

General Information	
Academic subject	ELEMENTS OF CHEMICAL EDUCATION
Degree course	SCIENZE DELLA FORMAZIONE PRIMARIA CLASSE LM/85 BIS
Curriculum	
ECTS credits	4
Compulsory attendance	Recommended
Language	ITALIANO

Subject teacher	Name Surname	Mail Address	SSD
	GIOVANNI LENTINI	giovanni.lentini@uniba.it	CHIM/08

ECTS credits details	Disciplinary scope	SSD	ECTS
	Chemical Disciplines	CHIM/03	4

Class schedule	
Period	I SEMESTER
Year	IV
Type of class	Traditional

Time management	
Hours measured	60 min
In-class study hours	30
Out-of-class study hours	70

Academy calendar	
Class begins	15 October 2018
Class ends	31 January 2019

Syllabus	
Prerequisite requirements	Equivalences. Arithmetic.
Expected learning outcomes	<ul style="list-style-type: none"> • <u>Knowledge and understanding</u> Knowledge and understanding in the field of chemistry; ability to discriminate between chemical and physical processes, and between chemical and physical properties; ability to classify a system on the basis of its chemical characteristics. • <u>Knowledge and applied understanding skills</u> Ability to design and carry out learning activities in the scientific domain, mainly focused on chemistry, for primary school children. Use of conceptual maps and Gowin's diagrams. • <u>Autonomy of judgment</u> Ability to ascertain the acquired knowledge through properly designed assessment tests. Ability to critically evaluate and modify the learning activities

	<p>in order to make them suited to new varied landscapes while keeping an eye on scientific soundness.</p> <ul style="list-style-type: none"> • <u>Communication skills</u> Ability to describe basic chemical phenomena or systems by means of simple, clear, and rigorous terms. • <u>Understanding skills</u> Ability to obtain information from the Internet and textbooks in order to deepen and broaden the acquired knowledge in the chemistry domain.
Contents	<p>Structure of the course and relevant instruments. What is needed: teacher, students, program (basic jargon, object, pivotal concepts, practical skills), texts. The final stakeholder: the child, a natural-born researcher. Curiosity and the pleasure of discovery. Welcome to serendipity. Good answers: covering-law model (Hempel's model), unifying model, causal model. Good strategies: meaningful learning, traditional learning, receptive learning, autonomous learning. Chemistry, the nearest science to figurative art. Instruments: conceptual maps (concepts, linking words, linking phrases, cross linking, examples); pros and limitations. Gowin's diagrams: focus question, event, theory side, method side; flux diagrams: rectangular boxes, elliptic boxes, diamonds, arrows; problem solving; logical thinking.</p> <p>Invitation to chemistry: what chemistry is, what does it deal with, what does it matter. The particle nature of matter (concepts of atom, molecule, and ion). Why beauty is rewarding. Chemistry and the Universe: a deeper pleasure. Chemistry, a pivotal science. Classification of matter: substances and mixtures. Physical and chemical processes. Matter and energy (the aggregation states of matter). Dimensions of the objects studied by chemists. Matter and space. Elements and compounds. Solids, liquids, and gases. State transitions.</p> <p>The chemical jargon. Symbols. Units. Scientific notation. The concept of mole. Atomic mass. Energy. Scientific measurements. Error and confidence. Accuracy and precision. Systematic and accidental errors. Significant figures. Laboratory equipment.</p> <p>The particulate nature of matter (atoms and molecules). The atom. Lavoisier. Proust. Dalton. The electric nature of matter. The discovery of the electron. Nucleons. The Thomson's atomic model. The Rutherford's atomic model. Atomic number. Mass number. Isotopes. Radioactivity. Dating a fossil. The dual nature of light. Diffraction and interference. The photoelectric effect. Heisenberg's uncertainty principle. Schrödinger equation. Orbitals. Electron configuration. The periodic table. The first 20 elements. The periodic law. Lewis structures. The octet rule.</p>

	<p>Ionization potential, electron affinity, and electronegativity. Inter-atomic bonds: ionic interactions, covalent bond (homopolar and heteropolar), metallic bond.</p> <p>Classification of matter (from substance to mixtures). Inorganic and organic substances. Inter-molecular interactions: dipole-dipole interaction, hydrogen bond, ion-dipole interactions, van der Waals interactions. Physical and chemical processes. Solutions and dispersed states of matter. Aqueous solubility. pH. Acids and bases. Acid rains. pH in the body.</p> <p>Exercises.</p> <ol style="list-style-type: none"> 1) Weight, volume, density: (a) Gerone's crown and the genius 2) Weight, volume, density: (b) the bottle in the refrigerator. 3) Air is matter: (a) an experiment with a glass 4) Air is matter: (a) the hypodermic syringe 5) 3) Air is matter: a scale to measure air weight.
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Course program	
Bibliography	<p>Secondary school textbooks. Hard-copies of the slides from the teacher J. D. Novak, D. B. Gowin. Imparando a Imparare. SEI Memorix Chimica – EdiSES O. J. Mullins. Esperimenti con la Scienza – Hoepli J. Emsley. Prodotti Chimici – Zanichelli P. W. Atkins. Molecole – Zanichelli N. Arnold. Cianuro, Arsenico, Stricnina e Altri Vomitevoli Veleni (Brutte Scienze) – Salani N. Arnold. Caotica Chimica (Brutte Scienze) – Salani A. Parisi. Numeri magici e Stelle Vaganti - Lapis Dispense del docente Texts freely available in the Internet: www.leparoledellascienza.it www.indire.it (Risorse Docenti, PON Educazione Scientifica page) http://www.chimica-online.it/</p>
Notes	Texts are suggested and most of the treated subjects are supported by supporting materials that may be freely downloaded from the Internet.
Teaching methods	Slides presentation. Exercises at the blackboard. Self-evaluation tests. Conceptual maps and Gowin's diagrams.
Assessment methods	Oral exam.
Further information	