

Daily Assignments Calendar

Check this every day!

I. Why is the Climate Changing?

Macroscopic, symbolic, and atomic-molecular view of chemistry

(1) Monday January 22, 2024

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 January 24, 2024

Activity 2: How much is the earth changing?

Lab 1: How much does air weigh?

- **Submit your “Scientific Autobiography”** in Google classroom.
- Read “Learning Chemistry by Doing What Chemists Do” and “Keeping Your Laboratory Notebook” in the course packet.
- Prepare for class by reading the introduction to “How much is the earth changing?”
- 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.
- Look at “Laboratory Glassware” on the class website to see if you can match equipment and names.

(3) For Friday January 26, 2024

Lab 2: How are gas volume and pressure related?

Lab 3: How are gas volume and temperature related?

- Finish Data Analysis, Calculations, and Discussion for “How much does air weigh?” in your lab notebook.
- Prepare for new labs 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”. Reference sheets are condensed notes on a topic to be used during the entire course. You might want to tab this page to make it easy to find.
- **At the end of class hand in your lab notebook for grading** of “How much does air weigh?”

(4) For Monday January 29, 2024

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**

(5) For Wednesday January 31, 2024

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

Lab 4: Which gases absorb infrared waves?

- Finish Data Analysis and Discussion for both gas volume experiments in your lab notebook.
- 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?” and watching the prelab videos on the course website.
- 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?”

(6) For Friday February 2, 2024**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.”
- **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 February 5, 2024**Lab 6: Which recipe gives the most precipitate?**

Activity 6: How do we balance source and sink equations?

- Prepare for lab by reading “Which recipe gives the most precipitate?”, watching the prelab videos on the course website, and **writing the purpose and method** on paper to be fastened in your lab notebook.
- Read the introduction to “How do we balance source and sink equations?”
- Read text 4.1 through Example 4.1 (**balancing chemical equations**)
- **Quiz 2**

(8) For Wednesday, February 7, 2024**Lab 7: How much carbon dioxide do you exhale in a year?**

Activity 7: How much do sources and sinks contribute to rising greenhouse gas concentrations?

- Finish Data Analysis and Discussion for “Which recipe gives the most precipitate?” in your lab notebook.
- Prepare for lab by looking at the available equipment on the course web site and 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?
- Read text 3.1 (**moles: the macro-particulate connection**)
- Read text 4.3 (**dimensional analysis**)
- Skim the “Calculation Reference Sheet”. Reference sheets are condensed notes on a topic to be used during the entire course. You might want to tab this page to make it easy to find.
- Prepare for class by reading the introduction, doing the formula weight calculations, and trying the hummingbird calculation for “How much do sources and sinks contribute to rising greenhouse gas concentrations?”

(9) For Friday, February 9, 2024**Lab 8: How much carbon dioxide is a mole?**

Activity 8: How should we keep cool? Summary Activity

- **Finish calculations** for posting and class discussion of “How much carbon dioxide do you exhale in a year?”
- 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.
- 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?”

Integrative Project 1 – What is the empirical formula of my cool blue copper compound?

Synthesis, stoichiometry, and spectroscopy

(10) For Monday, February 12, 2024**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** on paper to be fastened in your lab notebook.
- Read text 3.2 (**Determining Empirical Formula**)

(11) For Wednesday February 14, 2024**Lab 10: Ammonia Analysis via Titration**

- Prepare for lab by reading “Ammonia Analysis via Titration?”, watching the prelab videos, **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.

(12) For Friday February 16, 2024**Lab 11: Copper Analysis using Absorbance Spectroscopy**

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

(13) For Monday February 19, 2024

Activity 9: Writing a scientific report

- **Bring a printed draft of your report for peer review.**
- **Hand in revised Copper Project Report on Wednesday.**

II. Food and Fuel: Which Energy Sources Should We Use?*Covalent molecules and how they are transformed through chemical reactions*(14) For Wednesday February 21, 2024

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 do the Chemical Notation Worksheet during class.
- Skim text 20.1 through Alkanes (**organic compounds, functional groups, alkanes**).

(15) For Friday February 23, 2024**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**.

(16) For Monday February 26, 2024Activity 11: Why do we make so much CO₂?
Bond Enthalpies Worksheets

- **Finish calculations** for posting and class discussion of “How much heat is released upon fuel combustion?”
- 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 CO₂?” In class we will complete the worksheets for several molecules.
- **Quiz 3**

(17) For Wednesday February 28, 2024**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?”, looking the prelab images and figures on the course web site, and **writing the purpose and method** in your lab notebook.

(18) For Friday March 1, 2024**Lab 14: Which household chemicals react the same way?**

Activity 13: What functional groups are in food?

- Finish Questions for “Can we run a clock with a hydrogen fuel cell?” in your lab notebook.
- 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**).
- Skim the “Functional Groups Reference Sheet.” Reference sheets are condensed notes on a topic to be used during the entire course. You might want to tab this page to make it easy to find.
- Read text “Acid-Base Reactions” through Figure 4.8 (**acids & bases**) and text 14.2 (**pH**)
- **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 March 4, 2024**Lab 15: Can like attracts like be used to rank polarity?**

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

- Finish Results and Discussion for “Which household chemicals react the same way?”
- Read text 10.1 (**intermolecular forces** between molecules)
- Review the “Functional Groups Reference Sheet.” Reference sheets are condensed notes on a topic to be used during the entire course. You might want to tab this page to make it easy to find.
- **Prepare for lab by writing the purpose and method** on paper to be fastened in your lab notebook for “Can like attracts like be used to rank polarity?”
- **Quiz 4**

(20) For Wednesday March 6, 2024**Lab 16: How does vegetable oil change when hydrogenated?**

- Finish Results and Discussion for “Can like attracts like be used to rank polarity?” in your lab notebook.
- 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

(21) For Friday March 8, 2024 Activity 15: What is the difference between a fat and an oil? Summary Activity

- Finish Discussion for “How does vegetable oil change when hydrogenated?” in your lab notebook.
- 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**.
- **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

Integrative Project 2 - Synthesis And Analysis: Is My Aspirin Pure?*Applying functional groups, molecular structure, and spectroscopy*(22) For Monday March 18, 2024**Lab 17: Preparation of Aspirin**

- Prepare for lab by reading “Preparation of Aspirin”, reviewing the prelab videos on the course web site, 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**)

(23) For Wednesday March 20, 2024**Lab 18: IR Spectroscopy of Reference Samples and Aspirin****Lab 19: Titration of commercial aspirin to determination of moles NaOH/liter**

- **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**).
- Be sure to weigh your dry aspirin product 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?

(24) For Friday March 22, 2024**Lab 20: Titration of Aspirin to Calculate Molar Mass****Lab 21: NMR Spectroscopy of Reference Samples and Aspirin**

- **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?

(25) For Monday March 25, 2024

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?
- Hand in revised Aspirin paper on Wednesday.

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

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

(26) For Wednesday March 27, 2024

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 at start of class)
- **Hand in revised Aspirin paper.**
- Read text 2.5 (**periodic table**)
- Prepare for lab by reading “How well do different materials conduct heat?”, watching the prelab videos on the course web site, and **writing the purpose and method** in your lab notebook.

(27) For Friday March 29, 2024

Activity 18: How should we make light?

- Finish Calculations and Discussion for “How well do different materials conduct heat?” in your lab notebook.
- 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 (AEIMNR, BFJMOT, CGKMPS, or DHLMQU) and **write a summary page of notes**. During class groups will fill out the table “What lighting options are currently available?”
- **Hand in lab notebook for grading** of “How well do different materials conduct heat?”

(28) For Monday April 1, 2024

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**)
- **Quiz 5**

(29) For Wednesday April 3, 2024

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?”
- After lab, begin writing balanced chemical equations for reactions where a precipitate is observed, *leaving out the spectator ions*, and checking the solubility rules on the class web site.

(30) For Friday April 5, 2024

Activity 20: How can we represent solids?

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

- Finish Calculations and Discussion for “What is the net ionic equation?”
- 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**)
- **Hand in lab notebook for grading** of “What is the net ionic equation?”

(31) For Monday April 8, 2024

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?
- **Quiz 6**

(32) For Wednesday April 10, 2024

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 Monday.
- 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.

(33) For Friday April 12, 2024

Lab 27: How do we know how atoms are arranged in solids?

Lab 28: Synthesis and characterization of Solid Solution Perovskite Semiconductors $\text{CH}_3\text{NH}_3\text{Pb}(\text{I}_{1-x}\text{Br}_x)_3$

Work on Summary Questions from “How can you get a specific color of light from a solid?”

- **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**).

(34) For Monday April 15, 2024

Activity 22: Lighting Summary Exercise

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

Integrative Project 3 - Is my soil poisoned?

Applying quantitative lab techniques and atomic spectroscopy to an environmental and social justice problem

(35) For Wednesday April 17, 2024

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 Monday.
- 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.

Thursday, April 18, 2024

Student Research Symposium

- Attend a chemistry related talk at the Student Research Symposium for extra credit.

(36) For Friday, April 19, 2024

Lab 29: Preparation of Lead Standards

- Prepare for lab by reading “Preparation of Lead Standards” and **writing purpose and method** in your lab notebook. What equipment will you use?
- Start writing the final report. See Activity 24, Lead Project Letter.
- **Hand in Preparation of Lead Standards Homework** at the end of class.

(37) For Monday April 22, 2024

Lab 30: Preparation of Lead Samples

- Prepare for lab by reading “Preparation of Lead Samples” and **writing the purpose and method** in your lab notebook. Be prepared to start weighing soil, cooking, and filtering 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.

(38) Wednesday April 24, 2024

Spring Day

(39) For Friday, April 26, 2024

Lab 31: 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.

(40) For Monday April 29, 2024

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 7**

(41) For Wednesday May 1, 2024

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.

We will not use the final exam slot. This course finishes on May 1.