

## SYLLABUS FOR CHEMISTRY 1A-50325 – Spring 2021

Lectures: Online, Asynchronous

Labs and Exams: Specific dates, M or W 11:00-1:30pm in PHY82

Last name A-G Tuesdays and H-Z or Thursdays

**Instructor:** Veronica Cornel    **Lab Instructor:** Kurtis Thiesen

**Contact info:** e-mail [Veronica.Cornel@reedleycollege.edu](mailto: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, videos of the lectures and labs, grades, links to submit pdfs of your homework and labs, due dates etc. are all posted under “Modules” on Canvas.

<https://sccd.instructure.com>

**Zoom Office Hours:** MWF 1-2:30 pm

**Tutoring:** Free tutoring available. Go to [www.tutormatchingservice.com/reedley](http://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).

**Advisories:** English 1A

**Textbook:** Nivaldo J. Tro: Chemistry: A Molecular Approach (1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> or 4<sup>th</sup> 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), cloth mask, labcoat and closed shoes for lab.

### Canvas Modules

There will be a Module for each week-day. Work through the Module in order, do not go straight to the assignment.

**Lecture Notes:** Download from my Canvas website and fill in the notes while watching the lecture video. Homework from your textbook is assigned at the end of each day’s notes. The more effort you put into your homework, the better you will do in exams. I will write out the questions for the first week in case you don’t have your textbook yet.

**Homework:** Homework will be assigned every lecture at the end of the lecture notes. Take a photo of your homework (less than 1 MB) and upload it on Canvas by the due date. Turn your phone off “live” mode or the phone takes a short video instead of a single photo and its over 1MB and won’t upload. It is essential to your success in this class that you do all the assigned homework and read the relevant

sections in your Textbook. 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 selected problems and write the problems you made a mistake on next to your grade on Canvas. You then need to check the correct calculation and answer when I post the answer key. I will only accept late homework until I post the answer key 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:**

Students should complete the online health screening before coming to the campus:

[https://scccd.az1.qualtrics.com/jfe/form/SV\\_3IO880HybZg7ajX](https://scccd.az1.qualtrics.com/jfe/form/SV_3IO880HybZg7ajX)

If you have any of the following symptoms, 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

Students should also not attend class if they have had close contact with anyone who has had these symptoms in the last 14 days. 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 face to face labs and exams is mandatory (see below for the dates. You will only have to come to one of the 2 dates for each in-person exam/lab according to your last name A-G on the Monday and H-Z on the Wednesday). Attendance for online lectures and online labs will be done by checking if you submit the assignments by the due date (you can always submit assignments ahead of time and still be marked as present on the day they are due). The student will be dropped automatically if she/he doesn't submit the first assignment by the due date, without contacting the instructor. If a student misses more than 25% of the assignments, or three 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 (including not wearing a mask, not social distancing, using cell-phones, interrupting the instructor continuously) they may be asked to leave the exam/lab and recorded as "absent".

**Cancelled Classes:** If for some reason a face to face lab/exam 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 4 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 which will be part of the exams).

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 during face to face labs/exams will result in the student having less time for the lab/exam. We have to leave the room by 1:30pm.
- 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 homework may be submitted after I have posted the answer key. No alternative homework 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 cell phones, i-pods, i-watches will be allowed during exams, no programmable calculators, no restroom breaks and no talking.

## **LABS**

- Cloth or surgical masks must be worn at all times in the lab, even for exams. If you absolutely cannot wear a cloth 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, or not social distancing, 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 in safety video)
- 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. No late prelabs will be accepted. Turn in your lab report before leaving the lab.
- Wash your mask, safety glasses and lab coat when you get home.

**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.**

## Chemistry 1A Spring 2021 Cornel

Week	Labs (Mon or Wed) and Exams (Wed)		Lectures (M/W/F)
1. Feb 2-5	2/3	<i>Introduction to Laboratory Safety and Equipment (online)</i>	Syllabus and Periodic Table 1. Matter 1. Scientific Notation and Significant Figures 1. Dimensional Analysis
	2/5	<i>Lab 2: Properties and Changes in Matter</i>	
2. Feb 8-12	2/8	<i>Significant Figures and Dimensional Analysis Worksheet</i>	2. Atoms 2.9 Mole 3.5 Ionic Compounds 3.6 Molecules and Polyatomic Ions
	2/10	<i>Lab 7: The Mole</i>	
	2/11	<i>Nomenclature Worksheet</i> <i>Last day to add class. Last day to drop a class to avoid a "W"</i>	
	2/12	<i>Lincoln Day</i>	
3 Feb 15-19	2/15	<i>Washington Day</i>	3.8-9 Percent composition and Empirical Formulas 3.6 More Polyatomic Ions and Hydrates 3.10, 4.6 Writing and Balancing Reactions 4.2 Stoichiometry
	2/17	<b>Exam 1</b>	
	2/19	<i>Lab 6: Empirical Formulas: Oxide of Tin</i>	
4 Feb 22-26	2/22	<b>In person Lab 3: Density and Mixing Solutions and Lab 8: The Formula of a Hydrate</b>	4.3 Limiting Reactions 4.4 Solutions 4.5 Electrolytes and Net Ionic equations 4.7-8 Acid-Base reactions and Titrations
	2/24	<b>In person Lab 3: Density and Mixing Solutions and Lab 8: The Formula of a Hydrate</b>	
5 Mar 1-5	3/1	<b>In person Lab 13: Acid and Base Titrations</b>	4.7 Reaction Types 4.9 Redox Reactions 18.2 Balancing Redox Reactions 18.2 Redox Titrations and Activity Series
	3/3	<b>In person Lab 13: Acid and Base Titrations</b>	
	3/5	<i>Lab 15: Redox Reactions- The Burning of Magnesium</i>	
6 Mar 8-12	3/8	<i>Lab 10: Alum Crystallization. Recycling Aluminum Cans</i>	5. Gas 1 5. Gas 2 5. Gas 3 4. Gas 4
	3/10	<b>Exam 2</b>	
	3/12	<i>Lab 21: Charles' Law</i>	
	3/12	<i>Last Day to drop class to get a "W"</i>	
7 Mar 15-19	3/15	<i>Lab 22: Molecular Mass of a Volatile Liquid</i>	6. Thermo 1-3 7. Light 1
	3/17	<i>Lab 23: Atomic Mass of a Divalent Metal</i>	
8 Mar 22-26	3/22	<b>In person Lab 16: Reactions of Copper</b>	7. Light 2 8.4 Electron Configuration 7. Quantum Numbers 8. Periodicity
	3/24	<b>In-person Lab 16: Reactions of Copper</b>	
<b>March 29-Apr 2</b>		<b>Spring Break</b>	
9 Apr 5-9	4/5	<i>Lab 27: Heat Flow, Calorimetry</i>	9. Lewis Diagrams 10. Geometry 1 10. Geometry 2 9.8 Formal Charges and Polar Bonds
	4/7	<b>Exam 3</b>	
10 Apr 12-16	4/12	<i>Lab 28: Molecular Geometry part 1 and 2</i>	10.5 Dipoles 10.7 Hybridization 21. Hydrocarbons 9.8 Resonance
	4/14	<i>Lab 29: Alkanes, Alkenes, Alkynes</i>	
11 Apr 19-23	4/19	<b>In-person Lab 28+29: Molecular Models</b>	11.2 Intermolecular Forces 11.2-3 Liquids and 11.6-8/11-12 Solids 12.5-6. Solutions and 12.6 Freezing Point Lowering
	4/21	<b>In-person Lab 28+29: Molecular Models</b>	
12 Apr 26-30	4/26	<i>Lab 30: Freezing Point Depression</i>	pH and pOH
	4/28	<b>Exam 4</b>	

**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**

**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