SYLLABUS FOR CHEMISTRY 1A-55257 – Spring 2022

Lectures: MWF 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** (using "Chem1A" as the subject or I will delete it) or through the Canvas Inbox
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: MW 1-3pm in MSE 223 or on zoom, F 1-2pm on zoom (see Canvas for link)

Tutoring: Free tutoring available in person and on Zoom. Go to www.tutormatchingservice.com/reedley , sign up for a free account, and begin searching for RC chemistry tutors. We will have an embedded tutor and I will give you his/her email soon. Here is a tutorial video on how to use Tutor Matching service: https://youtu.be/xvRD7kSJNhs

Course Objectives: Chemistry 1A is a general course in chemistry designed not only for chemistry majors, but also for biology, physics, chemical engineering, pre-medical and pre-pharmacy majors.

Prerequisites: students need to have passed CHEM10, or High School chemistry with a lab component, or 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^{st}, 2^{nd} , 3^{rd} , 4^{th} or 5^{th} 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 one designed for STATS) (You will not be allowed to use a programmable calculator or cell phone on exams). Approved safety glasses (Z87 in the stem of the glasses), mask (until covid restrictions lifted), 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. The homework is due at the start of the next MWF 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.

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 most 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 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.

Covid-19 Precautions:

All students coming to campus need to have an approved vaccine card on file with the College, or a medical or religious exemption and twice weekly testing at the College. Students must wear a surgical or KN95 face mask (over nose and mouth) inside any buildings. Cloth masks are no longer acceptable. These masks are available at the Welcome Center in the Student Services building, or at the switchboard in the Admin building.

If you have any of the following symptoms, or test positive, you should not attend class. Students are encouraged to contact the nurse or healthcare provider for further guidance. Common COVID-19 symptoms include, but are not limited to:

- cough
- sore throat
- shortness of breath
- runny nose (not due to seasonal allergies)
- fever (100.4 degrees or more)
- and/or chills

Email me if you need to miss class for a Covid-19 reason. If you have to miss too many in-person meetings you may need to take a W or Incomplete for the course.

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 the instructor. If a student misses more than 25% of the classes or assignments in a week, without contacting the instructor with a valid excuse, they may also be dropped. If you miss an exam and have a valid, written excuse, I will give you one make-up exam. 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 for a small partial credit. If a student misses more than 3 labs they will not pass the class.

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. 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, i-watches, programmable calculators, restroom breaks or talking will be allowed during exams.

LABS

- A surgical or KN95 mask must be worn correctly at all times in the lab (until covid restrictions are lifted), even for exams. If you absolutely cannot wear a mask you may wear a face shield over your safety glasses.
- 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 2022 Cornel

Week	Date	Labs (T/Th)	Lectures (M/W/F)
Week 1 Jan 10-14	1/11	Introduction to Laboratory Safety and Equipment	Syllabus and Periodic Table
	1/13	Lab 2: Properties and Changes in Matter	1. Matter 1. Scientific Notation and Significant Figures
Week 2 Jan 17-21	1/17	Martin Luther King Day (No classes)	1. Dimensional Analysis 2. Atoms
	1/18	Lab 3: Measurements	
	1/20	*Significant Figures Worksheet*	
Week 3 Jan 24-28	1/25	*Dimensional Analysis Worksheet*	2.9 Mole 3.5 Ionic Compounds 3.6 Molecules and Polyatomic Ions
	1/27	**Exam 1**	
	1/28	**Last day to add a class. Last day to drop a class to avoid a "W"**	
Week 4 Jan 31-Feb 4	2/1	Lab 7: The Mole	3.8-9 Percent composition and Empirical Formulas 3.6 More Polyatomic Ions and Hydrates 3.10, 4.6 Writing and Balancing Reactions
	2/3	*Nomenclature Worksheet*	
Week 5 Feb 7-11	2/8	Lab 6: Empirical Formulas: Oxide of Tin	4.2 Stoichiometry 4.3 Limiting Reactions 4.4 Solutions
	2/10	**Lab Quiz 1 (Labs 2,3,7, Safety and Labware)**	
Week 6 Feb 14-18	2/15	Lab 8: The Formula of a Hydrate	4.5 Electrolytes and Net Ionic equations 4.8 Acid-Base reactions and Titrations
	2/17	**Exam 2**	
	2/18	Lincoln Day (No classes)	
Week 7 Feb 21-25	2/21	Washington Day (No classes)	4.7 Reaction Types 4.9 and 18.2 Balancing Redox Reactions
	2/22	Lab 9: Stoichiometry	
	2/24	Lab 16: Reactions of Copper	
Week 8 Feb 28-Mar 4	3/1	Lab 10: Alum Crystallization. Recycling Aluminum	18.2 Redox Titrations and Activity Series 5. Gas 1 5. Gas 2
	3/3	Lab 15: Redox Reactions- The Burning of Magnesium	
Week 9 Mar 7-11	3/8	**Lab Quiz 2 (Labs 6, 8, 9, 10, 16)**	5. Gas 3 4. Gas 4 6. Thermo 1
	3/10	Lab 21: Charles' Law	
	3/11	**Last Day to drop class to get a "W"**	
Week 10 Mar 14-18	3/15	**Exam 3**	6. Thermo 2-3 7. Light 1
	3/17	Lab 22: Molecular Mass of a Volatile Liquid	
Week 11 Mar 21-25	3/22	Lab 27: Heat Flow, Calorimetry	7. Light 2 8.4 Electron Configuration 7. Quantum Numbers
	3/24	Lab 23: Atomic Mass of an Unknown Divalent Metal	
Week 12 Mar 28-Apr 1	3/29	Lab 13: Acids and Bases	8. Periodicity 9. Lewis Diagrams 10. Geometry 1
	3/31	**Lab Quiz 3 (15, 21, 22, 23, 27)**	
Week 13 Apr 4-8	**4/5**	Lab 19: Vitamin C in Fruit Juices	10. Geometry 2 9.8 Polar Bonds and 10.5 Dipoles 10.7 Hybridization
	4/7	Lab 28: Molecular Geometry Part 1	
Spring Break	**April 11-15**		
Week 14 Apr 18-22	4/19	Lab 28: Molecular Geometry Part 2	21. Alkanes 21. Alkenes, Alkynes, cycloalkanes, isomers
	4/21	**Exam 4**	
Week 15 Apr 25-29	**4/26**	**Titration Practical Exam**	9.8 Formal Charges and Resonance 11.2 Intermolecular Forces
	4/28	**Titration Practical Exam**	
Week 16 May 2-6	5/3	Lab 29: Alkanes, Alkenes, Alkynes	11.2-3 Liquids and 11.6-8/11-12 Solids 12.5-6. Solutions and 12.6 Freezing Point Lowering
	5/5	Lab 17: Percent Iron (II) in an Unknown	
Week 17 May 9-13	5/10	**Lab Quiz 4 (Labs 13, 17, 28A, 28B, 29)**	**pH and pOH**
	5/12	Lab 30: Freezing Point Depression	
Finals Week	5/16 (Tue)	**Exam 5**	

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