

# **noeo science**

## **chemistry 3**

**Noeo Science Packages:**

Biology 1  
Physics 1  
Chemistry 1

Biology 2  
Physics 2  
Chemistry 2

Physics 3  
Chemistry 3

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## **chemistry 3**

**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

*DK Eyewitness: Chemistry*, Dr. Ann Newmark

*Exploring the World of Chemistry*, by John Tiner

*Molecules: The Elements and the Architecture of Everything*, Theodore Gray

*Chemistry: Investigate the Matter That Makes Up Your World*, by Carla Mooney

# Experiment Kits

CHEM C2000, Thames and Kosmos (2011 edition)

WARNING! – This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

**NOTE: The CHEM C2000 kit must be used under adult supervision. Please read the cover, inside front cover, pages 1-15 and 123-124, and complete experiments 1 and 2 in the CHEM C2000 Experiment Manual prior to beginning any other experiments contained in this kit.**



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# Weekly Schedule of Topics

Week 1	Ancient Chemistry
Week 2	Ancient Chemistry
Week 3	Ancient Chemistry
Week 4	Ancient Chemistry
Week 5	Ancient Chemistry
Week 6	Measurements in Chemistry
Week 7	Atoms & Elements
Week 8	The Periodic Table
Week 9	States of Matter (water)
Week 10	States of Matter (gas)
Week 11	Fresh Air for our Lungs
Week 12	Changing States of Matter
Week 13	Compounds, Mixture and Solutions
Week 14	Chemical Reactions
Week 15	Chemical Reactions (cont'd)
Week 16	Acids and Bases
Week 17	Acids and Bases (cont'd)
Week 18	Acids and Bases (cont'd)
Week 19	Soap (water, fat and surfactants)
Week 20	More Soap!
Week 21	Carbon and Its Compounds
Week 22	Greenhouse Gas
Week 23	Sulfur Dioxide & Acid Rain
Week 24	The Nucleus and Radioactivity
Week 25	Branches of Chemistry (electrochemistry & organic)
Week 26	Organic Chemistry (rope and fiber)
Week 27	Synthetics
Week 28	Silicon & Modern Metals
Week 29	Quicklime and Plaster
Week 30	Iron: #1 Commercial Metal
Week 31	Copper
Week 32	Copper (cont'd)
Week 33	Biochemistry
Week 34	Biochemistry (cont'd)
Week 35	Biochemistry (cont'd)
Week 36	Odds & Ends



# 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
Gumdrops (a variety of different colored)	7
Sticker dots, small	7
Toothpicks, wooden (several)	7
Dowel, wooden	10
Eyehooks, small (3)	10
Household objects, small (several)	10
Spring scales	10
String	10
File	11
Ink, red (if available)	11
Paper	11
Paper clip	11
Scissors	11
Magnifying glass	12
Iron filings (filed from a nail)	13
Jelly beans	13
Magnet, bar	13
Salt, table	13
Cups, large	14
Ink, black	14
Isopropyl alcohol	14
Markers, black (4 different ones, not permanent)	14
Pencils	14
Cups, small	15
Dishwashing soap, liquid	15
Dry yeast	15
Food coloring (liquid with a dropper)	15
Funnel	15
Plastic soda bottle, 16oz, clean	15
Rubber gloves	15
Carbonated soda	16
Distilled water	16
Shampoo	16
Toothpaste	16
Apple, 1 sour (unripe), 1 sweet (ripe)	17
Cola drink	17
Citric acid	18
Clothespin, large	18
Cloth, various pieces	19
Dust or carbon powder	19
Laundry detergent, mild	20

Laundry detergent, regular	20
Drinking straw	22
Flower petals, colored	23
Objects, small (such as coins, candies, or beads)	24
Ribbons or other material	24
Copper pennies	25
Cutting board	25
Galvanized Nails (coated in zinc)	25
LED bulb	25
Metal wire	25
Candle wax	29
Coin or medal	29
Egg, raw	29
Spoon, old	29
9-volt square battery	30
Ash	30
Rust	30
Sandstone (or piece of brick)	30
Aluminum foil	34
Apple	34
Dinner plate, old	34
Grapes	34
Matches	34
Sugar cube	34
Sugar, powdered	34
Honey, natural	35
Iodine solution	35
Vitamin C tablets	35
Skewer, wooden (splint)	7, 22
Coffee filter, white and round	9, 14
Cups, clear plastic (short, wide, rimmed and tall, narrower-rimmed)	10, 12
Masking tape	10, 14
Permanent marker	11, 18
Cardboard	11, 29
Steel wool	11, 30
Tea-light candle	11, 18, 22, 31
Iron nail	11, 31
Pliers	11, 34
Sand	13, 22, 34
Water	15, 16
Hydrogen Peroxide	15, 20, 30
Lemon juice	16, 17
Vinegar, white	16, 17
Soap, bar	16, 17, 19, 20
Baking Soda	17, 18, 22, 34
Lemon	18, 25
Water, sparkling	19, 20
Cooking oil	19, 29
Plaster (see note on Exp. 139)	20, 29
Knife	22, 25
Iron nails, shiny (2)	23, 30
Denatured alcohol	31, 34

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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>• Emphasizes vocabulary development, especially in the younger years.</li><li>• Develops critical thinking skills and logic through the use of the scientific method.</li><li>• 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>• Provides the best books available (including "living books").</li><li>• Utilizes a child's natural curiosity to acquire knowledge. "Studies serve for delight".</li><li>• 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.

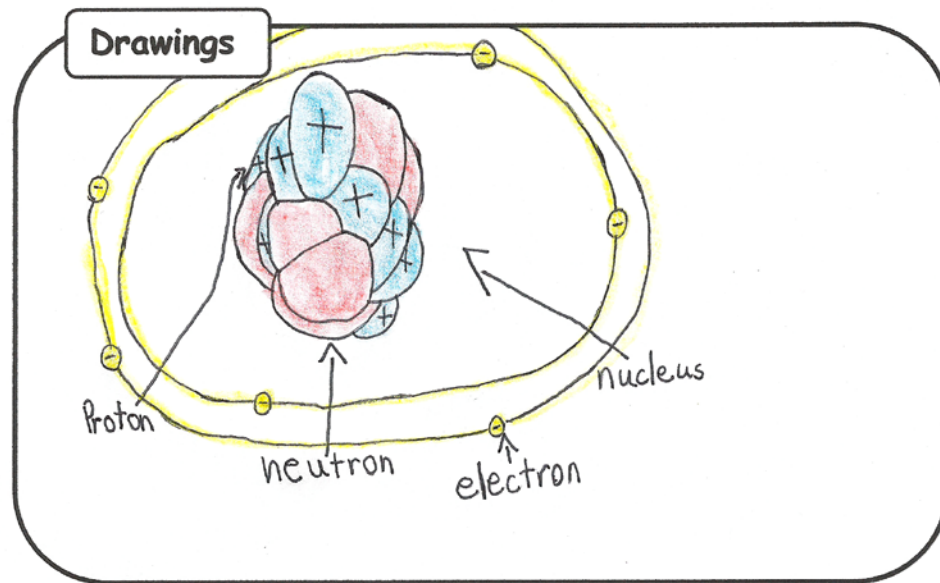
## Lab Experiments

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.













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)**

---

---

---



Date \_\_\_\_\_

Experiment Name \_\_\_\_\_

**Observation/Research**

---

---

---

**Question**

---

---

---

---

**Materials**

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

**Experiment/Test**

---

---

---

**Hypothesis/Prediction**

---

---

---

**Results**

---

---

---

**Conclusion**

---

---





# **Weekly Reading & Experiments**



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<b>Week 1</b>				
<b>Ancient Chemistry</b>				
	<b>Day 1</b>	<b>Day 2</b>	<b>Day 3</b>	<b>Day 4</b>
<i>Exploring the World of Chemistry</i>	Chapter 1, Ancient Metals	(cont'd)	Chapter 2, The Money Metals	(cont'd)

**Supply List:**

Nothing this week.

**Assignments:**

You will begin this year with an overview of chemistry through the ages--the things that motivated mankind to pursue this field of study. You'll touch on many concepts and ideas that will be studied more in depth later in the year. But, for now, it's important to know the STORY of chemistry...

**Days 1 & 2** - Take these days to read chapter 1. Answer the questions at the end of the chapter (the key is on page 137). Be sure and look up anything you may have missed.

**Days 3 & 4** - Take these days to read chapter 2. Answer the questions at the end of the chapter. Be sure and look up anything you may have missed.

Also, take some time to look over the various timelines in all of your books. Pay careful attention to the scientists mentioned in your reading.



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<b>Week 2</b>				
<b>Ancient Chemistry</b>				
	<b>Day 1</b>	<b>Day 2</b>	<b>Day 3</b>	<b>Day 4</b>
<i>Exploring the World of Chemistry</i>	Chapter 3, The Search for Gold	(cont'd)	Chapter 4, Gases in the Air	(cont'd)

**Supply List:**

Nothing this week.

**Assignments:**

**Days 1 & 2** - Take these days to read chapter 3. Answer the questions at the end of the chapter.

**Days 3 & 4** - Take these days to read chapter 4. Answer the questions at the end of the chapter.

