Unit I. Why is the Climate Changing?

Macroscopic, Symbolic, and Atomic-Molecular View of Chemistry

How to use this calendar:

- Set aside 30 mins - 1 hour ***before*** each class to **to complete the preclass assignment found on Moodle.** Every class meeting will have a preclass assignment due at 11:59 pm the day before class.
- Often, you will be asked to use the material in your Course Packet to complete the preclass assignments. Please complete the work in both the Moodle quiz **and** in your Course Packet when prompted.
- To prepare for **Labs**, as part of your preclass assignment, you will be asked to read over the entire procedure in your Course Packet and write out the Purpose and Method sections. Follow any additional instructions regarding outlining the "Actions" or creating a "lab plan".
- **Textbook Readings** can be found in Moodle. Reading these will be a necessary part of correct completion of your preclass assignments. After class read that textbook section, take written notes, write and work through example problems, and write down any remaining questions you have.
- **Lab reports will always be due next class period,** unless otherwise indicated by your instructor.
- **Quizzes will always be on Fridays.**

Week 1 topics: practice analyzing graphical data, properties of gases, measurements and significant figures, keeping a lab notebook, data analysis.

8/26 M Course Introduction
Activity 1: How much is the climate changing?

8/28 W Textbook Readings: **OpenStax Textbook Sections 1.4 (Measurements), 1.5 (Significant Figures, Examples 1.3, 1.4, 1.5, and 1.6), 9.1 (Gas Pressure - just up to Table 1).**
In Class: Lab check-in and lab notebook set up
Lab 1: How much does air weigh?

8/30 F In Class: Recap Lab 1: How much does air weigh?
Printing Tutorial from LITS
Quiz 1 (Analyzing climate change data, significant figures)

Week 2 topics: ideal gas law (relationship between properties of gases), covalent bonds and Lewis dot structures, molecular shape (VSEPR).

9/2 M NO CLASS - LABOR DAY

9/4 W Textbook Readings: **Section 2.3 (Atomic Structure and Symbols), 2.4 (Chemical Formulas) 7.3-7.4 (Lewis formulas, Example 7.4). 9.2 (Ideal gas law, especially Figures 9.10-9.13, focus on relationships, not calcs), 9.5 (Kinetic-Molecular Theory).**
Activity 2: How are the atoms connected within gas molecules?
Lab 2: How are gas volume and pressure related?
Lab 3: How are gas volume and temperature related?

9/6 F Textbook Readings: **Section 7.6 (VSEPR, Example 7.11-7.16).**
Activity 3: What are the shapes of atmospheric gas molecules?
Quiz 2 (sig figs, Lewis formulas, gas property relationships.)

Week 3 topics: IR spectroscopy, greenhouse gases, covalent bonding, electronegativity, and polarity. balancing equations, sources and sinks of greenhouse gases, dimensional analysis.

9/9 M Textbook Readings:: **Figure 6.3** in Section 6.1 (Electromagnetic Energy)**, 7.2 (Covalent Bonding), 7.6 (subsection Molecular Polarity and Dipole Moment)**
Lab 4: Which gases absorb infrared waves? (worksheet due Wed)
Begin *Activity 4: What are sources and sinks of greenhouse gases?*

9/11 W Textbook Readings: **4.1 and 4.3 (Balancing Equations and Stoichiometry).**
Lab 5: What happens when you breathe into water?
Continue *Activity 4: What are sources and sinks of greenhouse gases?*

9/13 F **Quiz 3** (Lewis Dot and VSEPR, IR spectroscopy, electronegativity, greenhouse gas)
Activity 5: How do we balance source and sink equations?

Week 4 topics: dimensional analysis, stoichiometry, moles, limiting reactant, precipitation reaction.

9/16 M Textbook Readings: **1.6 ("Mathematical ..." aka dimensional analysis, Examples 1.8-1.10), 3.1 (moles) 4.4 (Reaction Yields- focus on limiting reactant), 2.6 (ionic compounds).**
Lab 6: Which recipe makes the most precipitate?
Activity 6: How much do sources and sinks contribute to rising greenhouse gas concentrations?

9/18 W Review textbook sections 1.6 and 3.1.
Demo: Mole of CO_2
Activity 7: What are your personal contributions to CO_2 emissions?
Lab 7: How much CO_2 do you exhale per year?

9/20 F **Quiz 4**
Finish Lab 7 and Activity 7

Unit II. Food and Fuel: Which Energy Sources Should We Use?

Covalent Molecules and How They Are Transformed Through Chemical Reactions

Week 5 topics: organic chemistry - molecular representations and functional groups, thermodynamics, energy transfer, calorimetry.

9/23 M Textbook Readings: **2.4 (Chemical formulas), 20.1-20.3 (skim organic functional groups and work through Example 20.1, 20.2).**
Activity 8: How do chemists represent the structure of molecules?
Begin *Activity 9: How much heat is released upon fuel combustion?*

9/25 W Textbook Readings: **5.1-5.2 (Energy and Calorimetry, work through Example 5.1, 5.2).**

Activity 9: How much heat is released upon fuel combustion?
Lab 8: Fuel Calorimetry

9/27 F **Quiz 5**

Week 6 topics: thermodynamics, energy transfer, bond energies, acids and bases.

9/30 M Textbook Readings: **7.5 (Bond Strengths and Energies).**
Activity 10: Why do we make so much CO_2?

10/2 W Textbook Readings: **7.5 (Bond Strengths and Energies).**
Continue Activity 10: Why do we make so much CO_2?
Activity 11: What functional groups are in food?

10/4 F Textbook Readings: **4.2 (focus on Acid-Base reactions).**
Quiz 6
Lab 9: Which household chemicals react the same way?

Week 7 topics: polarity, intermolecular forces**.**

10/7 M Textbook Readings: **10.1 (Intermolecular Forces).**
Lab 10: Does water interact with all materials in the same way?
Activity 12: How are functional groups, molecular sizes, and boiling points related?

10/9 W Textbook Readings: **10.1 (Intermolecular Forces).**
Continue: *Activity 12: How are functional groups, molecular sizes, and boiling points related?*
Activity 13: What is hydraulic fracking?

10/11 F **Quiz 7**
Continue: *Activity 13: What is hydraulic fracking?*

Week 8 M 10/14 – F 10/18 FALL BREAK

Integrative Project 1 - Synthesis and Analysis: Is My Aspirin Pure?

Week 9 topics: synthesis, functional groups, titration, spectroscopy.

10/21 M **Lab 11**: Synthesis of Aspirin

10/23 W Textbook Readings: **4.4 (Percent Yield).**
Lab 12: IR spectroscopy of reference samples and synthesized aspirin
Lab 13: Part 1 Titration of aspirin tablet

10/25 F **Lab 13:** Part 2. Titration of synthesized aspirin
Lab 14: NMR spectroscopy of reference samples and synthesized aspirin

Week 10 topics: scientific literature, scientific writing.

10/28 M Finish any lab work.
Discuss aspirin report and searching the literature for journal articles.

10/30 W Aspirin Report Workshop: Bring all data and spectra!

11/1 F Aspirin Report Workshop: Peer review aspirin reports: *Each person - bring printed copy of Introduction and Discussion sections.*
Quiz 8 (NMR, IR spectroscopies)

Unit III. What Changes Can We Make to Reduce Our Environmental Impact?

Chemical Periodicity, Solids, Metals and Ions, and Interaction of Light with Matter

Week 11 topics: inorganic chemistry - solid structures, metals, ions, atomic energy levels and transitions, solubility rules, precipitation reactions and net ionic equations. Emission spectroscopy.

11/4 M Textbook Readings: **10.5 (subsection Metallic Solids).**
meet at the Logan Museum
Activity 14: Why have metals been used through the ages?
Activity 15: Alternative Fuels (17.5 batteries and fuel cells)

11/6 W Textbook Readings: Lighting background readings (Google Classroom), review **6.1 (Electromagnetic Energy),** read **6.2 (Bohr model).**
Activity 16: What are the three ways we make light?
Lab 15: How can you identify different sources of light?

11/8 F Alternative Fuels MiniPresentations
Quiz 9

Week 12 topics: metals, ions and precipitation reactions, structure and properties of solids.

11/11 M Textbook Readings: **4.1 (subsection Equations for Ionic Reactions, Example 4.2) 4.2 (subsection Precipitation Reactions and Solubility rules), 2.6 (Molecular and Ionic Compounds - use Figure 2.29, Table 2.5 and Table 2.6 as reference).**
Activity 17: Which elements in the periodic table are metals?
Lab 16: What is the net ionic equation?

11/13 W Textbook Readings: **7.1 (Ionic Bonding), 10.5-10.6 (Solids), 18.2 (subsection Carbon).**
Activity 18: How can we represent solids?
Lab 17: How are structure and properties of solids related?

11/15 F continue **Lab 17**: How are structure and properties of solids related?
Quiz 10

Week 13 topics: structure and properties of solids, periodic properties, electromagnetic spectrum, semiconductors and bandgap energies.

11/18 M Textbook Readings: **6.5 (Periodic Variations in Element Properties).**
Activit y 19: What controls the properties of elements?
Activity 20: How can you get a specific color of light from a solid LEDs?

11/20 W **Lab 18**: Periodic Properties and LEDs
Activity 22: Project Design: Is My Soil Poisoned?

11/22 F **Quiz 11**
Lab 19: Collect Soil Samples

Integrative Project 2 – Is my soil poisoned?

Week 14 topics: application of quantitative lab techniques and atomic absorption spectroscopy to a new environmental problem.

11/25 M **Lab 20**: Preparation of Lead Samples and Standards

11/27 W **Lab 21:** Atomic Absorption Spectroscopy of Lead Samples & Standards

11/29 F NO CLASS THANKSGIVING

Week 15 topics: scientific writing, science communication, data analysis.

12/2 M **Lab 21:** Atomic Absorption Spectroscopy of Lead Samples & Standards

12/4 W Discuss lead letter and data workup.
Lab check out

12/6 F Work on or peer review lead letters.
Course review, wrap up, course evals.

	Final Exam Period
Section 01 Mon 12/9 7-10 pm *Section 02* Tues 12/10 9am -noon *Section 03* Tues 12/10 2-5pm	**Quiz 12** *All lead letters will be due Monday by 7pm.*