between science, society and technological development, as well as relevant civil conducts, with the aim of working towards a sustainable future.	<ul style="list-style-type: none"> <li>- Undertaking practical activities both in the laboratory and the classroom or in any location, which are based on contents related to matter or energy for the acquisition and promotion of scientific methods and attitudes and respect for the environment.</li> <li>- Ability to work in a group.</li> <li>- Ability to research, analyse and synthesise scientific information.</li> <li>- Interest in learning and active participation.</li> </ul>



### Appraisal criteria:

Criteria	Definition
Knowledge and comprehension of the basic concepts of the subject.	<ul style="list-style-type: none"> <li>• Accurately expresses and defines concepts.</li> <li>• Knows how to apply concepts to examples and to solve problems.</li> <li>• Relates different concepts.</li> </ul>
Undertaking practical activities both in the laboratory and the classroom or in any location, which are based on contents related to matter or energy for the acquisition and promotion of scientific methods and attitudes and respect for the environment.	<ul style="list-style-type: none"> <li>• Is able to perform activities related to scientific contents, making use of the laboratory, the class or any other space.</li> </ul>
Acquisition by the student of habits of observation and scientific motivation regarding natural chemical and physical phenomena, above all those related with matter and energy.	<ul style="list-style-type: none"> <li>• Applies knowledge acquired in practical and theory classes in nature.</li> </ul>
Development of abilities and skills enabling the student to use scientific material and instrument design to implement their experiences and practices. as.	<ul style="list-style-type: none"> <li>• Is familiar with and knows how to use different scientific and laboratory instruments and materials.</li> </ul>
Clear, precise and correct use of language and vocabulary in presentations and class work.	<ul style="list-style-type: none"> <li>• Uses learned language.</li> <li>• Does not have any grammatical errors.</li> <li>• Expresses him/herself correctly using scientific language.</li> </ul>
Interest in learning and active participation.	<ul style="list-style-type: none"> <li>• Carries out unassessed work</li> <li>• Hands in assessed work</li> <li>• Participates in class</li> <li>• Volunteers for extra activities when required</li> </ul>
Ability to work in a group.	<ul style="list-style-type: none"> <li>• Is able to work in a group</li> <li>• Carries out group activities in a coordinated and participative manner</li> <li>• Helps fellow group members to overcome difficulties that arise</li> </ul>
Ability to research, analyse and synthesise scientific information.	<ul style="list-style-type: none"> <li>• Is able to write a bibliographic index properly</li> <li>• Is able to cite and use texts in his/her work without committing plagiarism.</li> <li>• Is able to find material to complete the contents provided in the class</li> </ul>

## Assessment procedure

In order to pass the subject, students must demonstrate through certain assessment criteria, that they have achieved all of the competences set out in this study guide. This assessment procedure is based on the “Normativa reguladora de los procesos de evaluación de aprendizajes de la Universidad de Alcalá”. It is available for download in the link: <https://www.uah.es/export/sites/uah/es/conoce-la-uah/organizacion-y-gobierno/.galleries/Galeria-Secretaria-General/Normativa-Evaluacion-Aprendizajes.pdf>

**Students are required to complete all of the assessed work presented in this study guide and to have, at least, a mark of 5 in every assessment work. This includes continuous and final assessment, both in the ordinary and extraordinary examination periods.**

**Attendance to seminars and group presentations is a compulsory and essential part of the continuous evaluation. If a student fails to attend two of these sessions without presenting an absence note, he/she must sit the final evaluation exam.**

**Complete or partial coping of any activity or project is forbidden and it implies to fail the subject. This includes continuous and final assessment, both in the ordinary and extraordinary examination periods**

### **CONTINUOUS ASSESSMENT. Ordinary and extraordinary examinations**

Continuous assessment for the ordinary and extraordinary examinations will be assessed according to the following tools:

1. Written exams
2. Group work
3. Subject dossier
4. Class work and participation

The relationship between the assessment criteria and the percentage weighting are displayed in the following table:

Assessment tool

Criteria	%	Assessment tool		
		Class work and participation	Group work	Written exam
Knowledge and comprehension of the basic concepts of the subject.	28	X	X	X
Undertaking practical activities both in the laboratory and the classroom or in any location, which are based on contents related to matter or energy for the acquisition and promotion of scientific methods and attitudes and respect for the environment.	10		X	
Acquisition by the student of habits of observation and scientific motivation regarding natural chemical and physical phenomena, above all those related with matter and energy.	12	X	X	X
Development of abilities and skills enabling the student to use scientific material and instrument design to implement their experiences and practices.	5		X	
Clear, precise and correct use of language and vocabulary in presentations and class work.	17		X	X
Interest in learning and active participation.	8	X	X	
Ability to work in a group.	15	X	X	
Ability to research, analyse and synthesise scientific information.	5		X	
Final mark		20	40	40

### FINAL ASSESSMENT. Ordinary and extraordinary examinations

Criteria	%	Assessment tool
Knowledge and comprehension of the basic concepts of the subject.	38	Written exams
Undertaking practical activities both in the laboratory and the classroom or in any location, which are based on contents related to matter or energy for the acquisition and promotion of scientific methods and attitudes and respect for the environment.	10	Written exams
Acquisition by the student of habits of observation and scientific motivation regarding natural chemical and physical phenomena, above all those related with matter and energy.	17	Written exams
Development of abilities and skills enabling the student to use scientific material and instrument design to implement their experiences and practices.	5	Written exams
Clear, precise and correct use of language and vocabulary in presentations and class work.	17	Written exams
Interest in learning and active participation.	3	Written exams
Ability to work in a group.	5	Written exams
Ability to research, analyse and synthesise scientific information.	5	Written exams

## 6. BIBLIOGRAPHY

### Basic Bibliography

- Tipler, P. A. y Mosca, G. (2010): Física para la ciencia y la tecnología. 6ª Ed. Barcelona, Reverté.
- Chang, R. (2010): Principios esenciales de Química general. 10ª Ed. Madrid, McGraw-Hill.
- Tsokos, K. A. (2011): Physics for the IB Diploma. 5ª Ed. Cambridge University Press
- Owen, S. (2011): Chemistry for the IB Diploma. Cambridge University Press

## Additional Bibliography

- Several links to websites will be provide in each topic in order to complement the course contents.

### Books of issues and problems

- Bermejo Martínez, F. y Paz Castro, M. (1995): Mil problemas de Química general y sus fundamentos. Madrid, Paraninfo.
- Butler, I. S. y Grosser, A. E. (1995): Problemas de Química. Barcelona, Reverté.
- López Cancio, J. A. (2000): Problemas de Química. Madrid, Pearson Prentice Hall.
- Díaz Díaz, J. L. y otros (1985). La Física en problemas: análisis dimensional, sistemas de unidades. Madrid, Alhambra.
- González, F. A. (1997): La Física en problemas. Madrid, Tebar Flores.