SYLLABUS FOR CHEMISTRY 1A-52039– Spring 2020

Lectures: MWF 11-11:50 in PHY76
Labs: T and Th 11:00-1:50pm in PHY82

Instructor: **Veronica Cornel**
Contact info: e-mail **Veronica.Cornel@reedleycollege.edu** (using "Chem1A" as the subject or I will delete it) or leave message at the front desk or on my voicemail (559) 638-3641 ext. 3449.
Canvas Website: https://scccd.instructure.com
Office Hours: MW 9-11 and F 9-10 in PHY78

Tutoring: Free tutoring available in the Tutorial Center (by the library) or the STEM tutorial center (FEM). Self enroll using this link: **https://scccd.instructure.com/enroll/AJ6NXM**

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^{st}, 2^{nd} , 3^{rd} or 4^{th} Edition).

Lab Manual: CHEM 1A Lab Book by V. Cornel. Print the labs as they are posted on Canvas

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, labcoat and closed shoes for lab. I will have some labcoats and safety goggles to loan you for the semester.

Lecture Notes: **Download** from my Canvas website prior to class and **fill in** the notes during class. Homework from your textbook is assigned at the end of the notes and is due the next lecture period. Studies have shown that 90% of the lecture material is retained if you review the lecture within 24 hours. The more effort you put in to your homework, the better you will do in exams.

Homework: Homework will be assigned every lecture. It is essential to your success in this class that you do all the assigned homework and read the relevant sections in your Textbook. All homework will be collected at the beginning of the following lecture and selected problems graded. This is to ensure that you work consistently and can apply what you learn to problems. There will be no make-up homework assignments, but I will drop the lowest four 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 go home and 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. You will learn where you are going wrong when I go over the homework. The latest I will accept homework is just before I hand back the graded homework the next lecture. This is not ideal as you won't have your homework in front of you when I go over it and you will lose 10% for the homework being late. Absence is not an excuse for not doing your homework on time as you can send it in with another student, or count that assignment as one you drop. I can't accept emailed homework. If

you leave the class or are disruptive while I go over homework, I will also deduct points. You need to write out the important parts of the homework questions as well as the answers so you can study your homework. You can also do the corresponding odd number problems for extra practice and check the answers at the back of the book.

Attendance: Attendance in lecture and lab is mandatory. The student will be dropped automatically if she/he misses the first day of class, without contacting the instructor. If a student misses more than 25% of the lectures/labs, or three lectures or labs in a week, without contacting the instructor with a valid excuse, they may also be dropped. If you miss a lecture you need to read and summarize the chapter in the textbook **before** meeting with the instructor to discuss any problems. The homework will be on the internet notes so that you can do the homework even if you missed the lecture. **There will be no make-up exams**. The **final exam grade** will count as an exam and will also be counted as a make-up exam for the missing exam. If you have not missed any exams, and do better in the final exam than one of the earlier exams, the final exam grade will **replace the earlier exam grade**. If you miss two exams you will receive a zero for the second missing exam. If a student is disruptive (including using cell-phones, interrupting the instructor continuously) they may be asked to leave the lecture/lab and recorded as "absent". If you leave or are disruptive when I go over the homework you will also be recorded as "absent".

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 and the final cumulative exam, equally weighted and counting 65% of your grade. Homework will count 10% and your lab work will count 25% (12.5% lab reports and 12.5% lab quizzes). The lab practical will count as a lab quiz.
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:

- Tardiness, leaving early, or sleeping during lectures will result in a partial or full absence being recorded. Students need to sign the sign-in sheet within the first 10 minutes of class.
- 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 handed in after I have started handing the homework back. No alternative homework will be given. I will drop the lowest four homework assignments though.
- No extra credit will be given. You need to work consistently from the beginning.
- Please turn your cell phones onto “silent buzzer” mode during lectures so as not to disturb the class. No cell phones or i-pods will be allowed during exams, nor programmable calculators.

LABS

- Safety glasses need to be worn whenever 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.
- 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.
- 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 period)
- Clean up any spills promptly (Clean-up procedures will be discussed during first lab period)
- 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 wash your hands with soap and water. Two students will be assigned to clean the balance areas at the end of each 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

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

Chemistry 1A Spring 2020

Week	Lab Date	Labs (T/Th)	Lectures (M/W/F)
1. Jan 13-17	Jan 14	*Lab 1: Introduction to Laboratory Safety* *Inventory check-in*	Syllabus and Periodic Table 1. Matter
	Jan 16	Lab 2: Properties and Changes of Matter	1. Scientific Notation and Significant Figures
2.	**Jan 20**	**Martin Luther King Day**	**No lecture Monday**
	Jan 21	Lab 3: Measurement	1. Dimensional Analysis
	Jan 23	*Significant Figures /Dimensional Analysis Worksheet*	2. Atoms
3	Jan 28	Lab 7: The Mole	2.9 Mole 3.5 Ionic Compounds 3.6 Molecules and Polyatomic Ions
	Jan 30	**Exam 1**	
	Jan 31	**Last day to add this class (or drop to avoid a W)**	
4	Feb 4	*Nomenclature Worksheet*	3.8-9 Percent Composition and Empirical Formulas 3.6 More Polyatomic ions and Hydrates
	Feb 6	Lab 6: Empirical Formulas: Oxide of Tin	
5	**Feb 11**	**Lab Quiz 1 (Labs 2, 3, 7, equipment and safety)**	3.10, 4.6 Writing and Balancing Reactions 4.2 Stoichiometry **No lecture Friday**
	Feb 13	Lab 8: The Formula of a Hydrate	
	Feb 14	**Lincoln Day**	
6	**Feb 17**	**Washington Day**	**No lecture Monday** 4.3 Limiting Reactions 4.4 Solutions
	Feb 18	*Nomenclature Worksheet*	
	Feb 20	**Exam 2**	
7	Feb 25	Lab 10: Alum Crystallization from Aluminum.	4.5 Electrolytes and Net Ionic 4.8 Acid-Base reactions 4.7 Titrations and Reaction Types 4.9 Redox Reactions
	Feb 27	Lab 9: Stoichiometry	
8	Mar 3	Lab 5: Double Displacement Reactions	18.2 Balancing Redox 18.2 Redox titrations, Activity series 5. Gas 1
	Mar 5	Lab 13: Acids and Bases	
9	Mar 10	Lab 15: Redox Reactions- The Burning of Mg	5. Gas 2-4
	Mar 12	**Lab Quiz 2 (Labs 5, 6, 8, 9, 10, 16)**	
	Mar 13	**Last Day to drop class to get a "W"**	
10	Mar 17	**Exam 3**	6. Thermo 1-2
	Mar 19	Lab 16: Reactions of Copper	
11	Mar 24	Lab 21: Charles's Law	Thermo 3 7. Light 1 and 2
	Mar 26	Lab 22: Molecular Mass of a Volatile Liquid	
12	Mar 31	Lab 23: Atomic Mass of an Unknown Divalent Metal	8.4 Electron Configuration 7. Quantum Numbers and 8. Periodicity
	Apr 2	Lab 27: Heat Flow, Calorimetry	
	Apr 6-10	**Spring Break**	
13	Apr 14	Lab 19: Vitamin C in Fruit Juices	9. Lewis Diagrams 10. Geometry 1 10. Geometry 2
	Apr 16	**Exam 4**	
14	**Apr 21**	**Lab Practical (Group 1)**	21.Hydrocarbons 9.8 Formal Charges, Polar Bonds 10.5 Dipoles
	Apr 23	**Lab Practical (Group 2)**	
15	Apr 28	Lab 28: Molecular Geometry Part 1	10.7 Hybridization 9.8 Resonance 11.2 Intermolecular Forces
	Apr 30	Lab 28: Molecular Geometry Part 2	
16	May 5	**Lab Quiz 3 (Labs 15, 21, 22, 23, 27)**	11. Liquids and Solids 15. pH and pOH
	May 7	Lab 17: Percent Iron (II) in an Unknown	
17	May 12	**Exam 5**	12.5-12.6 Solutions Freezing point depression and Boiling Point Elevation
	May 14	Making ice-cream and check-out of lockers	
18	**Wed May 20 Final Exam 11:00-12:50pm (Cumulative, counts twice, then lowest exam dropped)**		