UNIVERSITÀ DI PAVIA

Anno Accademico 2015/2016

CHEMISTRY	
Enrollment year	2013/2014
Academic year	2015/2016
Regulations	DM270
Academic discipline	CHIM/07 (FOUNDATIONS OF CHEMISTRY FOR TECHNOLOGIES)
Department	DEPARTMENT OF CIVIL ENGINEERING AND ARCHITECTURE
Course	
Curriculum	PERCORSO COMUNE
Year of study	3°
Period	1st semester (28/09/2015 - 22/01/2016)
ECTS	6
Lesson hours	80 lesson hours
Language	ITALIAN
Activity type	WRITTEN AND ORAL TEST
Teacher	QUARTARONE ELIANA (titolare) - 3 ECTS GHIGNA PAOLO - 3 ECTS
Prerequisites	=
Learning outcomes	The course aim to provide the fundamentals of chemistry and chemical-physics useful for the comprehension of materials structure-activity relationship. It also discusses on the materials of specific interest to the Master of Science in Civil Engineering and Architecture.
Course contents	Basics of chemical formulas and chemical reactions Qualitative and quantitative aspects of chemical formulas and reactions, stoichiometry, principal reaction types. Radiochemistry Nuclear stability, radioactive decays, kinetic of radioactive decay, natural radioactive families. Chemical and biological effects of radiations.

The environmental radioactivity. Radon.

Basics of chemical bond theory
The hydrogen atom. Electronic configuration of elements and periodic properties. Ionic, covalent, polarized-covalent, coordination and metallic bonds. Molecular geometries. Dipolar moments of molecules. Intermolecular interactions: hydrogen-bond, van der Waals forces and dispersion forces. Ionic and covalent valences of elements of s, p block and first transition row. Oxides, hydrides, anions and cations, salts. Basics of organic chemistry.

States of matter
Gaseous state: ideal gases and real gases. The ideal gas equation. Gaseous mixtures, Dalton's law, PVT calculations. Solid state: crystalline systems, Bravais' lattices, compact structures, reference structures for ionic salts. Covalent (diamonds, graphite, silicon, quartz), metallic and molecular crystals. Liquid crystals. Liquid state: surface tension, adhesion and cohesion forces, wettability, vapor tension.

Thermodynamics, kinetics and chemical equilibrium
Thermodynamic state functions. Enthalpy of formation of compounds, heats of reaction, thermodynamic cycles (Hess law), reaction isotherm. The equilibrium in gaseous phase, the equilibrium constant, reaction quotient, the effect of temperature. Basics of chemical kinetics.

Solutions
The measuring units of concentration: molarity, molality, w/w and w/v percent. Liquid-vapor equilibrium, the Raoult's law. Freezing-point depression, boiling-point elevation, osmotic pressure. Solubility equilibrium (solubility product). Acid-base equilibrium, definition of pH, pH of strong and weak acids and basis. Hydrolysis of anions and cations. Buffer solutions.

Phase equilibria
Phase state diagram of water. Thermal analysis of alloys. Eutectic diagrams and diagrams with total and partial solubility in the solid phase.

Electrochemistry
Electrode potentials and basics of batteries. Standard electrochemical potentials, Nernst equation. Corrosion phenomena of metals, passivation, corrosion protection. Batteries and accumulators in everyday use. Electrolysis.

Materials
Polymeric materials and structure/property relationship. Metals and ferrous alloys: steel, cast iron, the Fe/C diagram. Thermal treatments. Ceramic materials. Building materials: lime, hydraulic lime, plaster, cements. Wood and derivatives.

Teaching methods

Lectures (hours/year in lecture theatre): 80
Practical class (hours/year in lecture theatre): 0
Practicals / Workshops (hours/year in lecture theatre): 0

Reccomended or required readings

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Assessment methods

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Further information

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