SYLLABUS FOR CHEMISTRY 1A-50033 – Spring 2024

Lectures: MW 11-12:15pm in new Math/Science building 204
Labs: Every T and Th 11:00-1:50pm in new Math/Science building 201.

Instructor: **Veronica Cornel**
Contact info: e-mail through Canvas or **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 daily "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 MW 1:45-2:45 in MSE 223 or MSE 202. Virtual Office Hour Fri 12-1pm (see Canvas). Additionally, ask for help during 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 **not** just Stats).

Advisories: English 1A

Textbook: Nivaldo J. Tro: Chemistry: A Molecular Approach (1st, 2nd , 3rd , 4th or 5th 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. 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. If you can't complete the Prelab before the lab starts, complete it during lab and turn in with your lab report.

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 by yourself 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 Spring 2024 Cornel

Week	Lectures (MW)	Date	Labs (TTh)
Week 1 Jan 8-12	Syllabus and Periodic Table 1. Matter 1. Scientific Notation and Significant Figures	Jan 9	Introduction to Laboratory Safety and Equipment Lecture during lab: Periodic Table
		Jan 11	Lab 2: Properties and Changes in Matter
Week 2 Jan 15-19	1. Dimensional Analysis	**Jan 15**	**Martin Luther King Day – no classes**
		Jan 16	Lab 3: Measurements
		Jan 18	*Sig Figs and Dimensional Analysis Worksheet*
Week 3 Jan 22-26	2. Atoms 2.9 Mole 3.5 Ionic Compounds 3.10, 4.6 Writing and Balancing Reactions	Jan 23	Lecture during lab: The Mole Lab 7: The Mole
		Jan 25	**Exam 1**
		Jan 26	**Last day to add a class. Last day to drop a class to avoid a "W"**
Week 4 Jan 29-Feb 2	3.6 Molecules and Ionic compounds with Polyatomic Ions 3.8-9 Percent composition and Empirical Formulas	Jan 30	Lecture during lab: Balancing reactions *Nomenclature Worksheet*
		Feb 1	Lab 6: Empirical Formulas: Oxide of Tin
Week 5 Feb 5-9	3.6 More Polyatomic Ions and Hydrates 4.2 Stoichiometry and 4.3 Limiting Reactions	Feb 6	Lab 8: The Formula of a Hydrate
		Feb 8	**Lab Quiz 1 (Labs 2,3,6,7,8 Safety and Labware)**
Week 6 Feb 12-16	4.4 Solutions 4.5 Electrolytes and Net Ionic equations	Feb 13	Lab 10: Alum Crystallization. Recycling Aluminum
		Feb 15	**Exam 2**
		Feb 16	**President's Day – no classes Fri**
Week 7 Feb 19-23	4.8 Acid-Base reactions and Titrations	**Feb 19**	**Washington Day – no classes Mon**
		Feb 20	Lab 9: Stoichiometry
		Feb 22	Nomenclature worksheet
Week 8 Feb 26-Mar 1	4.7 and 4.9 Reaction Types and Redox 18.2 Balancing Redox Reactions 18.2 Redox Titrations and Activity Series	Feb 27	Lab 13: Acids and Bases
		Feb 29	Lab 15: Redox Reactions- The Burning of Magnesium
Week 9 Mar 4-8	5. Gas 1 and 2 5. Gas 3 and 4	Mar 5	Lab 21: Charles' Law
		Mar 7	Lab 22: Molecular Mass of a Volatile Liquid
		Mar 8	**Last Day to drop class to get a "W"**
Week 10 Mar 11-15	6. Thermo 1 and 2 6. Thermo 3	**Mar 12**	**Exam 3**
		Mar 14	Lab 23: Atomic Mass of an Unknown Divalent Metal
Week 11 Mar 18-22	7. Light 1 and 2 8.4 Electron Configuration	**Mar 19**	**Lab Quiz 2 (Labs 9, 10, 13, 15, 21, 22)**
		Mar 21	Lab 27: Heat Flow, Calorimetry
Mar 25-29	**Spring Break**		
Week 12 Apr 1-5	8. Periodicity **and** 9. Lewis Diagrams 10. Geometry 1 and 2	Apr 2	Lab 19: Vitamin C in Fruit Juices
		Apr 4	Lab 16: Reactions of Copper
Week 13 Apr 8-12	9.8 Polar Bonds and 10.5 Dipoles 10.7 Hybridization	Apr 9	Lab 28: Molecular Geometry Part 1
		Apr 11	Lab 28: Molecular Geometry Part 2
Week 14 Apr 15-19	21. Alkanes 21. Alkenes, Alkynes, cycloalkanes, isomers	Apr 16	**Exam 4**
		Apr 18	Lab 29: Alkanes, Alkenes, Alkynes
Week 15 Apr 22-26	7. Quantum Numbers 9.8 Formal Charges and Resonance	**Apr 23**	**Titration Practical Exam**
		Apr 25	**Titration Practical Exam**
Week 16 Apr 29-May 3	11.2 Intermolecular Forces 11.2-3 Liquids and 11.6-8/11-12 Solids	Apr 30	Lab 17: Percent Iron (II) in an Unknown
		May 2	**Lab Quiz 3 (Labs 10, 16, 19, 21, 22, 23, 27)**
Week 17 May 6-10	12.5-6. Solutions and 12.6 Freezing Point Lowering pH and pOH	May 7	Lab 30: Freezing Point Depression
		May 9	
Finals week		**May 14**	**Tues: Exam 5 during lab time**

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 syntehsis, 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 peroidicity 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 or error, and interpret experimental results and correlate experimental results with the appropriate theory