

# Daily Assignments Calendar

## Check this every day!

### I. Why is the Climate Changing?

*Macroscopic, symbolic, and atomic-molecular view of chemistry*

(1) For Monday August 28, 2023

*Languages of Chemistry*

*Activity 1: What is happening to the polar ice?*

- We will discuss the languages of chemistry, work on Activity 1 from the class website and course packet, and talk about course goals, structure, processes and lab notebooks.

(2) For Wednesday August 30, 2023

**Lab 1: How much does air weigh?**

*Activity 2: How much is the earth changing?*

- **Submit your “Scientific Autobiography”** (Google classroom)
- Read “Learning Chemistry by Doing What Chemists Do” and “Keeping Your Laboratory Notebook” in the course packet.
- Prepare for lab by reading “How much does air weigh?”, watching the prelab videos on the course website, and **writing a draft of Purpose and Method in your laboratory notebook**. Being able to read directions and think through lab steps is an important course goal.
- Prepare for class by reading the introduction to “How much is the earth changing?”
- Look at “Laboratory Glassware” on the class website to see if you can match equipment and names.

(3) For Friday September 1, 2023

**Lab 2: How are gas volume and pressure related?**

**Lab 3: How are gas volume and temperature related?**

- Prepare for lab by reading “How are gas volume and pressure related?” and “How are gas volume and temperature related?”, watching the prelab videos on the course website, and **writing a draft of Purpose and Method in your laboratory notebook** for both experiments. Being able to read directions and think through lab steps is an important course goal.
- Skim the “Significant Figures Reference Sheet”.
- **At the end of class hand in your lab notebook for grading** of “How much does air weigh?”

(4) Monday September 4, 2023

*No Class (Labor Day)*

(5) For Wednesday September 6, 2023

*Activity 3: How are the atoms connected within gas molecules?*

- Prepare for class by reading the introduction to “How are the atoms connected within gas molecules?” and **writing answers to questions 1-2**. Read your text 7.3 (**Lewis dot symbols**).
- In class we will also look at “Properties of Gases” figures from Labs 2 and 3 on the course website (**kinetic-molecular theory of gases**). Which two variables are studied in each figure? How are these two variables measured? How are the other two variables kept constant?
- **Quiz 1**

(6) For Friday September 8, 2023

**Lab 4: Which gases absorb infrared waves?**

*Activity 4: What are the shapes of atmospheric gas molecules?*

- Prepare for class by reading the introduction to “What are the shapes of atmospheric gas molecules?”
- Read text 7.6 through Example 7.16 (**VSEPR theory and molecular shape**)
- How equally are electrons shared in a bond? Read text “Electronegativity” through Figure 7.6 (**electronegativity**), and text “Molecular Polarity and Dipole Moment” through Figure 7.28 (**bond polarity**)
- Prepare for lab by reading the introduction for “Which gases absorb infrared waves?” Find the infrared portion of the **electromagnetic spectrum** in “Greenhouse Gases and Electronegativity” web images 7-9. Find three gases using “Molecular Bond Vibrations (animations)” that would absorb infrared radiation.
- During class, post your infrared spectra on the whiteboard in the hallway in order to share data.
- **At the end of class hand in the lab worksheet** “Which gases absorb infrared waves?”
- **Hand in your lab notebook for grading** of “How are gas volume and pressure related?” and “How are gas volume and temperature related?”

(7) For Monday September 11, 2023**Lab 5: What happens when you breathe into water?***Activity 5: What do atmospheric concentrations tell us about sources and sinks of greenhouse gases?*

- Read the introduction to “What do atmospheric concentrations tell us about sources and sinks of greenhouse gases” and **before class fill in the table** using the class website “Gas Concentrations, Global Warming Potential, and Atmospheric Lifetime.”

(8) For Wednesday, September 13, 2023*Activity 6: How do we balance source and sink equations?*

- Read the introduction to “How do we balance source and sink equations?”
- Read text 3.1 (**moles: the macro-particulate connection**)
- Read text 4.1 through Example 4.1 (**balancing chemical equations**)
- **Quiz #2**

(9) For Friday, September 15, 2023**Lab 6: Which recipe gives the most precipitate?***Activity 7: How much do sources and sinks contribute to rising greenhouse gas concentrations?*

- Prepare for lab by reading “Which recipe gives the most precipitate?”, watching the prelab video on the course website, and **writing the purpose and method** in your lab notebook.
- Read text 4.3 (**dimensional analysis**)
- Skim the “Calculation Reference Sheet”.

(10) For Monday, September 18, 2023**Lab 7: How much carbon dioxide do you exhale in a year?***Activity 8: What are your personal contributions to CO<sub>2</sub> emissions?*

- Prepare for lab by **writing the purpose and method** in your lab notebook for “How much carbon dioxide do you exhale in a year?” How will you measure volume? How will you measure time?
- Review the “Calculation Reference Sheet”.
- Read the introduction to “What are your personal contributions to CO<sub>2</sub> emissions?”

(11) For Wednesday September 20, 2023**Lab 8: How much carbon dioxide is a mole?***Activity 9: How should we keep cool? Climate Change Concluding Activity*

- Bring your **completed Lab 7 calculations** for posting and class discussion.
- Read articles about refrigerants on the course web site for this Activity. **Write a paragraph summarizing what is most important and/or interesting about the readings.** In class we will do and hand in a group exercise on refrigerants and their connection to climate change.

**Integrative Project 1 – What is the empirical formula of my cool blue copper compound?***Synthesis, stoichiometry, and spectroscopy*(12) For Friday September 22, 2023**Lab 9: Synthesis of a Copper-Ammonia Complex**

- Prepare for lab by reading “Synthesis of a Copper-Ammonia Complex?”, watching the prelab videos on the course website, **completing the pre-lab questions**, and **writing the purpose and method for the synthesis** in your lab notebook.
- Read text 3.2 (**Determining Empirical Formula**)
- After class **hand in your lab notebook for grading** of “Which recipe gives the most precipitate?” and “How much carbon dioxide do you exhale in a year?”

(13) For Monday September 25, 2023**Lab 10: Ammonia Analysis via Titration**

- Prepare for lab by reading “Ammonia Analysis via Titration,” **completing the pre-lab questions**, and **writing purpose and method for the ammonia analysis** in your notebook.
- Read text 4.5 through Example. 4.14 (**determine by titration the amount of product produced**).
- Work on your Copper Project report.

(14) For Wednesday September 27, 2023**Lab 11: Copper Analysis using Absorbance Spectroscopy**

- Prepare for lab by reading “Copper Analysis using Absorbance Spectroscopy,” **completing the pre-lab questions**, and **writing purpose and method for the copper analysis** in your notebook.
- Work on your Copper Project report.

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

*Covalent molecules and how they are transformed through chemical reactions*

(15) For Friday September 29, 2023

*Activity 10: How do chemists represent the structure of molecules?*

• **Hand in your Copper Project Report**

- Read the introduction to “How do chemists represent the structure of molecules?” We will work on the Chemical Notation Worksheet during class.
- Skim text 20.1 through Alkanes (**organic compounds, functional groups, alkanes**).

(16) For Monday October 2, 2023

**Lab 12: How much heat is released upon fuel combustion?**

- Review the introduction to “How do we balance source and sink equations?” (**combustion reactions**)
- Read text 5.1 (**energy transfer and specific heat J/g**)
- Prepare for lab by reading “How much heat is released upon fuel combustion?” and **answering questions 1-5** in your lab notebook, and **writing the purpose and method**.

(17) For Wednesday October 4, 2023

*Activity 11: Why do we make so much CO<sub>2</sub>?  
Bond Enthalpies Worksheets*

- Read text 5.2 and 7.5 through Table 7.3 (**fuel & food values and length & strength of bonds**)
- Read the introduction to “Why do we make so much CO<sub>2</sub>?” In class we will complete the worksheets for several molecules.
- **Quiz #3**

(18) For Friday October 6, 2023

**Lab 13: Can we run a clock with a hydrogen fuel cell?**

*Activity 12: What are some alternative fuels we could use?*

- Read text “Fuel Cells” including Figure 17.14 (**fuel cells**)
- Read text “Automobile Catalytic Converters” including Figure 12.24 (**cars and air quality**)
- Prepare for lab by reading “Can we run a clock with a hydrogen fuel cell?” and **writing the purpose and method** in your lab notebook.
- **Hand in your lab notebook for grading** of “How much heat is released upon fuel combustion?” and the “Can we run a clock with a hydrogen fuel cell?”

(19) For Monday October 9, 2023

**Lab 14: Which household chemicals react the same way?**

*Activity 13: What functional groups are in food?*

- Prepare for lab by reading “Which household chemicals react the same way?”, watching the prelab video on the course website, and **writing the purpose and method** in your lab notebook.
- Read the introduction to “What functional groups are in food?” and **answer Questions 1-2**. Be prepared to discuss the remaining questions in class (**recognizing functional groups**).
- Read text “Acid-Base Reactions” through Figure 4.8 (**acids & bases**) and text 14.2 (**pH**)

(20) For Wednesday October 11, 2023

**Lab 15: Can like attracts like be used to rank polarity?**

*Activity 14: How are functional groups, molecular sizes, and boiling points related?*

- Read text 10.1 (**intermolecular forces** between molecules)
- Review functional groups reference sheet
- **Prepare for lab by writing the purpose and method** in your lab notebook for “Can like attracts like be used to rank polarity?”

(21) For Friday October 13, 2023

**Lab 16: How does vegetable oil change when hydrogenated?**

- Prepare for lab by reading “How does vegetable oil change when hydrogenated?”, watching the prelab videos on the course website, and **writing the purpose and method** in your lab notebook. Include the chemical reaction scheme in the method.
- Read text “Soaps and Detergents” through Figure 11.33
- **Hand in lab notebook for grading** “Can like attracts like be used to rank polarity?” and “How does vegetable oil change when hydrogenated?”

MIDTERM BREAK

(22) For Monday October 23, 2023

*Activity 15: What is the difference between a fat and an oil?*

- Review text 10.1 (**intermolecular forces** between molecules)
- Read the introduction to “What is the difference between a fat and an oil?” and **answer questions 1-2**.

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## **Integrative Project 2 - Synthesis And Analysis: Is My Aspirin Pure?**

*Applying functional groups, molecular structure, and spectroscopy*

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(23) For Wednesday October 25, 2023

### **Lab 17: Preparation of Aspirin**

- Prepare for lab by reading “Preparation of Aspirin” and **writing the purpose and method** in your lab notebook. Include the chemical equation for the synthesis as your method. Read through the lab procedure carefully and highlight important steps. Be prepared to start lab work as soon as you get to class and work efficiently. Which parts of the “Aspirin Project Accomplishments Checklist” will you accomplish today?
- Read text 4.4 (**percent yield**)

(24) For Friday October 27, 2023

### **Lab 18: IR Spectroscopy of Reference Samples and Aspirin**

### **Lab 19A: Titration of Aspirin to Calculate Molar Mass**

- **Hand in Preparation of Aspirin homework problem** at the beginning of class.
- Prepare for lab by reading “IR Spectroscopy of Reference Samples and Aspirin”, watching the “Loading infrared samples” prelab video on the course website, and **writing the purpose and method** in your lab notebook. Review IR spectroscopy from two earlier experiments using your notes.
- Prepare for lab by reading “Titration of Aspirin to Calculate Molar Mass” and **writing the purpose and method** in your lab notebook. Determine moles NaOH/liter.
- Review textbook 4.5 through Example 4.14 (**titration**).
- Weigh aspirin so you can calculate your % yield.
- During class post IR spectra for reference compounds outside the classroom and begin the IR Worksheet.
- During class obtain IR of your synthesized aspirin and keep it for your report.
- Which parts of the “Aspirin Project Accomplishments Checklist” will you accomplish today?

(25) For Monday October 30, 2023

### **Lab 20: NMR Spectroscopy of Reference Samples and Aspirin**

### **Lab 19B: Titration of Aspirin to Calculate Molar Mass**

- **Hand in IR Spectroscopy of Reference Samples and Aspirin Worksheet** at the beginning of class.
- Prepare for lab by reading “NMR Spectroscopy of Reference Samples and Aspirin”, watching the “Loading NMR samples” prelab video on course website, and **writing the purpose and method** in your lab notebook.
- During class post NMR spectra for reference compounds outside the classroom and do the NMR Worksheet.
- During class obtain NMR of your synthesized aspirin and keep it for your report.
- During class titrate your product until two trials agree for the molecular weight of the aspirin. (Do the calculations in lab!)
- **Hand in Lab 20 NMR Worksheet by the end of class.**
- Which parts of the “Aspirin Project Accomplishments Checklist” will you accomplish today?

(26) For Wednesday November 1, 2023

*Activity 16: Writing a scientific report*

- **Bring a printed draft of your report for peer review.**
- Which parts of the “Aspirin Project Accomplishments Checklist” will you accomplish today?
- **Quiz #4**
- **Hand in revised Aspirin paper on Friday.**

### III. What changes can we make to reduce our environmental impact?

*Chemical periodicity, metals and ions, and interaction of light with matter*

(27) For Friday November 3, 2023

#### Lab 22: How well do different materials conduct heat?

*Activity 17: Why have metals been used through the ages? (Logan Museum)*

- **Class will start in the Logan Museum** (meet at the entrance to the museum)
- **Hand in revised Aspirin paper.**
- Read text 2.5 (**periodic table**)
- Prepare for lab by reading “How well do different materials conduct heat?” and **writing the purpose and method** in your lab notebook.

(28) Monday November 6, 2023

*Activity 18: How should we make light?*

- Read text 6.1 through Figure 6.3 (**light waves**), and 6.2 (Bohr **energy level diagrams**).
- Read the introduction to “How should we make light?” and **answer questions 1-4**. Be prepared to discuss the remaining questions in class.
- Read your assigned online article set (AHMN, BIMO, CJMP, DKMQ, ELMR, FMST or GMUV) and **write a summary paragraph or page of notes**. During class groups will fill out the table “What lighting options are currently available?”

(29) For Wednesday November 8, 2023

*Activity 19: Which elements in the periodic table are metals?*

#### Lab 23: How can you identify incandescent, atomic, and semiconductor sources of light?

- Read “Which elements in the periodic table are metals?” and using the videos on course website **complete Question 1 and Figure 19-5 for the videos you watched** before class.
- Prepare for lab by reading “How can you identify different incandescent, atomic, and semiconductor sources of light?” After lab, your **answers to questions 1-6 will be due at end of class**.
- Read text 10.5 (**solid state**) and “Band Theory” and Figure 8.39 (**bands and band gap**)

(30) For Friday November 10, 2023

#### Lab 24: What is the net ionic equation?

- Read text Figure 2.29, Table 2.5, “Ionic Compounds” through Example 2.11, 2.7 through Table 2.10 (**naming ionic compounds**) and text Example 4.2 through Example 4.3 (**precipitation reactions**).
- Prepare for lab by reading “What is the net ionic equation?”

(31) For Monday November 13, 2023

*Activity 20: How can we represent solids?*

#### Lab 25: How are structure and properties of solids related? (Solid State Model Building)

- Finish ionic precipitate laboratory by writing balanced chemical equations for reactions where a precipitate is observed, *leaving out the spectator ions*.
- Examine **ionic radii** on the course webpage, Ions image 15. Are positive ions or negative ions bigger?
- Read “How can we represent solids”, especially the sections on **Counting Atoms** and **Layer Sequences**.
- Read text 10.6 through Figure 10.62 (**unit cells**)

(32) For Wednesday November 15, 2023

*Activity 21: What controls the properties of elements?*

#### Lab 25: How are structure and properties of solids related? (Solid State Model Building)

- Read text 18.1 (**periodic properties**).
- Read “What controls the properties of elements” and **bring your finished worksheet (problems 1-8) to class**.
- What happens at the macroscopic and at the atomic-molecular level in metallic, ionic, and covalent network solids when you bend such a material? Be sure that you have built models that represent each type of bonding as you do your structure and properties lab.
- **Quiz #5**

(33) For Friday November 17, 2023

#### Lab 26: How can you get a specific color of light from a solid? Periodic Properties and LEDs

- **Hand in the Model Building Report worksheet if you did not hand it in on Wednesday.**
- Prepare for lab by reading “How can you get a specific color of light from a solid?” and answering the **Pre-Lab Exercises (questions 1-8)** in your lab notebook.
- **Hand in lab notebook for grading** of “How well do different materials conduct heat?” and “What is the net ionic equation?”

(34) For Monday November 20, 2023**Lab 27: How do we know how atoms are arranged in solids?****Lab 28: Synthesis and characterization of Solid Solution Perovskite Semiconductors  $\text{CH}_3\text{NH}_3\text{Pb}(\text{I}_{1-x}\text{Br}_x)_3$** 

- **Prepare for lab by writing the purpose and method** in your lab notebook for both diffraction labs, one using visible light and your eyes as the detector, and the other involving x-rays and an instrument as the detector.
- Read text “X-Ray Crystallography” through Figure 10.64 (**x-ray diffraction**).

(35) For Wednesday November 22, 2023*Activity 22: New Kinds of LED Lighting Summary Exercise*

- The results from the previous five labs will be needed for the “New Kinds of LED Lighting Summary Exercise.” Most of you should almost get this finished in class, but it will be due Monday.
- Begin the online Background Readings in preparation for “Project Design: Is my soil poisoned?” on Monday.

(36) Friday, November 24, 2023**Thanksgiving****Integrative Project 3 - Is my soil poisoned?***Applying quantitative lab techniques and atomic spectroscopy to an environmental and social justice problem*(37) For Monday November 27, 2023*Activity 23: Project Design: Is my soil poisoned?*

- **Hand in the answers to the questions in the Lighting Summary Exercise if you did not hand it in Wednesday.** Use complete sentences.
- Read “Project Design: Is my soil poisoned?” in your course packet *and* the background readings on the course website. **Write a paragraph summarizing what you read and providing references.** Where might you find lead in Beloit? An important component of the final project is choosing a reasonable site, backing up that choice with literature references, and designing a sampling strategy that tests your hypothesis.
- In class collect and document soil samples for analysis, return to the lab and put samples in the oven to dry.

(38) For Wednesday November 29, 2023**Lab 29: Preparation of Lead Standards**

- Prepare for lab by reading “Preparation of Lead Samples and Standards” and **writing the purpose and method** in your lab notebook. You might outline your actions in your lab notebook, saving plenty of space for additions, corrections, and observations.
- Prepare all the standard solutions.
- Start writing the final report. See Activity 24, Lead Project Letter.
- **Hand in Preparation of Lead Standards Homework** at the end of class.

(39) For Friday, December 1, 2023**Lab 29: Preparation of Lead Samples**

- Weigh soil, cook, filter, dilute. Be prepared to start lab work as soon as you get to class.
- Calculate the concentrations of your standard solutions based on the actual buret readings.
- **Hand in Atomic Absorption Spectroscopy of Lead Samples Homework** at the end of class.

(40) For Monday December 4, 2023**Lab 30: Atomic Absorption Spectroscopy of Lead Samples & Standards**

- Continue writing the final report. See Activity 24, Lead Project Letter.
- In class do atomic absorption spectroscopy analysis of your sample and standard solutions.
- In class enter data for your sample and standard solutions into a spreadsheet.
- In class complete lead concentration calculations for all soil samples you have analyzed.

(41) For Wednesday December 6, 2023*Activity 24: Lead Letter and Peer Review*

- **Bring a printed draft of your Lead Project Letter** for peer review (**one printed copy for each group member**).
- Check out of lab and complete course evaluation during class.
- **Quiz #6**

(42) For Friday December 8, 2023*Activity 25: Environmental & Climate Justice*

- **Submit your Lead Project Letter (one copy per group).**
- Read the course web page resources for “Environmental & Climate Justice” and be prepared to discuss them in class.

We will not use the final exam slot. This course finishes on December 8.