

**FALL 2023**

**CHEM 1406**

## **INTRODUCTORY CHEMISTRY**

- **INSTRUCTOR:** TRACY DAWSON; tracy.dawson@plainviewisd.org; Room 103/117 S; 806-293-6005.
- **OFFICE HOURS:** TUESDAY/THURSDAY 7:30-8:00 AT PCHS ROOM 103; TUESDAY/THURSDAY 4:00-4:30 AT PCHS ROOM S84 (BY APPOINTMENT ONLY).
- **TEXT:** No textbook. Laboratory Manual - Jesse Yeh, 2<sup>nd</sup> ed.
- **REQUIRED MATERIALS.** A laboratory manual. A scientific calculator; not a graphing calculator. You may not use your cell phone as a calculator.

**COURSE DESCRIPTION and PURPOSE.** This course is introductory to the principles and applications of inorganic chemistry, organic chemistry and biochemistry. The course fulfills the requirements for a one semester chemistry course for allied health professionals. It also fulfills the basic chemistry requirement for anatomy and physiology. (THIS COURSE WILL NOT SUBSTITUTE FOR CHEM 1411).

**COURSE OBJECTIVES.** CHEM 1406 provides (1) basic chemical knowledge for people living in a world of advancing technology, (2) understanding of the basic chemical nature of our world, and (3) a laboratory experience designed to enhance their appreciation of science and of the role of the clinical laboratory in the hospital.

**CLASS ATTENDANCE AND PARTICIPATION.** Lecture and laboratory attendance is mandatory. If you miss 5 classes throughout the semester you may be dropped from the course. If you miss 3 consecutive classes for any reason you may be dropped from the course. Class participation, in and of itself, is not a grade requirement. I encourage you to ask questions during class. You are expected to take notes and to be attentive to instruction.

**CHEATING AND CLASSROOM ETIQUETTE.** Cheating will not be tolerated. Zeroes will be given for cheating and possibility of being dropped from the course. Turn your cell phone off before you enter the classroom for lecture/lab. Once my lecture starts I require that there be no extemporaneous talking or distractions. Students must participate in lecture questioning.

## **Exam Schedule**

<b>EXAM 1.</b>	<b>Sept. 1st Chapters 1&amp;2</b>	<b>Cumulative Final:December 14th 8:00 am cafe.</b>
<b>EXAM 2.</b>	<b>Sept. 18th Chapter 3</b>	<b>(Nov 30th - last day to drop a course)</b>
<b>EXAM 3.</b>	<b>October 23rd. Chapter 4</b>	
<b>EXAM 4.</b>	<b>November 13th Chapters 5&amp;6</b>	
<b>EXAM 5.</b>	<b>December 8th Chapter 7&amp;8</b>	

**METHOD OF EVALUATION.** Grades will be assigned on the following basis: 100-90 A, 89-80 B, 79-70 C, 69-60 D, 59-0 F.

Students will be evaluated by means of weekly quizzes, lecture exams and performance in the laboratory. Typically, weekly quizzes or exams will be given on Mondays and lab exercises will be conducted Wednesday of each week. Labs will be due the following Wednesday. If absent for a quiz, the quiz must be completed by 4:30 pm on the following Thursday as the feedback will be posted on Blackboard at that time. There will be five forty-five minute exams and a final exam. Each exam will cover 1/5th of the class material. **The lowest Exam grade will be dropped near the end of the semester. Three of your lowest quiz AND lab grades will be dropped near the end of the semester.** The final will be comprehensive covering the entire semester worth of material. Chapter exam will account for 50% of your grade; the final will make up 20% of your grade. The remaining 30% of your grade will be determined from your performance on the weekly quizzes and your performance in the laboratory with each being 15%. There will be **no retake** opportunities for quizzes/exams. If you find that you cannot sit an exam for a valid reason (as determined by me) you must let me know as soon as possible before the exam. If you do not sit the exam without having first contacted me, you will be scored a zero for that exam with no opportunity for make-up. **No assignment may be completed after feedback has been posted on Blackboard.** It is imperative that you keep up with the material throughout the course of the semester. The only extra credit for this course is through completion exam reviews due the day of exam for +5, extra credit of +5 on quiz 1 & 2 for passing element quiz 1 & 2.

### Semester Overview

Week of:	Projected coverage of material (+/-)
Aug 9th	Chapter 1      Measurements
Aug 24th	Chapter 2      Atoms and Elements
Sept. 5th	Chapter 3      Periodic Table (Coulombic Attraction and Periodic Trends)
Sept. 19th	Chapter 4      Compounds and their bonds.
October 24th	Chapter 5      Chemical Reactions
Nov. 2nd	Chapter 6      Energy
Nov. 14th	Chapter 7      Gasses
Nov. 28th	Chapter 8      Solutions
Dec. 11th	Finals week

## Schedule

Week	Date	Topic
Week 1	August 9	Introductions/go over syllabus/lab notebook/Blackboard/element list/supplies, check personal email for Bb login, Scavenger Hunt for Syllabus assignment
	August 10	Chap1 Slides 1-12,39-40 metric system & prefixes
	August 11	SPC Registration Mrs. Robison
Week 2	August 14	Access SPC Bb, <b>Open Note Quiz #1 (Slides 1-12,39-40)</b> ; pass out index for element flash cards (HW all 60 flash cards)
	August 15	Chap1 Slides 13-27; measured numbers, sig figs (can use reference sheet for rules); Counting sig figs worksheet
	August 16	Login into wifi for SPC; Lab #1 Safety - Lab procedures/draw and label safety equipment in lab room attach drawing to Bb assignment name Lab #1 Safety
	August 17	Chap1 Slides 28-38 (add/sub&mult/div of sig figs); worksheet sig figs calculations (x/+)
	August 18	Quiz #1 corrections/Element quiz 1-30 on Bb - counts as ExCr for Quiz #1
	August 21	<b>Open Notes Quiz #2 (Slides 13-38)</b> ; Study Slides (41-62); equalities, & conversions;conversion worksheet/watch video
Week 3	August 22	Practice conversions/go over worksheet
	August 23	Lab #1 due; Lab #2 Measurement Lab (Experiment #2 in lab manual)
	August 24	Chap2 Slides 21-35 complete atomic structure worksheet
	August 25	Quiz #2 corrections; Element quiz 31-60 on Bb ExCr for Quiz #3; Chap2 Slides 36-42; Isotopes; isotope worksheet (watch video and complete assignment)
Week 4	August 28	<b>Open Note Quiz #3 (Chap1 Slides 41-62 and Chap2 Slides 21-42)</b> ; Chap2 Slides 43-52; EMR and EMS and Energy Levels & Energy Shell Arrange.;handout Exam 1 review
	August 29	Chap2 Slides 43-52 EMR, EMS, Energy Levels, Energy Shell Arrangement
	August 30	Lab #2 due; Lab #3 Color periodic table activity (Chap2 Slides 1-20); activity on powerpoint
	August 31	Quiz #3 corrections; Review for Exam 1 complete for bonus on Exam 1 +5 points due day of Exam
	September 1	<b>Exam 1 (Measurement &amp; Atoms/Elements)</b> for this Exam and ONLY this exam can use colored PT
Week 5	September 4	Labor Day Holiday (SPC & PISD); NO QUIZ :)
	September 5	Chapter 3 Notes will be POGIL Coulombic Attraction & Periodic Trends
	September 6	Lab #4 ID and use of equipment/lab pros with sensors/Scale/Buret/Etc.
	September 7	Coulombic Attraction POGIL

	September 8	Periodic trends POGIL
Week 6	September 11	<b>Open Notes Quiz #4 (Coulombic Attraction/1st section of Periodic Trends);</b> Periodic Trends video and worksheet
	September 12	Periodic Trends POGIL
	September 13	Lab #5 Flame tests; Official census day
	September 14	Periodic Trends POGIL
	September 15	Quiz #4 corrections; Review for Exam 2 Chapter 3
Week 7	September 18	<b>Exam 2 Periodic Table, Coulombic Attraction and PT Trends</b>
	September 19	Chap4 Slides 1-19; Ion Worksheet
	September 20	Lab #6 density (Teach during lab time)
	September 21	Chap4 Slides 21-31; Positive Ion (Cation) worksheet
	September 22	Chap4 Slides 32-37: Cations with Multiple charges worksheet
Week 8	September 25	<b>Open Notes Quiz #5</b> (Slides 1-37); NOT an SPC holiday (PISD holiday); Quiz will be at home and open from 8:00-4:00
	September 26	Chap4 Slides 38-43; Covalent Bonding; worksheet
	September 27	Lab #7 Atoms & Molecules (Experiment #5) no naming on formula section until Tuesday
	September 28	Chap4 Slides 44-49; Multiple Bonds and naming covalent
	September 29	Quiz #5 corrections; Chap 4 Slides 52-58; Types of Bonds (Polar covalent/nonpolar covalent/ionic); worksheet
Week 9	October 2	<b>Open Notes Quiz #6</b> (Slides 38-49,52-58); Slides 59-69 Polyatomic Ions; watch video and complete worksheet; handout review for Ch4 Exam Compounds and their Bonds
	October 3	Go over worksheet on polyatomic ions; will get to use reference sheet for Exam 3; complete Experiment 5 Naming on formula section
	October 4	Lab #8 VSEPR lab Experiment 6 (Slides 70-83); must build structures can work on the rest during the week
	October 5	Chap4 (Slide 83-87); polar and nonpolar molecules and continue with VSEPR; work on lab
	October 6	Quiz #6 corrections; Chap4 Review
Week 10	October 9	<b>Open Note Quiz #7 (Slides 59-83);</b> NOT SPC holiday; PISD holiday Quiz will taken at home and open from 8:00-4:00

	October 10	Types of Bonds Combined worksheet/video; NOT SPC holiday; PISD holiday
	October 11	Home lab #9; NOT SPC holiday; PISD holiday; <a href="https://contrib.pbslearningmedia.org/WGBH/arct15/SimBucket/Simulations/chemthink-ionicbonding/content/index.html">https://contrib.pbslearningmedia.org/WGBH/arct15/SimBucket/Simulations/chemthink-ionicbonding/content/index.html</a>
	October 12	Naming Practice Combined worksheet/video; NOT SPC holiday; PISD holiday
	October 13	Quiz #7 corrections; Formula Writing Combined worksheet/video; NOT SPC holiday; PISD holiday
Week 11	October 16	<b>Open Note Quiz #8 (Slides 1-83)</b> ; Quiz will be 20 questions; NOT SPC holiday; PISD holiday Quiz will be open from 8:00-4:00
	October 17	Naming/Writing Formulas /Drawing practice (PSAT Sophomores)
	October 18	Lab #10; PHET activity <a href="https://phet.colorado.edu/services/download-servlet?filename=%2Factivities%2F3478%2Fphet-contribution-3478-6102.docx">https://phet.colorado.edu/services/download-servlet?filename=%2Factivities%2F3478%2Fphet-contribution-3478-6102.docx</a>
	October 19	Review Chap4 Exam
	October 20	SPC holiday - Fall Break; Quiz #8 corrections; Review Chap 4 Exam
Week 12	October 23	<b>Exam 3 Compounds (Naming/Formula Writing)</b>
	October 24	Chap5 (Slides 1-10); physical/chem change/writing a chem rxn/symbols; worksheet
	October 25	Lab #11 Chemical Reactions Lab (use later for balancing) - just look for identifiers in this lab
	October 26	Chap 5 (Slides 11-20) ; Balancing chemical equations; worksheet
	October 27	Chap5 (Slides 21-37); Types of chemical reactions; worksheet continued (complete reaction on lab)
Week 13	October 30	<b>Open Note Quiz #9 (Slides 1-37)</b> ; Mole notes (Slides 45-56); video on mole/avogadros number
	October 31	Chap5 (Slides 57-65); using molar mass as a conversion factor and mole factors; worksheet
	November 1	Lab #12 Experiment 7 Determining Mole Ratios
	November 2	Chap6 (Slides 1-14) PE/KE, specific heat
	November 3	Quiz #9 corrections; Chap6 (Slides 15-18) Heat calculations; worksheet
Week 14	November 6	<b>Open Notes Quiz #10 Slides Chap5 Slides 57-65, Chap6 Slides (1-18); hand out Exam 5 review</b>
	November 7	Chap6 (Slides 19-31); State of Matter (s,l,g) and attractive forces (IMF's)
	November 8	Lab #13 Endothermic/Exothermic Lab
	November 9	Chap6 (Slides 32-34); changes of state/heating curve; worksheet
	November 10	Quiz #10 corrections; Exam 5 Review Registration for Spring 2024 begins
Week 15	November 13	<b>Exam 4 Chemical Reactions and Energy</b>

	November 14	Chap7 (Slides 1-9;12-17) Boyles Law; worksheet
	November 15	Lab #14 Experiment #9; Boyles Law
	November 16	Chap7 (Slides 18-25) Charles Law; worksheet
	November 17	Chap7 (Slides 26-30) Gay-Lussac's Law; worksheet
Week 16	November 20	<b>Open Notes Quiz #11 Slides 1-30</b> (PISD holiday NOT SPC) Quiz will be taken at home from 8:00 am - 4:00 pm
	November 21	PISD holiday NOT SPC Chap7 (Slides 31-33); Combined Gas Law worksheet
	November 22	SPC Thanksgiving holiday - you actually get a holiday because it's on BOTH schedules - yay for you!
	November 23	SPC Thanksgiving holiday - you actually get a holiday because it's on BOTH schedules - yay for you!
	November 24	SPC Thanksgiving holiday-you actually get a holiday because it's on BOTH schedules - yay for you!
Week 17	November 27	<b>Open Notes Quiz #12 Chap7 Slides 1-33; Avogadro's Law(Slides 34-36) worksheet</b>
	November 28	Chap8 (Slides 1-13) water/solvent/solute/like dissolves like/formation
	November 29	Lab #15 Mini Lab Gas Laws
	November 30	Chap8 (Slides 14-19, 25-33); electrolytes/solubility - solubility graph worksheet <b>(LAST DAY TO DROP FALL COURSES)</b>
	December 1	Quiz #11&12 corrections; Chap 8 (Slides 57-63) Calculating Molarity; worksheet
Week 18	December 4	<b>Open Notes Quiz #13 (Chap8 Slides 1-19,25-33,57-63); Chap8 slides (61-70); Molarity as a conversion factor worksheet</b>
	December 5	Go over Molarity worksheet to prepare for lab
	December 6	Lab #16 Koolaid Solution (Molarity calculations)
	December 7	Quiz #13 corrections; Review for Exam 6
	December 8	<b>Exam 5 Gases and Solutions</b>
Week 19	December 11	Finals Week review
	December 12	review
	December 13	review
	December 14	FINAL EXAM (all classes meet in cafe. at 8:00 am)
	December 15	Final grades due by 10 am

# Student Learning Outcomes/Competencies

## Measurements

- Write the names and abbreviations for the units used in measurements of length, volume, and mass; write a number in scientific notation.
- Determine the number of significant figures in measured numbers.
- Adjust calculated answers to the correct number of significant figures.
- Use the numerical values of prefixes to write a metric equality.
- Write a conversion factor for two units that describe the same quantity.
- Use conversion factors to change from one unit to another.
- Calculate the density or specific gravity of a substance, and use the density or specific gravity to calculate the mass or volume of a substance.

## Energy and Matter

- Identify energy as potential or kinetic.
- Given a temperature, calculate a corresponding temperature on another scale.
- Use specific heat to calculate heat loss or gain, temperature change, or mass of a sample.
- Identify the physical state of a substance as a solid, liquid, or gas.
- Describe the changes of state between solids, liquids, and gasses; calculate the energy involved.

## Atoms and Elements

- Classify matter as pure substances or mixtures.
- Given the name of an element, write its correct symbol; from the symbol, write the correct name.
- Use the periodic table to identify the group and the period of an element and decide whether it is a metal, nonmetal, or metalloid.
- Describe the electrical charge and location in an atom for a proton, a neutron, and an electron.
- Given the atomic number and the mass number of an atom, state the number of protons, neutrons, and electrons.
- Give the number of protons, electrons, and neutrons in the isotopes of an element and to know how to calculate the average atomic masses of the elements.
- Given the name or symbol of one of the 60 most common elements in the periodic table, write the electron arrangement and use it to explain the periodic law.
- Use the electron arrangement of elements to explain periodic trends.

## Compounds and Their Bonds

- Using the octet rule, write the symbols of the simple ions for the representative elements.
- Using charge balance, write the correct formula for an ionic compound.
- Given the formula of an ionic compound, write the correct name; given the name of an ionic compound, write the correct formula.
- Write the name and formula of a compound containing a polyatomic ion.
- Given the formula of a covalent compound, write its correct name; given the name of a covalent compound, write its formula.
- Use electronegativity to determine the polarity of a bond.
- Predict the three-dimensional structure of a molecule and classify it as polar or nonpolar.

## Chemical Reactions and Quantities

- Identify a change in a substance as a chemical or a physical change.
- Write a balanced chemical equation from the formulas of the reactants and products for a reaction.
- Identify a reaction as a combination, decomposition, replacement, or combustion reaction.
- Define the terms *oxidation* and *reduction*.
- Use Avogadro's number to determine the number of particles in a given number of moles.
- Determine the molar mass of a substance and use molar mass to convert between grams and moles.
- Given a quantity in moles of reactant or product, calculate the moles of another substance in the reaction.
- Given the mass in grams of a substance in a reaction, calculate the mass in grams of another substance in the reaction.
- Describe endothermic and exothermic reactions and factors that affect the rate of a reaction.

### **Gasses**

- Describe the kinetic theory of gasses and the properties of gasses.
- Describe the units of measurement used for pressure and change from one unit to another.
- Use the pressure-volume relationship (Boyle's law) to determine the new pressure or volume of a certain amount of gas at a constant temperature.
- Use the temperature-volume relationship (Charles' law) to determine the new temperature or volume of a certain amount of gas at a constant pressure.
- Use the temperature-pressure relationship (Gay-Lussac's law) to determine the new temperature or pressure of a certain amount of gas at a constant volume.
- Describe the relationship between the amount of a gas and its volume and use this relationship in calculations concerning gasses in chemical reactions conducted at STP.
- Use partial pressures to calculate the total pressure of a mixture of gasses.

### **Solutions**

- Identify the solute and solvent in a solution. Describe the formation of a solution.
- Identify solutes as electrolytes or nonelectrolytes.
- Define *solubility*; distinguish between an unsaturated and a saturated solution.
- Calculate the percent concentration of a solute in a solution; use percent concentration to calculate the amount of solute or solution.
- Calculate the molarity of a solution; use molarity to calculate the moles of solute or the volume needed to prepare a solution.
- Describe the dilution of a solution.
- Given the volume and molarity of a solution, calculate the amount of another reactant or product in the reaction.
- Identify a mixture as a solution, a colloid, or a suspension. Describe osmosis and dialysis.

### **Acids and Bases (selected topics)**

- Describe and name acids and bases.
- Identify conjugate acid-base pairs for Brønsted-Lowry acids and bases.
- Write equations for the dissociation of strong and weak acids and bases.
- Use the ion product of water to calculate the  $[H_3O^+]$  and  $[OH^-]$  in an aqueous solution.



- Calculate pH from  $[H_3O^+]$ ; given the pH, calculate  $[H_3O^+]$  and  $[OH^-]$  of a solution.
- Write balanced equations for reactions of acids and bases.
- Describe the role of buffers in maintaining the pH of a solution.

### Organic Chemistry (selected topics)

- Identify properties characteristic of organic or inorganic compounds.
- Write the IUPAC names and structural formulas for alkanes, alkenes, and alkynes.
- Write the IUPAC names for alkanes with substituents.
- Identify the properties of alkanes and write a balanced equation for combustion.
- Write the structural formulas and names for cis-trans isomers of alkenes.
- Identify and name alcohols and ethers; classify alcohols as primary, secondary, or tertiary.
- Describe some properties of alcohols, phenols, and ethers.
- Identify compounds with the carbonyl group as aldehydes and ketones.
- Compare the boiling points and solubility of aldehydes, ketones, alkanes and alcohols.
- Identify chiral and achiral carbon atoms in an organic molecule.
- Describe the boiling points, solubility, and ionization of carboxylic acids in water.
- Describe some properties of amines.
- Classify a monosaccharide as an aldose or ketose and indicate the number of carbon atoms.
- Draw the D or L configurations of glucose, galactose and fructose.
- Draw and identify the cyclic structures of monosaccharides.
- Describe the monosaccharide units and linkages in disaccharides.
- Describe the structural features of amylose, amylopectin, glycogen, and cellulose.
- Describe the classes of lipids.
- Write structures of fatty acids and identify as saturated or unsaturated.
- Describe the characteristics of glycerophospholipids.
- Describe the structures of steroids.
- Describe the composition and function of the lipid bilayer in cell membranes.
- Classify proteins by their functions in the cells.
- Draw the structure for an amino acid. Write the zwitterion of an amino acid.
- Draw the structure of a dipeptide. Identify the structural levels of a protein.
- Describe how enzymes function as catalysts and give their names.
- Describe the role of an enzyme in an enzyme-catalyzed reaction.
- Describe the effect of temperature, pH, concentration of a substrate, and inhibitors on enzyme activity.

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<https://www.southplainscollege.edu/syllabusstatement>

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