

## **SYLLABUS FOR CHEMISTRY 1A-52039 – Fall 2023**

Lectures: MW 11-12:15pm in new Math/Science building 204

Labs: Every T and Th 8:00-10:50am in new Math/Science building 201.

**Instructor:** Veronica Cornel

**Contact info:** e-mail through [Canvas](#) or [veronica.cornel@reedleycollege.edu](mailto:veronica.cornel@reedleycollege.edu) (using “Chem1A” as the subject or I will delete it)

**Canvas Website:** Fill-in notes, fill-in lab reports, grades, exam dates etc. are all posted under “Modules” on Canvas. <https://scccd.instructure.com>

Start at the “Home” or “Modules” page as there is a Module for each day that you need to work through.

**Office Hours:** M 9-11am and F 10-12am in MSE 223 or MSE 201 and a virtual office hour M 2-3pm (see Canvas for link). Additionally, ask for help during my lab hours.

**Tutoring:** Free tutoring available in person in the tutorial center and on zoom:

<https://www.reedleycollege.edu/academics/tutoring-services/index.html> , sign up for a free account, and begin searching for RC chemistry tutors.

**Course Objectives:** Chemistry 1A is a general course in chemistry designed for chemistry **majors**, but also for biology, physics, chemical engineering, pre-medical and pre-pharmacy majors. **If you need an introductory chemistry course you should rather take CHEM3A.**

**Prerequisites:** students need to have passed CHEM3A, or the equivalent, as well as basic algebra (Math 3, Algebra II or the equivalent, but just Stats is not sufficient).

**Advisories:** English 1A

**Textbook:** Nivaldo J. Tro: Chemistry: A Molecular Approach (1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> or 5<sup>th</sup> Edition). **Please do not purchase the International or Global edition.**

**Lab Manual:** CHEM 1A Lab Book by V. Cornel. Print the labs as they are posted on Canvas and **complete the prelab before coming to lab!**

**Other Supplies:** A scientific **calculator** is required TI-30XA or TI-30XII (needs exponents, SCI mode and logs, but not a programmable calculator, nor a Casio calculator, nor one designed for STATS) (You will not be allowed to use a programmable calculator, Casio calculator or cell phone on exams). Approved **safety glasses** (Z87 in the stem of the glasses – but don’t purchase the goggle-type), **labcoat** and closed shoes for lab.

### **Canvas Modules**

There will be a Module for each week-day. Print the **fill-in notes**, fill them in during lecture, read the section in your textbook and then complete the homework assigned from your textbook. The homework is due at the start of the next MW lecture. Prelabs are due as you walk into the lab, even if you walk in late. You will lose points if you turn in the homework or Prelabs late, even if you walk into class late. If you miss the lab, complete the Prelab and Postlab and email it to me **before** the start of the next lab day for partial credit.

**Homework:** Homework from your textbook will be assigned every lecture at the end of the fill-in notes. It is essential to your success in this class that you do all the assigned homework and read the relevant sections in your Textbook. The more effort you put into your homework, the better you will do in exams. I will type out the questions for the first week in case you don't have your textbook yet. You need to **write the questions and show all your work** to get credit for the homework.

There will be no make-up homework assignments. Do not just copy somebody else's homework or you will not be able to do the problems for yourself in the exams. You can ask another student or tutor to help you with the problems, but then you need to redo them by yourself. Even if you get all the problems wrong, you will still get 70% for the assignment for attempting all the problems yourself and showing all your work and writing the important parts of the question as well as the answer. I will grade, correct and go over selected problems. I will only accept late homework one lecture day late and you will lose 10% for the homework being late. You need to write out the important parts of the homework questions, show your work, as well as the answers so you can study your homework before the exam. You can also do the corresponding odd number problems for extra practice and check the answers at the back of the book.

**Attendance:** Attendance for the lectures, labs and exams is mandatory. Students may be dropped if they don't attend the first lectures or lab, without contacting me. This is to allow waitlisted students to add the class. Students who have not attended class for a week, or a cumulative 25%, may be dropped if they do not contact me and email the missing assignments.

You are responsible for withdrawing from the course before the drop date. If you stop attending class after this date you will be given an "F" instead of a "W".

If you miss an exam and have a valid, written excuse, I will give you **one make-up exam** (even for covid absences). If you miss a second exam you will not be allowed a make-up exam and you will receive a zero. If a student is disruptive (using cell-phones, interrupting the instructor continuously) they may be asked to leave the class and recorded as "absent". No make-up labs will be given, but a student may email me the prelab and postlab before the start of the next lab for a small partial credit. If a student **misses more than 3 labs** they **will not pass** the class. If you are absent you may email me the homework but the late policies will be the same as for those attending class i.e. 10% deducted for being late and you may email it only until the start of the next lecture.

**Cancelled Classes:** If for some reason a class is cancelled, an official yellow cancellation form will be posted on the door of the classroom. We will make every effort to inform the students via Canvas, or on the Reedley College Website in a timely manner.

**Grading :** There will be 5 lecture exams, equally weighted and counting 65% of your grade. The final exam is not cumulative, but some concepts like nomenclature, moles and significant figures are in every exam. Homework will count 10% and your lab work will count 25% (12.5% lab reports and 12.5% lab quizzes). General Grading break-off : **A** 90-100%, **B** 80-89%, **C** 70-79%, **D** 60-69%, **F** 0-59%

Please be aware of the following rules:

- Arriving late or leaving early will result in the student being recorded "Tardy" or "Absent" and the student will lose points on the homework or Prelab.
- Fraudulent behavior during exams is graded with a (0) zero.
- Copying of homework, experimental data, and lab reports is considered fraudulent behavior for both the copier and the originator and points (10-100%) may be deducted from both the copier and the originator.

### DO NOT HAND IN IDENTICAL HOMEWORK.

- No assignment may be submitted after I start returning the graded assignments. No alternative homework or labs will be given. I will drop the lowest two homework assignments though.
- No extra credit will be given. You need to work consistently from the beginning.
- No notes, cell phones, i-pods, smart watches, programmable calculators, restroom breaks or talking will be allowed during exams.

### LABS

- Safety glasses need to be worn whenever you or somebody near you is conducting an experiment.
- No experiments may be conducted without the instructor or teaching assistant present
- No horseplay or unauthorized experiments. Do not taste any chemical or smell any chemical directly.
- Dangerous behavior in the lab will result in the student being asked to leave the lab.
- No visitors inside the lab. You need to go outside to meet with them.
- No food or drinks allowed in the lab.
- Backpacks should not be left on the floor where others can trip over them.
- Closed shoes and buttoned up lab coats must be worn in the lab at all times when you are conducting experiments.
- Long hair should be tied back so it will not fall into chemicals or flames.
- If any accident occurs in the lab, inform your instructor and follow safety procedures. (To be discussed during first lab)
- Clean up any spills promptly, even water spills
- Do not point the open end of a test tube towards anybody
- Turn off flames when working with organic solvents. Dispose of them in waste bottles in the fume hood, not down the sink.
- At the beginning of each lab your instructor will inform you of any special safety precautions and how to dispose of used chemicals. You need to be on time for the lab so that you hear these instructions.
- Do not dispose of matches, paper or solid chemicals in the sink.
- Put broken glassware in the “broken glassware box”, not in the trash.
- Before leaving the lab, wipe the desktop and your chair and wash your hands with soap and water.
- Turn in your prelab as you walk into lab or you will lose points for it being late. Turn in your lab report before leaving the lab.

**If you have a verified need for an academic accommodation (especially in labs) or materials in alternate media (i.e., Braille, large print, electronic text, etc.) per the Americans with Disabilities Act (ADA) or Section 504 of the Rehabilitation Act, please contact the Disabled Student Services as soon as possible.**

**With this statement on my course syllabus, I am referring each of my enrolled students in need of academic support to tutorial services. Referral reason: Mastering the content, study skills, and basic skills of this course is aided by the use of trained peer tutors**

## Chemistry 1A Fall 2023 Cornell

Week	Date	Labs (TTh)	Lectures (MW)
<b>Week 1</b> Aug 7-11	Aug 8	Introduction to Laboratory Safety and Equipment <b>Lecture during lab: Periodic Table</b>	Syllabus and Periodic Table 1. Matter 1. Scientific Notation and Significant Figures
	Aug 10	Lab 2: Properties and Changes in Matter	
<b>Week 2</b> Aug 14-18	Aug 15	Lab 3: Measurements	1. Dimensional Analysis 2. Atoms
	Aug 17	<i>Sig Figs and Dimensional Analysis Worksheet</i>	
<b>Week 3</b> Aug 21-25	Aug 22	<b>Lecture during lab: The Mole</b>	2.9 Mole
	<b>Aug 24</b>	<b>Exam 1</b>	3.5 Ionic Compounds
	<b>Aug 25</b>	<b>Last day to add a class. Last day to drop a class to avoid a "W"</b>	3.6 Molecules and Ionic compounds with Polyatomic Ions
<b>Week 4</b> Aug 28-Sep 1	Aug 29	Lab 7: The Mole	3.8-9 Percent composition and Empirical Formulas
	Aug 31	<b>Lecture during lab: Balancing reactions</b> <i>Nomenclature Worksheet</i>	3.6 More Polyatomic Ions and Hydrates 3.10, 4.6 Writing and Balancing Reactions
<b>Week 5</b> Sep 4-8	<b>Sep 4</b>	<b>Labor Day – No classes</b>	4.2 Stoichiometry and
	Sep 5	Lab 6: Empirical Formulas: Oxide of Tin	4.3 Limiting Reactions
	<b>Sep 7</b>	<b>Lab Quiz 1 (Labs 2,3,7, Safety and Labware)</b>	
<b>Week 6</b> Sep 11-15	Sep 12	Lab 8: The Formula of a Hydrate	4.4 Solutions 4.5 Electrolytes and Net Ionic equations
	<b>Sep 14</b>	<b>Exam 2</b>	
<b>Week 7</b> Sep 18-22	Sep 19	Lab 9: Stoichiometry	4.8 Acid-Base reactions and Titrations
	Sep 21	Lab 13: Acids and Bases	4.7 and 4.9 Reaction Types and Redox
<b>Week 8</b> Sep 25-29	Sep 26	Lab 10: Alum Crystallization. Recycling Aluminum	18.2 Balancing Redox Reactions 18.2 Redox Titrations and Activity Series
	Sep 28	Lab 15: Redox Reactions- The Burning of Magnesium	5. Gas 1 and Gas 2
<b>Week 9</b> Oct 2-6	<b>Oct 3</b>	<b>Lab Quiz 2 (Labs 6, 8, 9, 13)</b>	5. Gas 3 and 4
	Oct 5	Lab 21: Charles' Law	6. Thermo 1 and 2
	<b>Oct 6</b>	<b>Last Day to drop class to get a "W"</b>	
<b>Week 10</b> Oct 9-13	Oct 10	Lab 22: Molecular Mass of a Volatile Liquid	6. Thermo 3 7. Light 1
	<b>Oct 12</b>	<b>Exam 3</b>	
<b>Week 11</b> Oct 16-20	Oct 17	Lab 27: Heat Flow, Calorimetry	7. Light 2
	Oct 19	Lab 23: Atomic Mass of an Unknown Divalent Metal And Lecture on Quantum Numbers	8.4 Electron Configuration 7. Quantum Numbers
<b>Week 12</b> Oct 23-27	Oct 24	Lab 16: Reactions of Copper	8. Periodicity 9. Lewis Diagrams and 10. Geometry 1
	<b>Oct 26</b>	<b>Lab Quiz 3 (10, 15, 21, 22, 23, 27)</b>	
<b>Week 13</b> Oct 30-Nov 3	Oct 31	Lab 19: Vitamin C in Fruit Juices	10. Geometry 2
	Nov 2	Lab 28: Molecular Geometry Part 1	9.8 Polar Bonds and 10.5 Dipoles 10.7 Hybridization
<b>Week 14</b> Nov 6-10	Nov 7	Lab 28: Molecular Geometry Part 2	21. Alkanes
	<b>Nov 9</b>	<b>Exam 4</b>	21. Alkenes, Alkynes, cycloalkanes, isomers
	<b>Nov 10</b>	<b>Veteran's Day – No classes</b>	
<b>Week 15</b> Nov 13-17	<b>Nov 14</b>	<b>Titration Practical Exam</b>	9.8 Formal Charges and Resonance 11.2 Intermolecular Forces
	Nov 16	Lab 29: Alkanes, Alkenes, Alkynes	
<b>Week 16</b> Nov 20-24	Nov 21	Lab 17: Percent Iron (II) in an Unknown	11.2-3 Liquids and 11.6-8/11-12 Solids
	<b>Nov 23-24</b>	<b>Thanksgiving – No classes Thurs or Fri</b>	

<b>Week 17</b> Nov 27- Dec 1	Nov 28	<b>Lab Quiz 4 (Labs 13, 17, 28A, 28B, 29)</b>	pH and pOH 12.5-6. Solutions and 12.6 Freezing Point Lowering
	<b>Nov 30</b>	Lab 30: Freezing Point Depression	
<b>Finals Exam</b>	<b>Dec 5</b>	<b>Tues: Exam 5</b>	

### **Course Outline: Each Topic takes 1-2 weeks**

#### **Matter and energy**

The laws of conservation of mass and energy

States and classifications of matter, including elements, ionic compounds, molecules, homogeneous mixtures and heterogeneous mixtures Chemical and physical properties of matter

Chemical and physical changes of matter

Scientific method

#### **Measurements in chemistry**

SI units and derived units of measurement: length, mass, volume, density, pressure Temperature scales

Dimensional analysis and problem solving

Precision and accuracy in making measurements

Significant figures

Standard deviation

#### **Atoms and elements**

Laws of conservation of mass, of constant composition, and of multiple proportions

Modern atomic theory

Protons, electrons, and neutrons

Atomic number, atomic mass and atomic mass unit

Isotopes including isotopic abundance and determining atomic mass

Classification of elements, including metals, metalloids, non-metals and groups

Conversions between mass, moles and atoms using Avogadro's number and molar masses

#### **Molecules, ions, ionic compounds and organic molecules**

Chemical bonds: ionic and covalent bonds

Ionic compounds, including formulas, nomenclature and properties

Molecules, including formulas, nomenclature and properties

Acids, including formulas, nomenclature and properties

Organic Molecules

Recognizing alkane, alkene, alkyne, alcohol, aldehyde, ketone, carboxylic acid, amine and aromatic functional groups. Nomenclature of alkanes

Formula mass and molar mass, including conversions between grams to molecules to atoms Percent composition, empirical formulas, molecular formulas and combustion analysis

## **Chemical equations and stoichiometry**

Writing and balancing chemical equations

Reaction classifications, including synthesis, decomposition, single displacement, double displacement, combustion, acid base neutralization and redox reactions.

Stoichiometry calculations including limiting reactant, theoretical yield, and percent yield.

## **Solutions**

Concentration including percent by mass, percent by volume and molarity

Dilution of solutions

Solution stoichiometry

## **Aqueous Reactions**

Strong, weak and non-electrolytes

Precipitation reactions, including prediction of products and solubility rules

Molecular, complete and net ionic equations

Acid-base reactions

Arrhenius acids, bases and salts

Bronsted-Lowry acids and bases

Properties of acids and bases

Acidity scale and pH

Gas-forming reactions

Redox reactions

Assigning oxidation numbers

Recognizing redox reactions by the change in oxidation state

Identifying oxidant and reductant

Balance redox reactions by the half-reaction method in acidic and basic conditions  
Acid-base and redox titrations

## **Gases**

Gas pressure

The relationship of pressure and volume; Boyle's Law

The relationship of volume and temperature. Charles' Law

Kelvin absolute temperature scale

Standard temperature and pressure (STP)

Combined gas law

Ideal gas law, including molar volume, determining the density and molar mass of a gas and stoichiometry calculations

Gas mixtures and partial pressure, including Dalton's law of partial pressures

Kinetic molecular theory

Diffusion and effusion, including Graham's law

## **Thermochemistry**

Kinetic, potential, thermal and chemical energy

Exothermic and endothermic reactions

First Law of thermodynamics

Pressure-volume work  
Enthalpy  
Calorimetry, specific heat, and related calculations  
State functions and Hess' law  
Standard enthalpies of formation  
Heat of reactions and stoichiometry

### **Atomic Structure**

Nature of light, including electromagnetic radiation, wave properties, electromagnetic spectrum, interference, diffraction, Planck's equation, quanta and the photoelectric effect  
Bohr's model of the atom  
Atomic spectra and calculations of transition energies  
Quantum numbers, orbitals, main shells, subshells, electron spin

### **Periodic properties and the relationship to atomic structure**

The periodic arrangement of atoms  
Electron configuration, Pauli's exclusion principle, Hund's rule  
Orbital diagrams of atoms and ions  
Valence electrons  
The periodic table  
Periodic properties and trends, including ionization energy, electron affinity, electronegativity, atomic and ionic size, metallic character

### **Chemical Bonding**

Covalent, ionic and metallic bonds  
Lewis structures  
Octet rule  
Incomplete octets, expanded octets and odd-electron structures  
Organic molecules including degrees of unsaturation, constitutional isomers, *cis* and *trans* stereoisomers, chiral carbons and stereoisomers.  
Line-bond structures of organic molecules  
Formal charges  
Bond length and bond energies  
Resonance structures  
VSEPR Theory and molecular geometry of molecules and polyatomic ions  
Electronegativity and bond polarity  
Molecular shape and polarity  
Hybridization and molecular geometry, including organic molecules  
Sigma and pi orbital overlap and bond rotation  
Energy level diagram of orbitals  
Homonuclear diatomic molecules  
Heteronuclear diatomic molecules

### **Intermolecular forces, liquids and solids**

Intermolecular forces

Hydrogen bonding, including organic molecule examples

Phase changes and phase diagrams, including boiling points, freezing points, vapor pressure, vaporization, condensation, sublimation, deposition, critical point, and heating curves. Liquid state, including adhesion, cohesion, vapor pressure, viscosity and surface tension. Solid state, including cubic crystal structures, molecular, ionic, metallic and covalent network solids.

### **Solutions**

Solutions terminology

Solution concentration units, including molarity, molality, mole fraction, percent mass/volume, percent volume/volume, ppm, ppb and ppt.

Colligative properties, including freezing point depression, molecular mass determination, boiling point elevation, van't Hoff factor, osmosis

### **STUDENT LEARNING OUTCOMES:**

*(Specify the learning skills the student demonstrates through completing the course and link critical thinking skills to specific course content and objectives.)*

Upon completion of this course, students will be able to:

- A. Collect and analyze data and have reasonable conclusions. Assessed by the lab practical.
- B. Competent knowledge of the periodic table, molecules, and compounds. Assessed from a pre-test administered at the beginning of the semester and the final exam administered at the end of the semester.
- C. Ability to apply skills to solve chemical problems especially math skills. Assessed from a pre-test administered at the beginning of the semester and the final exam administered at the end of the semester.

### **III. COURSE OBJECTIVES:**

*(Specify major objectives in terms of the observable knowledge and/or skills to be attained.)*

In the process of completing this course, students will:

- A. Use systematic nomenclature to name and classify chemical species.
- B. Predict ionic and covalent bonding between species.
- C. Convert from the English to the metric system in weights, volume, and linear measurements.
- D. Calculate molecular weights, formula weights, gas volumes, temperature, pressure concentration of solutions, molarity, empirical and molecular formulas, and percentage composition.
- E. Define the structural periodicity of the elements and discuss the trends in all directions on the periodic chart and the terms for grouping elements, i.e., metalloids, transition elements, inner transition, etc..
- F. Use stoichiometric relationships to calculate quantities of reactants, products, limiting reactants, theoretical yields, percent yields, and chemical formulas.



- G. Describe covalently bonded structures using Lewis theory, valence bond theory (including hybrid orbitals), and molecular orbital theory of diatomic molecules.
- H. Define the theoretical and mathematical description of ideal gases, including the concepts of temperature and kinetic energy distribution.
- I. Identify types of reactions, predict the outcomes of chemical reactions, and write and balance chemical reactions.
- J. Apply the first law of thermodynamics, contrast internal energy and enthalpy, describe how energy changes are related to temperature, atomic motions, and change in chemical bonding and perform thermochemical calculations.
- K. Describe colligative properties of solutions of ionic and non-ionic substances and solve their numerical problems.
- L. Effectively collect, record, and analyze experimental data, recognize the limitations of measurements and identify sources of error, and interpret experimental results and correlate experimental results with the appropriate theory