



SANT'ANNA
INSTITUTE
SORRENTO

CHEM 103 - General Chemistry I (4 credits, 45 hrs classroom + 45 hrs lab)

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Fall 2023

1 About this course

This course is designed to provide an in-depth understanding of the fundamental concepts associated with atomic models, periodic table, periodic trends, chemical bonds, nomenclature, reactivity and reactions, stoichiometry, and nuclear chemistry. Laboratories activities are included (45 hours).

More in detail, covered topics will be the following:

- **Atomic models.** Dalton Model, Thompson Model, Rutherford Model, Bohr Model, Schrodinger Model. Nucleons and electrons, atomic mass, and atomic number. Isotopes. Introduction to Schrodinger equation, wave functions and orbitals.
- **Periodic table.** Periods and groups. Metals, non-metals, and metalloids. Alkali and alkaline earth elements, transition metals, chalcogens, halogens and noble gases. Rare-earth metals. Octet rule. Periodic trends: atomic radius, electron affinity, ionization energy. Electronegativity: Mulliken relation and Pauling scale.

- **Electronic configuration.** Shells and subshells. Aufbau principle, Madelung rule and Hund rule. Pauli exclusion principle. s-block, p-block, d-block, f-block. Quantum numbers: principal, azimuthal, magnetic and spin.
- **Chemical bonds.** Ionic and covalent bonds. Percent ionic character (Pauling). Metallic bond.
- **Molecular structures.** Lewis structures. VSEPR theory. VB theory. Molecular geometries. Dipole moment and polarity.
- **Intermolecular (nonbonding) forces.** Ion-dipole, H-bond, dipole-dipole, ion-induced dipole, dipole-induced dipole, dispersion (London) interactions.
- **IUPAC nomenclature.** IUPAC nomenclature of inorganic ions and compounds.
- **Chemical reactions.** Reactants and products. Introduction to reaction kinetics and energy. Stoichiometry. Reduction-oxidation (redox) reactions.
- **Introduction to Nuclear Chemistry.** Alpha, beta and gamma decays. Radioactivity.

1.1 Course Material

Suggested books:

- M.S. Silberberg, *Chemistry: The Molecular Nature of Matter and Change*, Sixth Edition, 2012.
- D.W. Oxtoby, H.P. Gillis, A. Campion, H.H. Helal, K.P. Gaither, *Principles of Modern Chemistry*, Seventh edition, 2011.

Also, additional course materials will be available.

2 Lesson architecture

Each **standard** lesson includes:

- lecture (theoretical).
- 5 min. break.
- lecture (theoretical/practical calculus based);
- Q&A session (about the current lecture).

3 Final grade

The grade in this course will be composed as follows:

- Attendance: 10%.
- First test (30 min, written test, exercises): 10%.
- Mid-term assessment (60 min, written text, theory, and exercises): 20%.
- Second test (30 min, written test, exercises): 10%.
- Final assessment (60 min, written test, exercises): 20%.
- Laboratory reports: 30%.

The grading scale is reported in [Table 1](#).

Grade	Percentage Interval
A	95% - 100%
A-	90% - 94%
B+	87% - 89%
B	83% - 86%
B-	80% - 82%
C+	77% - 79%
C	73% - 76%
C-	70% - 76%
D+	69% - 69%
D	63% - 66%
D-	60% - 62%
F	under 60

Table 1: Grading scale.

4 Sant'Anna Institute Procedures

4.1 Classroom behavior

All students are expected to observe basic tenets of common decency and acceptable behavior. This means turning off cell phones, pagers, iPods, and other devices, and putting away newspapers and other forms of distraction, for the duration of the class period (exceptions will be allowed for emergencies with advance permission of the professor). Please come to class on time and plan to stay for the entire period. Coming late and/or disrupting the learning environment shows disrespect for the faculty and your colleagues.

4.2 Late Assignments

Late assignments may be accepted only with the advance approval of the professor and will be assessed a late penalty of one letter grade per day. If you have a problem with a due date because of a specific emergency, please notify the professor in advance or plan to turn the assignment in early. To pass this class, all assignments must be completed. Any missing assignments at the end of the course will result in an overall course grade of D or F.

4.3 Contesting a Grade

If students wish to contest a grade, they must make an appointment to do so in person. The student should contact the instructor with any concerns within 3 days of receiving the grade. The student must also demonstrate that they have read the comments accompanying the grade by presenting a brief written statement specifying why the grade does not reflect the quality of the work. It is up to the instructor to decide whether the work and the student's request warrant any increase or decrease in the grade. Students should retain a copy of all submitted assignments and feedback (in case of loss) and should also retain all their marked assignments.

4.4 Attendance

Students are allowed 1 unexcused absence. Documentation for any other absence MUST be produced and APPROVED by the professor or the Academic Director. For absences due to illness, they are invited to provide the professor with a doctor's note upon returning to class as well as inform them and/or the school the first day of illness. Each unexcused absence after the first will reduce the grade by 3 percentage points.