



# UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze della Terra e del Mare
ACADEMIC YEAR	2019/2020
BACHELOR'S DEGREE (BSC)	GEOLOGY
SUBJECT	GEOCHEMISTRY AND VOLCANOLOGY
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50189-Ambito mineralogico-petrografico-geochimico
CODE	18788
SCIENTIFIC SECTOR(S)	GEO/08
HEAD PROFESSOR(S)	AIUPPA ALESSANDRO    Professore Ordinario    Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	9
INDIVIDUAL STUDY (Hrs)	149
COURSE ACTIVITY (Hrs)	76
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	<b>AIUPPA ALESSANDRO</b> Wednesday 14:30    15:30    via archirafi 36 III piano

**DOCENTE:** Prof. ALESSANDRO AIUPPA

<b>PREREQUISITES</b>	knowledge of principles of Earth dynamics; chemistry and physics
<b>LEARNING OUTCOMES</b>	<p>The main expected results are:</p> <p>Acquisition of skills required for the understanding of the laws governing the abundance and distribution of elements in various spheres geochemical</p> <p>Comprehension of the behavior mechanisms of active volcanoes.</p> <p>Ability to use the specific language of the disciplines.</p> <p>Ability to apply the knowledge gained in the modeling of natural phenomena, using the equilibrium thermodynamic approach. Ability to predict the behavior of the active volcanoes.</p> <p>Ability to expose the results of geochemical and volcanological studies to a non-expert public.</p> <p>Ability to emphasize the possible scientific implications of geochemical and volcanological applications</p> <p>Ability to studying and understanding scientific texts in English.</p> <p>Capacity to follow, using the knowledge acquired in the course, specialized seminars in the field of geochemistry and volcanology.</p>
<b>ASSESSMENT METHODS</b>	<p>1. mid-term test, aimed at assessing the response of the class to the exposed concepts the test will consist in a minimum of 2 open questions max. score 10/30</p> <p>2. written final test the test will consist in a minimum of 4 open questions. max. score 20/30 The test will ascertain : (i) the acquired knowledge level (ii) the adoption of an appropriate technical language (iii) critical and independent reasoning (iv) ability to make connections between the various topics of the course . The minimum requirements for passing the test are: (i) identification of pyroclastic deposits and their volcanological context ; (ii) ability to quantitatively analyze equilibria reactions in geochemical processes in fluid and solid phases (iii) fluidity of interconnection between the different course topics</p> <p>3. The written test will be integrated by an oral test to evaluate communication skills</p>
<b>EDUCATIONAL OBJECTIVES</b>	<p>The course aims at understanding the laws that govern the abundance of elements in the various spheres geochemical: atmosphere, hydrosphere, lithosphere.</p> <p>Of each of the geochemical spheres, composition, origin and evolution will be discussed. The perturbations induced by anthropogenic activities will be highlighted, trying to capture the short and long term effects.</p> <p>Principle and applications of geochemistry and isotope geochemistry to environmental problems and the study of natural hazards will also be introduced. Particular attention will be given to understanding volcanoes, by studying their origin, evolution and behavior, as well the techniques used to analyse volcanic rocks and deposits.</p> <p>Pending on the availability of economic resources, an excursion on Ustica, Etna or on the Aeolian island will be organized to in the context of the "multidisciplinary field excursion" program, to see "live" some volcanological aspects covered in the course,</p>
<b>TEACHING METHODS</b>	frontal lessons, laboratory
<b>SUGGESTED BIBLIOGRAPHY</b>	<p>S. RICHARDSON, H. Mc SWEEN, Jr – Geochemistry : Pathways and Processes. PRENTICE HALL- N.J</p> <p>H Sigurdsson, B Houghton, S McNutt, H Rymer, J Stix, (eds) The Encyclopedia of Volcanoes, Academic Press</p> <p>ulteriori testi di consultazione</p>

## SYLLABUS

Hrs	Frontal teaching
1	Geochemistry in the context of other Earth science disciplines; hystorical background
3	Origin and abundance of the elements in the universe. Composition and structure of the earth . Geochemical spheres . Geochemical affinity of the elements .
4	Chemical equilibrium : recalls of chemical thermodynamics .
6	Composition and structure of the atmosphere . Adiabatic expansion model and appropriate thermodynamic recalls. Evolution of the atmosphere in relation to the evolution of the earth . Overview of air pollution. The greenhouse effect and the ozone hole
4	Hydrosphere composition. The water cycle. Composition of rain in equilibrium with the atmosphere .
2	Oceans and groundwaters. Classification of water types using major components . Minors and trace constituents .

## SYLLABUS

Hrs	Frontal teaching
5	Water rock interaction; equilibria with carbonate rocks and silicate rocks .
5	Activity Diagrams and stability fields of phases . Eh-pH diagram
3	stable isotopes . Isotope fractionation . Isotopes as tracers, and genetic processes .
3	Law of isotope decay. absolute geochronology using unstable isotopes . Methods for determining the absolute age of geological materials: applications .
4	Operational definition of lithosphere. weighted average composition of the lithosphere. Basalts as main constituents of the lithosphere . Remarks on the origin of basalts
4	Physicochemical property of molten silicates. Abundance and solubility of volatiles in magmas. Volcanic gases and the primordial atmosphere .
6	Rheology of magmas. Magma ascent mechanisms. Pre- and syn-eruptive processes in magma chambers and conduits. Volcano dynamics and eruptive mechanisms
4	Pyroclastic deposits: properties and identification criteria
10	Classification of various eruptive activities. Dynamics, mechanisms and eruptive products: Hawaiian , Strombolian , Plinian , and phreatomagmatic activity
Hrs	Workshops
12	Water chemistry lab and field recognition of pyroclastic deposits