

# **noeo science**

## **chemistry 2**

**Noeo Science Packages:**

Biology 1  
Physics 1  
Chemistry 1

Biology 2  
Physics 2  
Chemistry 2

Physics 3  
Chemistry 3

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## **chemistry 2**

**by Dr. Randy Pritchard**





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# What does 'noeo' mean?

noeo | (no eh' o) | verb

1. To perceive with the mind, to understand, to have understanding.
2. To think upon, heed, ponder, consider.  
(Source: The New Testament Greek Lexicon)
3. Train the brain.  
(Source: our 8 year-old son)

Romans 1:20

For since the creation of the world His invisible attributes, His eternal power and divine nature, have been clearly seen, being understood through what has been made, so that they are without excuse.

noeo





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# Book List

*Chemistry for Every Kid: 101 Easy Experiments that Really Work*, by Janice VanCleave

*Fizz, Bubble & Flash*, by Anita Brandolini, Ph.D.

*Explore Rocks and Minerals!*, by Cynthia Light Brown and Nick Brown

*The Mystery of the Periodic Table*, by Benjamin D. Wiker

*Usborne Science Encyclopedia (Internet-linked)*

*Usborne Mysteries and Marvels of Science (Internet-linked)*

# Experiment Kits

The Young Scientists Club kits:

- Kit #12 Acids and Bases
- Kit #13 Water
- Kit #15 Air
- Kit #34 Surface Tension
- Kit #35 Polymers



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# Weekly Schedule of Topics

Week 1	Atoms and Molecules
Week 2	Atoms and Molecules
Week 3	Solids, Liquids, and Gases
Week 4	Solids, Liquids, and Gases
Week 5	Molecular Attractions
Week 6	Chemical Properties
Week 7	Chemical Properties; Elements
Week 8	The Periodic Table
Week 9	The Periodic Table
Week 10	The Periodic Table
Week 11	The Periodic Table
Week 12	The Periodic Table; Crystals; Metals
Week 13	Metals; The Periodic Table
Week 14	Metals
Week 15	Metals and Metalloids
Week 16	Metalloids; Nonmetals
Week 17	Nonmetals
Week 18	Halogens; Noble Gases
Week 19	Transition Metals
Week 20	Transition Metals; Lanthanides
Week 21	Lanthanides; Actinides
Week 22	Mixtures; Alloys
Week 23	Mixtures; Atmosphere
Week 24	Air
Week 25	Compounds
Week 26	Acids and Bases
Week 27	Acids and Bases
Week 28	Water
Week 29	Water
Week 30	Surface Tension
Week 31	Polymers and Plastics
Week 32	Polymers
Week 33	Geology
Week 34	Geology
Week 35	Geology
Week 36	Geology



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# Additional Materials

The following is a complete list of items that will be used for the experiments over the entire 36-week course. This list includes many items that are common in most homes. The list does not include the items that are provided in *The Young Scientists Club* kits.

Item Needed	Week(s) Used
Food coloring	1, 3, 23, 29, 30, 32
Balloons	2, 3, 4
Vanilla (or almond, or lemon) extract	2
Masking tape	3
Sugar	3, 7, 25
Bottles of soda (2, unopened)	3
Empty soda bottle	4
Felt pen	3
Baking soda	4, 24, 26, 27
White vinegar	4, 23, 24, 26, 27
Plastic pail	4
Meter stick	4
Grocery bags	4
String	4
Paper cups	5, 32
Cooking oil (vegetable)	5, 29, 30
Wax paper	5
Rubber band (approx. ¼" wide)	7
Yeast	7
Paper towels	23
Apple cider vinegar	23
Full juice box with straw	24
Needle or pin	24
Matches	24
Red cabbage	26, 27
Cola (canned)	26, 27
Empty cola can	28
Lemon (or lemon juice)	26, 27
Pennies	27

Salt	27, 29
Liquid dishwashing soap	30
Cornstarch	32
Acetone (nail polish remover)	32

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# **Introduction**

Welcome to Noeo Science! Thank you for trusting us to provide you with quality materials for teaching science at home. We understand that many homeschooling parents do not have a science background and may feel a bit intimidated about teaching science...especially when it comes to the experiments! Our books and experiment kits have been carefully selected to be of the highest quality available, yet simple enough for even the most science-phobic teachers and students. We intensely searched through library catalogs, websites, and hundreds of books before deciding on what we believe are the best-of-the-best. We hope that you will agree.

Our Instructor's Guides provide a logical, focused progression through the books and experiments. Multiple sources of information are used to teach each science topic. However, you won't need to spend your time searching for books or cross-checking indexes to make the curriculum flow. That work has been done for you!

## **The Noeo Philosophy**

The essence of science is simply observing and describing God's creation. When scientists make a new discovery, they are seeing another part of creation revealed. Romans 1:20 tells us that His attributes, power, and divine nature are clearly seen in what has been made.

While some scientists deny that their discoveries are evidence of God's creation, there are many that do recognize His attributes in all of creation. Our children should not be protected from science because of some scientific theories that deny God. They should instead be immersed in the sciences so that "His invisible attributes, His eternal power and divine nature" will be clearly seen.

# The Noeo Method

You will find that the Noeo Science curriculum is different from all the rest. Each year of science will fill your child with wonder and excitement as they build a strong foundational knowledge of science. They'll be having so much fun that the learning will come naturally for them...and painlessly for you.

Noeo Science is variety-filled, with a structure that is best described as a balance between the classical method and the Charlotte Mason approach. We emphasize narration and summarization, vocabulary development, observation, and the scientific method. We do not promote rote memorization or the worksheet and test methodology, as we think that this approach is less valuable for long-term retention. The following table illustrates these characteristics:

Teaching Method	Corresponding Noeo Science Curriculum Qualities:
Classical	<ul style="list-style-type: none"><li data-bbox="586 905 1354 978">• Emphasizes vocabulary development, especially in the younger years.</li><li data-bbox="586 1020 1260 1094">• Develops critical thinking skills and logic through the use of the scientific method.</li><li data-bbox="586 1136 1338 1209">• Incorporates the classical stages of learning, i.e. the "Trivium" (grammar, logic, and rhetoric).</li></ul>
Charlotte Mason	<ul style="list-style-type: none"><li data-bbox="586 1329 1297 1402">• Provides the best books available (including "living books").</li><li data-bbox="586 1444 1292 1518">• Utilizes a child's natural curiosity to acquire knowledge. "Studies serve for delight".</li><li data-bbox="586 1560 1344 1665">• Uses narration and notebooks rather than worksheets, tests, or repetitive drills to evaluate learning .</li></ul>



We think it is important to learn science from a variety of sources, using a variety of teaching techniques. Our curriculum does not use the traditional, single textbook approach to science education. We think variety will encourage more interest in science, particularly with younger students. All of the books are carefully selected to allow children to discover the beauty, complexity, orderliness, and wonder of God's design. While some written work is expected, many hands-on activities are included within the bright, colorful, and well-written books. Living book biographies of many important scientists are included to provide a practical perspective. Optional Internet references are also provided throughout the curriculum.

Occasionally, a book may introduce a particularly secular viewpoint. We view these times as an opportunity for discussions and encourage you not to skip over or “cover up” this information. We do not provide “canned” answers for these discussions, but encourage instructor's to study the issues for themselves and to pray for guidance and understanding in providing answers to each student's unique questions.

Just as creation is orderly and well organized, we think a good science curriculum should follow an orderly design. Each year of the curriculum will focus on biology, chemistry, or physics. Each of these three foundational sciences is studied independently for an entire year rather than jumping randomly from one subject to another without reason. The study of biology, chemistry, and physics is then repeated at a higher level and in more detail upon the completion of each three-year course of study (e.g. biology in 1st and 4th grade, chemistry in 2nd and 5th grade, etc.). Subjects that overlap multiple science disciplines, such as geology, weather, and astronomy, are included at logical points within the three major science studies. For example, astronomy is studied in parallel with the study of gravity within the physics curriculum.

	<b>Approximate Ages</b>	<b>Grade Equivalent</b>	<b>Classical Trivium Stage</b>
<b>Biology I Chemistry I Physics I</b>	<b>5-8</b>	<b>1-3</b>	<b>Early Grammar</b>
<b>Biology II Chemistry II Physics II</b>	<b>9-12</b>	<b>4-6</b>	<b>Late Grammar or Early Logic</b>
<b>Biology III Chemistry III Physics III</b>	<b>12-15</b>	<b>7-9</b>	<b>Late Logic or Early Rhetoric</b>

Our curriculum is designed on a 4-day per week schedule. If you would prefer to do science twice weekly, then simply complete the first two days of scheduled readings and assignments on your first day, and the last two days of reading and assignments on your second day. Alternatively, you may wish to do all of the reading on the first day and the assignments and experiments on the second day. The key is to understand what works best for you and your children and to adjust the schedule as necessary.

The daily time necessary to complete the assignments will vary with individual student ability and based on the content being studied. We provide the following table as a guideline of the approximate time that you can expect to spend on daily assignments:

	<b>4-Day Schedule</b>	<b>2-Day Schedule</b>
<b>Grades 1-3</b>	<b>15-20 minutes</b>	<b>30-40 minutes</b>
<b>Grades 4-6</b>	<b>20-30 minutes</b>	<b>40-60 minutes</b>
<b>Grades 7-9</b>	<b>30-40 minutes</b>	<b>60-80 minutes</b>

## **Noeo Notebooks**

We provide reproducible sheets for creating science and lab notebooks for use with the Noeo Science curriculum. The notebooks are an integral part of the curriculum. Feel free to modify these sheets and to tailor your expectations for each child.

Your student will be asked to describe, sketch or summarize what they learn from the reading assignments, or to complete a lab sheet for their experiments. This method will encourage concentration and attention to detail. In addition, the lab sheets are designed to help your student to apply the scientific method in all of their experiments.

Younger students may need to “narrate” their descriptions and observations to you or an older sibling. You will need to determine the length and amount of detail that your student is capable of. We encourage you to increase this expectation over the course of time.

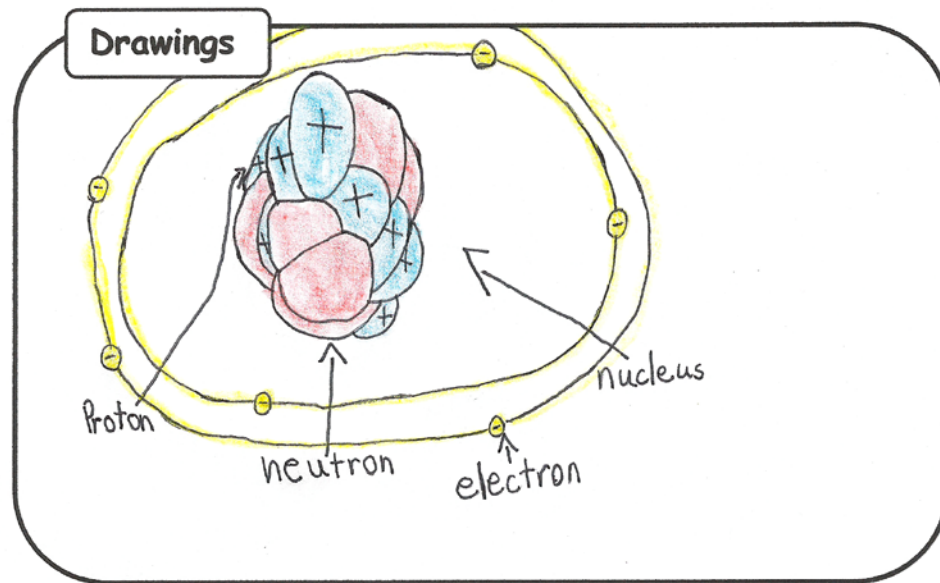
## Lab Experiments

Science is not a spectator sport. The best way for your child to learn and truly comprehend science is by doing hands-on experiments and activities. We understand that this is probably the most difficult part of science for many homeschool families. That is why we were determined to find sources of high quality, yet simple, experiments.

We are pleased to say that the experiments in our curriculum will provide a strong science foundation without wreaking havoc on your daily schedule. For example, many of our experiments are provided through a unique arrangement with *The Young Scientists Club*. These experiment kits come complete with all the items that are normally difficult to find. They have won multiple awards for their high quality and have become increasingly popular among homeschoolers in recent years. We think you will be pleasantly surprised as your child progresses through these well organized, fully explained experiment kits while actually having fun learning science.

Our other experiments and activities are also carefully selected to provide relevant and interesting examples of the topics being studied. We provide a supply list for each week of the year, along with a "Master Supply List" at the beginning of the Instructor's Guide. You'll notice that most, if not all, of the items on this list can already be found in your home (honest!).

The following pages are samples copied from a science notebook of a nine-year-old using our Chemistry II course. Younger students would orally "narrate" their summaries to an older sibling or adult. Older children should be expected to provide more detailed narrations (summarizations). It is not necessary to complete an experiment sheet for every experiment, especially with younger students. However, it is good to complete them often in order to establish a strong understanding of the scientific method.



### Reading Notes

Atoms are made up of: electrons, neutrons, and protons.  
Atoms are tiny particles of what everything is made.

### Definitions

nucleus- The core section of an atom that contains protons and neutrons.

neutron- a subatomic particle with no electrical charge in the nucleus of an atom.

Proton- a positively charged subatomic particle in the nucleus of an atom.

electron shells- an energy level around the nucleus.

Date 2/2/06

Experiment Name A feast for Yeast

What have you learned about this subject?  
(observation/research)

That yeast is alive!

What question are you trying to answer?  
(question)

What happens when you  
feed sugar to yeast?

What things do you need?  
(materials)

1. a bottle
2. yeast
3. sugar
4. warm water
5. a balloon
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_

What will you do to answer the question? (experiment/test)

put yeast in a bottle, put in sugar and put  
a balloon over it.

What do you think will happen? (hypothesis/prediction)

the balloon will blow up with CO<sub>2</sub> that the  
yeast makes

What happened? (results)

the balloon inflated.

Why do you think this happened? (conclusion)

The balloon catches the CO<sub>2</sub>.



# Reproducibles

## Science & Lab Notebook Pages

The following pages are provided for your convenience. They may also be found on our website ([www.logospresonline.com](http://www.logospresonline.com)) for free downloading and printing. New pages will also be added occasionally on the website. There are a variety of page styles to be used for notebook creation. Some contain a space for drawing *and* writing; others have space only for drawing *or* writing. Different line spacing options are also provided for young writers. Feel free to make as many copies as you need.

Please remember that younger students should begin by orally “telling back” what they have just learned. You may prefer to write their thoughts down in a notebook for them. As they become better writers, then begin to have them write a sentence or two. Increase your expectations over time until you can find a balance between the student’s love for learning and their need for applied narration.

The lab notebook pages (experiment page) are intended to be used as a tool for teaching the scientific method. Again, younger students should not be expected to complete this sheet without assistance. Begin by orally asking some of the questions on the sheet after completing an experiment. Progressively increase your expectations for the completion of the experiment sheet. Older students should eventually be able to write a complete lab report without the need for this sheet.





**Drawings**

A large, empty rounded rectangular box with a black border, intended for drawing. It occupies the upper half of the page.

**Reading Notes**

A series of 12 horizontal lines spaced evenly down the page, intended for writing reading notes.







Date \_\_\_\_\_

Lab Experiment \_\_\_\_\_

**What I did:**

A large, empty rounded rectangular box with a black border, intended for the student to describe the procedure of their experiment.

**What I saw:**

A large, empty rounded rectangular box with a black border, intended for the student to describe the observations made during the experiment.

**I think this happened because...**

Five horizontal lines provided for the student to explain the reasons behind the observed results.



Date \_\_\_\_\_

**Lab Experiment** \_\_\_\_\_

**What have you learned about this subject?  
(observation/research)**

---

---

---

**What question are you trying to answer? (question)**

---

---

---

**What things do you need?  
(materials)**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_

**What will you do to answer the question? (experiment/test)**

---

---

---

**What do you think will happen? (hypothesis/prediction)**

---

---

---

**What happened? (results)**

---

---

---

**Why do you think this happened? (conclusion)**

---

---

---





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# **Weekly Reading & Experiments**



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<b>Week 1</b>				
<b>Atoms and Molecules</b>				
	<b>Day 1</b>	<b>Day 2</b>	<b>Day 3</b>	<b>Day 4</b>
<i>Science Encyclopedia</i>		Pp. 10-11		
<i>Mysteries and Marvels of Science</i>	Pp. 6-7			
<i>Chemistry for Every Kid</i>			Pp. 8-11	Pp. 12-13
<b>Optional: Internet Links</b>	<i>M&amp;M of Sci.</i> pg. 7	<i>Science Encyclopedia</i> pg. 11		

**Supply List:**

- notebook paper
- paper hole punch
- balloon
- clear, plastic cup
- coin
- balloon

**Assignments:**

**Day 1** – Read the assigned pages and describe and/or sketch what you learned in your science notebook.

**Day 2** – Draw an atom (like the one on the bottom left corner of page 10 of the *Science Encyclopedia*) in your science notebook. Label the **nucleus**, **protons**, **neutrons**, and the **electron shells**. Color the different parts and label the correct electrical charge of each subatomic particle (see pg. 11 in the *Science Encyclopedia*).

**Day 3** – Read the assigned pages and perform the experiments, recording your observations in your lab notebook. Define **atom** and **electron**.

**Day 4** – Complete the experiment and record your observations in your lab notebook.



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<b>Week 2</b>				
<b>Atoms and Molecules</b>				
	<b>Day 1</b>	<b>Day 2</b>	<b>Day 3</b>	<b>Day 4</b>
<i>Science Encyclopedia</i>		Pp. 12-13		Pp. 14-15
<i>Mysteries and Marvols of Science</i>	Pp. 22-23		Pp. 8-9	
<i>Chemistry for Every Kid</i>	Pp. 22-23			
<b>Optional: Internet Links</b>		<i>Science Encyclopedia</i> pg. 13	<i>M&amp;M of Sci.</i> pg. 9	<i>Science Encyclopedia</i> pg. 15

**Supply List:**

drinking glass and a larger bucket  
piece of notebook paper

**Assignments:**

**Day 1** - Complete the experiment and record your observations in your lab notebook.

**Day 2** - Read the assigned pages and describe and/or sketch what you learned in your science notebook. Define **atomic number**, **mass number**, and **isotope**.

**Day 3** - Read the assigned pages and describe and/or sketch what you learned in your science notebook.

**Day 4** - Draw a model of a water molecule (like the one on page 15 in the *Science Encyclopedia*) in your science notebook. Color and label the parts.

