

Science

Chemistry Lessons
Chemistry Labs
Nature Notebook
Nature Walks & Scouting

SAMPLE





About the Course

This course includes the following topic(s): Chemistry Lessons, Chemistry Labs, Nature Notebook: Grades 9-12, Nature Walks & Scouting: Grades 9-12

About Chemistry Lessons

Alveary High School Chemistry provides a natural next step following Physical Science (e.g., Alveary Form 3 Science) and establishes a solid foundation for High School Biology. The course progresses through all expected topics in introductory chemistry and incorporates living engagement and special attention to citizenship, problem-solving, and communication skills for a complete Charlotte Mason science course. This course includes our video companion series, currently at no additional cost.

About Chemistry Labs

Labs are an essential part of science in which students engage with the Things they are reading about and practice the scientific method. Labs for this course are integrated into the lessons to facilitate adequate time for more involved activities and to better coordinate with the lessons.

About Nature Notebook: Grades 9-12

Outdoor work is established or continued as a lifelong habit. Optional resources are provided in science lessons and on the Alveary bookshelf.

About Nature Walks & Scouting: Grades 9-12

Outdoor work is established or continued as a lifelong habit. Optional resources are provided in science lessons and on the Alveary bookshelf.



Placement & Combining Tips

Chemistry Lessons

Recommended for learners who have completed Physical Science, such as Alveary Grade 7-8 Science, including the laboratory activities. Learners should be taking at least Algebra 1 alongside Chemistry (Algebra 2 if using Denison Success). Teachers wishing to place students in Physical Science instead of Chemistry may choose either to complete Alveary Grade 7-8 Science in a single year (with 5 lessons + 1 lab each week available in the Grade 7-8 Quick Links) or to purchase separately from Classical Academic Press the Novare Introductory Physics Program and Video Course.

Nature Notebook: Grades 9-12

Learners may be combined and follow their own interests.

Nature Walks & Scouting: Grades 9-12

Learners may follow their own interests or follow the plan of their local scouting troop or natural history club.



Scheduling

GRADE	SCHEDULE INFO.	BOOKS
9-12+	Chemistry Lessons 5 times/week 45 min	HS Chem Intro Introductory Chemistry: A Foundation Michael Faraday's The Chemical History of a Candle The Chemical Elements Coloring and Activity Book
9-12+	Chemistry Labs 1 time/week 60 min	Alveary Chemistry Lab Book
9-12	Nature Notebook: Grades 9-12 1+ time/week 20 min+	

GRADE	SCHEDULE INFO.	BOOKS
9-12	Nature Walks & Scouting: Grades 9-12 1 time/week 30 min+	

Sample Weekly View

Day 1	Day 2	Day 3	Day 4	Day 5
Science: Chemistry				
Chemistry Lessons	Chemistry Lessons Nature Walks & Scouting: Grades 1-8	Chemistry Lessons	Chemistry Lessons Nature Notebook: Grades 9-12	Chemistry Lessons Chemistry Labs



Planning & Prep

Permission to print for non-commercial use. See Alveary group use policy to use lessons in a group context.

LINKS: Click text or scan the QR code in the top corner of the lesson plan pages to view online resources associated with the lessons.

Responsibility for previewing all links rests with the teacher. All links were checked at the time of publication; however, websites change frequently and may contain objectionable content. Please report broken links by contacting us through our website.

Chemistry Lessons

- Carve out time to continue or establish the regular habit of spending time in nature, including the use of a nature journal, as appropriate.
- Obtain materials from the supply lists.
- Plan for discussion and engagement. Teachers who do not feel that they can discuss the subject of this course with students should plan to watch lesson videos, preread the material, or complete the course alongside their students. Expertise is not necessary, but discussion is as important in math and science as in history and literature.
- Labs/activities are presented in a fully integrated state in which they are connected to the lessons. To use them in this way, it is helpful for the lab to be scheduled after the 5th lesson. If your lab time is earlier in the week and you will find it difficult to be flexible, plan to delay the start of the lesson schedule so that lab day occurs after the 5th lesson. For example, if your lab time is on Tuesday, you might begin lesson 1 on Wednesday of the first week of school rather than on Monday. Those wanting to use the labs/activities on a more flexible schedule can do so, but should be ready and able to adjust lesson connections.
- Select a science book from the Alveary bookshelf for personal reading time, as appropriate.

Term Prep & Teacher Tips

Chemistry Lessons

- Gather household items, typically easy for students to scavenge or teachers to obtain locally:
 - 3 small objects from around the house
 - distilled or deionized water
 - mineral spirits/paint thinner (may substitute mineral oil or cooking oil, but won't be able to evaporate the solvent at the end of the lab)
 - 4 recycled soda cans
 - sticky tack, a piece of foam, or anything to hold the thermometer in a soda can and close the opening
 - hydrogen peroxide antiseptic
 - barometer or computer access to check the local weather station
 - ice
 - sugar
 - salt
 - spoon
 - lemon juice
 - stopwatch, such as those found on most electronic devices
 - microwave-safe bowl

- microwave
- whisk that you do not care about
- another whisk or electric mixer
- well-ventilated space (porch, carport, etc)
- juice or tea
- quart-sized mason jar with a lid
- jar, cup, or bowl
- slotted spoon, strainer, or coffee filter
- 2 large egg whites (Term 3)
- large mixing bowl
- cookie sheet
- oven
- optional: hard blunt tip (knitting needle, skewer, etc)
- optional: 227g coconut oil from the grocery store, IF you want to use the soap you will make
- optional: lemon-lime soda, ice cream, yogurt, or cottage cheese (Term 3)
- optional: cream of tartar
- optional: piping bag
- optional: food coloring
- optional: parchment paper

Reminders

Chemistry Lessons

Note that egg whites are used in the last lab of the year. Make a note in your calendar if you will need to purchase these closer to the appropriate time. Refer to the lab book for more details.



Books & Resources

For book rationales and purchase options, click the Book List link or scan the QR code below.

∞ [View Book List Details](#)

Science: Chemistry

Chemistry Lessons



HS Chem Intro



Introductory Chemistry: A Foundation



Michael Faraday's The Chemical History of a Candle



The Chemical Elements Coloring and Activity Book

Chemistry Labs



Alveary Chemistry Lab Book



Supplies

For supply list details and basic supplies helpful to have on hand, click the links or scan the QR code below.

∞ [View Basic Supplies](#)

∞ [View Supply List Details](#)

Science: Chemistry



Alveary High School Chemistry Kit



Food-Grade Calcium Chloride



Food-Grade Sodium Alginate



Food-Grade Sodium Hydroxide



Household Items - Science: Chemistry



Organic Chemistry Model Kit



Scale/Balance

Chemistry Labs



Safety Goggles



Quick Links

Science: Chemistry

- ∞ [Extra Helpings](#)
- ∞ [Chemistry Lab Book](#)

Chemistry Lessons

- ∞ [Alveary Bookshelf](#)
- ∞ [Contact Us for Teachers](#)
- ∞ [Homework Help for HS Science Students](#)
- ∞ [John Muir Laws • Nature Journaling Resources](#)
- ∞ [Khan Academy Video Playlists](#)
- ∞ [Lab Notebook Examples](#)
- ∞ [Seek app from iNaturalist](#)
- ∞ [SkyView Lite for Android](#)
- ∞ [SkyView Lite for iOS](#)

Click THIS text
or scan the QR
code for links.



Science: Chemistry

How To Approach



Introduce

- Learners begin each lesson with their existing knowledge. If the book or activity is new or unfamiliar, then look at the title, a picture, or guidance in the lesson plan to consider what learners think about it, drawing on previous experience. If continuing or revisiting a topic or activity, then recap.
- Take note of the chapter or section heading, and consider how the day's topic connects back to prior topic(s).
- Look back as needed. The outline of the book and even of the chapter is helpful in drawing out and connecting ideas. Learners practice making these connections as they proceed through the book.



Read

- Read or do as instructed in the lessons. Teachers should note any Teacher Tips provided.
- Use supportive strategies and educational tools to reduce frustration and better engage the mind, as appropriate. These could include, but are not limited to, the use of eBooks, pictures, audio, read-aloud, buddy reading, colored reading strips, etc.
- As they read, learners record ideas in a notebook or binder using outlines, diagrams, graphic organizers, or other methods (or a combination of methods) that suit them. These recordings can be a helpful mechanism for remembering or a mini-narration to support understanding.
- If learners do not understand a word or concept, do not worry. Try reading over the passage again, studying a picture or diagram, connecting the idea to something from real life, or practicing chapter exercises. The lab book further supports major concepts from the text.



Narrate

- Process the ideas of the lesson by explaining a concept, describing an object, retelling events, etc. Consider what the point of the lesson is before deciding what to do with it.
- Learners may use words, pictures, models, graphics, etc., to process and convey ideas in their own way.



Discuss

- Consider together any thoughts, confusion, or concerns about the passage.
- Questions/topics for further discussion are often provided in the lesson plans (or even lab books) to help. There are no right or wrong answers to these. Alternatively, many of these can be used for composition, depending on the needs of the learner and the instructional goals of the teacher.
- Note that learners may need to spend more than the allotted time engaging with or even repeating a lesson before moving on or as reinforcement at a later time. Adjust the pace as needed to feed the learner.
- Notice if there are any dates to keep for the Book of Centuries or quotes for the Commonplace Book.



Connect

- Follow any extra links, examine any sidebars in the text, look at pictures, etc, depending on learner needs and interest.
-

SAMPLE

Science: Chemistry

How To Approach Labs



Introduce

- Before beginning, be sure that the basic rules of lab safety (as listed in the lab manual) are understood and obeyed.
- Every science lab has the same flow, which follows the scientific method and is guided by the lab book.
- Learners begin with an introduction in their lab book. How does this lab activity relate to what they have learned so far, as well as any previous experience? What will they learn from the lab? This is how hypotheses are formed.
- If learners are unsure what to do with the Introduction, it can help to dialogue with someone as they work through the ideas. Check the Chemistry Companion in the Quick Links if a video tutorial might be helpful. This year is a pilot for this video series, so videos will be added to the Quick Link throughout the year.
- Once they have had a chance to think, learners compose a prelab narration to put these introductory ideas and hypotheses into their lab notebooks. These prelab narrations may seem short and even incomplete if learners are new to keeping a lab notebook, but that is okay.
- If learners have difficulty or are easily frustrated, then consider allowing a digital notebook for typing, a scribe, or use of assistive technology, as appropriate.
- After they complete their prelab narration, learners should collect the listed materials, being sure to let teachers know if something is missing or to remind the teacher if something needs to be purchased at the store.



Lab Procedure

- Learners complete the procedure as instructed in the lab book.
- The lab gives instructions for using the lab notebook to create tables and diagrams.



Analysis & Conclusions

- The last step in the lab is to analyze the data and observations and draw conclusions from them. This postlab narration is prompted in the lab manual. Similar to the prelab narration, the concluding or postlab narration is a chance to think about and put into words. This time, learners are considering what they learned from the lab and what they could learn more about, if they were to continue.
- Teachers should engage learners with this reflection by reviewing their lab notebooks with them, discussing the science used in the lab, and demonstrating curiosity about the lab themselves.
- Depending on the interest of the learner and the priorities of the teacher, the learner might be encouraged to spend more time on those ideas of what more they could learn or it might be time to move on. Either way, it is an important part of the scientific method to reflect on what we could or would do next - our practice should help to clarify our thinking and teach that there is always more to be learned.



Term 1

WEEK 1 45m Chemistry Lessons - Lesson 1

Materials: The Chemical History of the Candle Video link

High School Chemistry Lab Book and materials listed within

PREP: Be sure you have read the Course Notes and Planning and Prep.
Read Teacher Tip

→ INTRODUCTION

Watch the course introduction video:

∞ Video Link: HS Chemistry Intro (10:02)

In the 1840s, Michael Faraday began a public lecture series for young people, called the Chemical History of the Candle. The lecture series is an excellent demonstration of the scientific method and many fundamental concepts in chemistry. As you watch the lectures this week, create an outline and record any points that stand out to you. This will help you to identify the main points and connect them. You can use these notes to support narration.

→ ACTIVITY

Cut out the spiral from Lab 1 and attach a piece of thread by pushing a threaded needle through the dot in the center; observe the candle, recording observations in your notebook. Light the candle and observe. Using the thread, hold the spiral over the candle (without allowing it to catch fire) and observe. Blow out the candle and observe.

∞ Image Link: Lab Notebook Samples

∞ Video Link: Paper Spiral Demo (1:56)

∞ Image Link: Most Lab 1 materials

→ VIEW, NARRATE, & DISCUSS

Lecture 1

∞ Video Link: Engineering Guy #2 (11:47)

→ ACTIVITY

Complete the follow-up activity in your lab book.

• PLAN WEEKLY

nature walk - record observations

science free read

★ TEACHER TIP

The linked videos are a great way for teachers to keep up with what students are learning, even when they can't read the book alongside students! We especially recommend watching the course introduction video with students!

WEEK 1 45m Chemistry Lessons - Lesson 2

Materials: The Chemical History of the Candle Video link

High School Chemistry Lab Book and materials listed within

Prep: Read Teacher Tip

→ NOTE

Use the prompts bulleted in the lessons to help you engage with the material and to self-assess and decide if you are ready to move on. You don't need to be an expert in any or all of the topics, but the ideas should feel familiar, and you should be able to think about and discuss the ideas.

→ VIEW, NARRATE, & DISCUSS

Lecture 2

∞ Video Link: Engineering Guy #3 (13:44)

- Discuss how Faraday's demo indicates the presence of tiny particles in the candle's flame and how these tiny particles produce the brilliance of the flame.

- What can be concluded about the nature of the particles, and what is still in question regarding combustion production? Consider: Does combustion produce a pure substance or a mixture of substances that can be detected and separated? How did Faraday conclude that the black particles are C? How and what did Faraday observe about the invisible

★ TEACHER TIP

The discussion prompts bulleted in the lessons provide teachers with helpful ways to engage even when students are working independently.



Term 1

particles?

→ ACTIVITY

Complete the follow-up activity in your lab book.

WEEK 1 45m Chemistry Lessons - Lesson 3

Materials: The Chemical History of the Candle Video link

High School Chemistry Lab Book and materials listed within

→ VIEW, NARRATE, & DISCUSS

Lecture 3

∞ Video Link: Engineering Guy #4 (15:42)

- Compare/contrast the three phases observed as the candle burns with the three phases of water.
- Explain why water is still a pure substance even though it can be divided into two parts.
- How do oxygen and hydrogen relate to the combustion reaction?

★ STUDENT NOTE

Come to science ready to work a puzzle. If you're missing a piece of that puzzle, don't wait—message Homework Help for Students!

WEEK 1 45m Chemistry Lessons - Lesson 4

Materials: The Chemical History of the Candle Video link

High School Chemistry Lab Book and materials listed within

→ VIEW, NARRATE, & DISCUSS

Lecture 4

∞ Video Link: Engineering Guy #5 (20:00)

- Discuss why it is important that we understand that air is a mixture rather than a pure substance or nothing at all.
- Add to your previous diagram or make a new one, indicating what we now know about the products of the combustion reaction: C soot from the candle, water made of H from the candle, and O from the air, and something else.
- Describe the characteristics of the unknown substance.

→ ACTIVITY

Complete the follow-up activity in your lab book.

WEEK 1 45m Chemistry Lessons - Lesson 5

Materials: The Chemical History of the Candle Video link

High School Chemistry Lab Book and materials listed within

→ VIEW, NARRATE, & DISCUSS

Lecture 5

∞ Video Link: Engineering Guy #6 (21:06)

- How does Faraday demonstrate that the invisible substance is carbon dioxide? How does he show that carbon dioxide is a compounded substance? What is it made of?
- Discuss the uniqueness of carbon-based fuels.
- Describe respiration/breathing in terms of combustion and explain the resulting interdependence of plants and animals.



Term 1

WEEK 1 ☐ 60m Chemistry Lessons - Lesson 6

Observing a Candle

☐ Materials: High School Chemistry Lab Book and materials listed within

→ LAB DAY

Complete the Analysis and Conclusions for Lab 1. Explore Chapter 3 of the Introductory Chemistry text if you need help.

∞ Video Link: Lab 1 Conclusion (6:37)

WEEK 2 ☐ 45m Chemistry Lessons - Lesson 7

☐ Materials: Introductory Chemistry

Prep: Read Teacher Tip

→ INTRODUCTION

Just as you did with the Faraday lectures, continue to outline or diagram your readings, noticing main points and recording any definitions or important ideas. Even though you are externalizing the ideas while you do the lesson, you should still narrate and discuss at the end of the lesson. Review your notes at least weekly throughout the year.

Use the video lessons in whatever way is most helpful to you. You can turn on or off closed captions, speed them up or slow them down, use the pause button, etc. Some students prefer to watch the video lesson first and refer to the book as needed, some prefer to read the lesson first and watch the video as a summary or visual recap, and some don't like video lessons and don't use them at all. If you would like additional resources, you can find alternative videos in your Quick Links, as well as the Homework Help link to message Mrs. Merritt.

→ READ, NARRATE, & DISCUSS

Ch.1

∞ Video Link: Scientific Method (6:08)

- What is Chemistry?
- Describe 'the Scientific Method.'
- Discuss the Critical Thinking question in Sec.1-4.
- Discuss Active Learning #6.

• PLAN WEEKLY

- ☐ nature walk - record observations
- ☐ science free read

★ TEACHER TIP

The linked videos are a great way for teachers to keep up with what students are learning, even when they can't read the book alongside students! If you prefer a slower, more conceptual approach without the problem-solving and lab tie-in, there is an alternative in the Quick Links.

WEEK 2 ☐ 45m Chemistry Lessons - Lesson 8

☐ Materials: Introductory Chemistry

→ NOTE

When you complete exercises for the chapter, try a selection from different sections to help discern where your understanding is secure and where you may need some additional review and practice. The problems suggested below are simply those that seemed interesting to us; you may choose different ones. Those demonstrated in the video are noted. The point is not necessarily to get them all correct right away; sometimes exercises can stimulate new thoughts on the ideas. The point is to find where you are comfortable and where you may be confused. If the exercises seem comfortable, then continue. If they seem confusing or too challenging, then review the associated reading(s) and practice some more. This self-assessment is essential as you continue your education. The answers to even-numbered exercises are provided in the back of the book, so that you can check your understanding. Note that books always have some typos; however, don't be too dependent on the answers in the back!



Term 1

→ REVIEW AND PRACTICE

Ch.1 Review and Suggested Exercises:

Act. #12, 13,

1.2 #5, 6,

1.3 #7,

1.4 #10, 13,

1.5 #17

∞ Video Link: Chapter 1 Practice (8:35).

Act. #12, 13,

1.3 #7, edition 8e

WEEK 2 45m Chemistry Lessons - Lesson 9

Materials: Introductory Chemistry

→ NOTE

Always be sure to follow the example problems in the text and complete the self-check exercises as you read. If that means proceeding at a slower pace and spreading lessons over more than one day, that is fine.

If you want to go over zero and negative exponents, consider watching the Math Break video:

∞ Video Link: Math Break: Zero and Negative Exponents (3:48)

→ READ, NARRATE, & DISCUSS

Ch.2.1-2.4

∞ Video Link: Scientific Notation (8:45)

- Why do we use scientific notation, and how does it work?
- What is 'uncertainty' in a measurement, and how do significant figures help?
- Discuss the Critical Thinking question in Sec.2-2.

★ STUDENT REMINDER

Remember: scientific thinking is like solving a puzzle. If you're missing a piece of that puzzle, don't wait—message Homework Help for Students!

WEEK 2 45m Chemistry Lessons - Lesson 10

Materials: Introductory Chemistry

→ NOTE

There is a misprint in this section for the 9th edition. The fractions printed in blue are missing their bar/line.

→ READ, NARRATE, & DISCUSS

Ch.2.5-2.6

∞ Video Link: Significant Figures (10:46)

∞ Video Link: Unit Conversions (4:59)

- Discuss Active Learning #7.
- What is a conversion factor? What is its value? Why must this always be true?
- Explain how units help you check your math.

★ STUDENT REMINDER

Don't forget to review your lesson notes!

WEEK 2 45m Chemistry Lessons - Lesson 11

Materials: Introductory Chemistry

→ READ, NARRATE, & DISCUSS

Ch.2.7-2.8

∞ Video Link: Temperature and Density Problems (8:33)

- Explain the differences between the three temperature scales.
- What does it mean to say that something is dense?



Term 1

WEEK 2 60m Chemistry Lessons - Lesson 12

Evaluating Density

Materials: High School Chemistry Lab Book and materials listed within

Prep: Read Teacher Tip

→ LAB DAY

Complete Lab 2.

∞ Video Link: Density Lab (3:55)

∞ Image Link: Examples of Lab 2 materials

★ TEACHER TIP

Asking students to explain what they did in the lab is a great way to begin a discussion! Follow it up with, "Why/how did you do that?"

WEEK 3 45m Chemistry Lessons - Lesson 13

Materials: Introductory Chemistry

→ REVIEW AND PRACTICE

Ch.2 Review and Suggested Exercises:

Act. #1-5,

2.1 #7, 8,

2.2 #16,

2.3 #22, 24,

2.4 #30, 32,

2.5 #33, 48, 50,

2.6 #64, 66,

2.7 #74,

2.8 #90, 94

∞ Video Link: Chapter 2 Practice (33:07).

Act. #1-4,

2.1 #7, 8,

2.3 #22, 24,

2.5 #33, 48, 50,

2.6 #64,

2.7 #74,

2.8 #90, 94 from 8e

★ STUDENT REMINDER

Don't forget to use Homework Help in your Quick Links if you need any help or to offer a thought for discussion.

● PLAN WEEKLY

nature walk - record observations

science free read

WEEK 3 45m Chemistry Lessons - Lesson 14

Materials: Introductory Chemistry

→ REVIEW AND PRACTICE

Continue exercises.

● Remember to self-assess! If the exercises made sense, then move on. If they seemed confusing, then go back to the associated readings or use Homework Help.

WEEK 3 45m Chemistry Lessons - Lesson 15

Materials: Introductory Chemistry

High School Chemistry Lab Book

PREP: Read Teacher Tip

→ REVIEW

Briefly review the definition you wrote in the Analysis and Conclusions of Lab 1.

→ READ, NARRATE, & DISCUSS

Ch.4.1-4.4: As you visualize the atom, model it with the parts of your model

★ TEACHER TIP

The videos and discussion prompts are a great way to keep up and engage with students, even when they are working independently. Your positive support matters!



Term 1

kit, by sketching it, or with any medium you like, such as modeling clay or Lego!

∞ Video Link: Elements (10:05)

- What is an element?
- Tell what you know about Dalton's theory of atoms.
- What do we mean by the 'law of constant composition'?
- Explain what a chemical formula is and how chemical formulae work.
- Get to know your model kit by building the molecules in example 4.1 (or any suggested in your kit). You can use your kit to help you visualize molecules anytime you want throughout the course.

WEEK 3 45m Chemistry Lessons - Lesson 16

Materials: Introductory Chemistry

→ READ, NARRATE, & DISCUSS

Ch.4.5-4.7

∞ Video Link: Atoms and Isotopes (8:43)

- What do you know about the parts of atoms?
- How did scientists learn about the parts of the atom?
- Choose at least one Critical Thinking question in Sec.4-5 to discuss.
- What is an isotope?

★ STUDENT REMINDER

Don't forget to review your lesson notes!

WEEK 3 45m Chemistry Lessons - Lesson 17

Materials: Introductory Chemistry

→ READ, NARRATE, & DISCUSS

Ch.4.8-4.9

∞ Video Link: Meeting the Table (5:55)

- Tell about or diagram what you know about the periodic table so far.
- Discuss the differences between different elements, such as gold and hydrogen.
- Are elements atoms or molecules? Explain.

→ SUPPLEMENTAL

Check out some other ways to visualize the periodic table:

∞ Image Link: The Periodic Table in 3D

∞ Image Link: Cylinder with Bulges

★ STUDENT REMINDER

Doing science is like solving a puzzle. Adjust your pace and use the tools provided to maintain that mindset!

WEEK 3 60m Chemistry Lessons - Lesson 18

Materials: Coloring book or any blank periodic table

PREP: Read Teacher Tip

→ ACTIVITY

Use what you have learned to color your own copy of the Periodic Table.

★ TEACHER TIP

Learners encounter a lot more technical content at this disciplinary stage. If they do not remember or fully understand every detail, that is okay. Can they talk about it and explain their thinking? Do they know how to find what they need if they need it? Are they able to lean into the uncertainty with curiosity and a habit of problem-solving? If you are unsure about their progress, reach out through Contact Us.