26420 - Geochemistry

Información del Plan Docente

Academic Year	2017/18
Faculty / School	100 - Facultad de Ciencias
Degree	296 - Degree in Geology
ECTS	7.0
Year	3
Semester	First semester
Subject Type	Compulsory
Module	---

1.General information

1.1.Introduction

1.2.Recommendations to take this course

1.3.Context and importance of this course in the degree

1.4.Activities and key dates

2.Learning goals

2.1.Learning goals

2.2.Importance of learning goals

3.Aims of the course and competences

3.1.Aims of the course

3.2.Competences

4.Assessment (1st and 2nd call)

4.1.Assessment tasks (description of tasks, marking system and assessment criteria)

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

This course is designed to provide a broad introduction to Geochemistry by presenting the key geochemical concepts and methods needed to solve geological problems.

The student will develop competences it the application of the basic principles of chemistry to the Earth, including factors

controlling the abundance and distribution of chemical elements in the Earth and the Solar system, the behaviour of elements during geological processes, and geochemical methodologies to solve geological problems.

The learning process is divided into three complementary activities (see next section).

5.2.Learning tasks

Activity 1: Lectures (2.5 ECTS). Designed to present the key concepts and the theoretical basis of Geochemistry. The lectures are grouped in four blocks: Part I. Principles and Methods of Geochemistry; Part II. Exogenous Geochemical Processes; Part III. Endogenous Geochemical Processes; and Part IV. The big picture: cosmochemistry and the origin and differentiation of the Earth into geospheres.

Activity 2: Practical Sessions (4.5 ECTS). Problem-solving classes, with or without the aid of a computer, to solve problems on isotopic geochemistry, geochemistry of igneous rocks and low temperature geochemistry.

Activity 3: Essay. An optional paper on an issue related with the topics included in the lectures or practical sessions.

5.3.Syllabus

Lectures

Part I. Fundamentals and Methods

- Lecture 0. Introduction to Geochemistry.
- Lecture 1. Geochemical classifications of the elements.
- Lecture 2. Isotope Geochemistry I. Radioactive and radiogenic isotopes.
- Lecture 3. Isotope Geochemistry II. Stable isotopes.
- Lecture 4. Analytical methods in Geochemistry.

Part II. Exogenous Geochemical Processes

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- Lecture 5. Exogenous processes. Basic concepts.
- Lecture 6. Aqueous Geochemistry. Speciation.
- Lecture 7. Sedimentary Geochemistry.
- Lecture 8. Geochemical exploration. Principles and applications.

Part III. Endogenous Geochemical Processes

- Tema 9. Trace elements in the endogenous processes.
- Tema 10. Multielemental diagrams
- Tema 11. Hydrothermal processes.

Part IV. The Big Picture

- Lecture 12. Cosmochemistry.
- Lecture 13. The origin and differentiation of the Earth.
- Lecture 14. Geospheres: core, mantle and crust.

Practical classes

Part I. Principles and Methods

- Session 1. Geochemical classification of several elements.
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Session 2. Radioactive isotopes: g eochronology.

- Session 3. Stable isotopes: geothermometry.
- Session 4. Stable isotopes: paleotemperatures.
- Session 5. Nugget effect in sampling.
- Session 6. Quality control of analytical data.

Part II. Exogenous Geochemical Processes

- Session 7. Temperature effects on mineral solubility.
- Session 8. Silica system.
- Session 9. Carbonate system.
- Session 10. Stability diagrams for aluminosilicate minerals.
- Session 11. Geochemical indicators and weathering.
- Session 12. Geochemical classification of siliciclastic rocks.
- Session 13. Threshold value calculation for an anomaly.
- Session 14. Elaboration of maps through krigging.
- Session 15. Anomaly maps: Biel copper case.

Part III. Endogenous Geochemical Processes

- Session 16. HREE deposits in carbonatites
- Session 17. Gold hydrothermal deposits.

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Part IV. Overview

- Session 18. Chondritic Earth Model.

5.4.Course planning and calendar

- This course is taught during the first semester, starting in February and finishing in May. There are two theory lectures per week (Monday and Tuesday, 1 hour each) and two two-hour practical session per week (Tuesday afternoon and Wednesday morning).
  The course has 7 ETCS, i.e., 175 hours of student work: 70 hours of on-site teaching time and 105 hours of personal work. Out of the 90 hours of on-site teaching time, 25 hours are lectures and 45 hours are problem-solving sessions.

5.5.Bibliography and recommended resources

Course materials will consist of class notes, lecture notes (pdf files of Powerpoint presentations will be provided) and handouts. Recommended textbooks are:

- Faure, G. (1998). Principles and applications of geochemistry . Prentice Hall, 2 nd edition.
- Faure, G. (1986). Principles of isotope geology . John Wiley & Sons, 2 nd edition.
- Drever, J.I. (1997). The geochemistry of natural waters . Prentice Hall, 3 rd edition.
- Levinson, A. A (1974). Introduction to exploration geochemistry . Applied Publishing. Wilmette, Illinois.
- Albarède, F. (2009). Geochemistry: an introduction . Cambridge University Press, 2 nd edition.

In addition, the following books might be useful:

- Richardson, S.M. and McSween Jr., H.Y. (1989). Geochemistry: pathways and processes . Prentice Hall.
- Hoefs, J. (2004). Stable isotope geochemistry . Springer-Verlag, Berlin, 5 th edition.
- Rollinson, H. (2007). Early Earth systems: a geochemical approach . Blackwell Publishing.