

noeo science

biology 2

Noeo Science Packages:

Biology 1
Physics 1
Chemistry 1

Biology 2
Physics 2
Chemistry 2

Physics 3
Chemistry 3

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biology 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.

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Book List

The Body Book, by Donald M. Silver and Patricia J. Wynne

Usborne Complete Book of the Microscope (Internet-linked)

Usborne Science Encyclopedia (Internet-linked)

Usborne Mysteries and Marvels of Nature (Internet-linked)

Experiment Kits

Illumax 100X Slide Microscope and slides

The Young Scientists Club kits:

- Kit #28 Owls
- Kit #29 Eggs
- Kit #30 Seeds, Fruits, and Other Plant Parts

Weekly Schedule of Topics

Week 1	Microscopic World
Week 2	Microscopic World
Week 3	Microscopic World; Classification; Cells
Week 4	The Animal World: Insects
Week 5	The Animal World: Insects
Week 6	The Animal World: Insects
Week 7	The Animal World: Insects; Body Structure
Week 8	The Animal World: Body Protection; Camouflage
Week 9	The Animal World: Body Protection; Fish
Week 10	The Animal World: Fish and Other Water Creatures
Week 11	The Animal World: Fish & Water Creatures, Birds & Flying Creatures
Week 12	The Animal World: Birds
Week 13	The Animal World: Eggs
Week 14	The Animal World: Birds
Week 15	The Animal World: Land Animals; Reptiles and Amphibians
Week 16	The Animal World: Reptiles and Amphibians
Week 17	The Animal World: Reptiles and Amphibians; Mammals
Week 18	The Animal World: Mammals
Week 19	The Animal World: Mammals; Feeding Methods
Week 20	The Animal World: Feeding Methods; Food and Energy
Week 21	The Animal World: Internal Balance; Communication Senses
Week 22	The Animal World: Breathing; Reproduction; Life Cycles
Week 23	The Animal World: Ecology; Nature's Balance; Conservation; Evolution Theory
Week 24	Human Body
Week 25	Human Body: Senses
Week 26	Human Body: Senses; Skeleton
Week 27	Human Body: Skeleton; Muscles; Teeth; Digestion
Week 28	Human Body: Nervous, Respiratory & Circulatory Systems
Week 29	Human Body: Urinary System; Immune System
Week 30	Plants: Cells and Seeds
Week 31	Plants: Dispersal; Stems and Roots
Week 32	Plants: Stems and Roots
Week 33	Plants: Stems and Roots; Leaves
Week 34	Plants: Photosynthesis; Flowers
Week 35	Plants: Pollination; Germination; Propagation
Week 36	Plants: Water Plants; Fungi

ESPECIALLY FOR PARENTS!

- Week 22 discusses sexual reproduction in animals. Human reproduction is not included in the curriculum, but you may use this as an opportunity to introduce the topic

- Week 23, Day 4 describes the theories of evolution and natural selection. Be prepared to discuss these topics with your students.

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
Sugar	2
Paper (paper towel, magazine, colored)	2, 13
Adhesive bandage (e.g. Band-Aid)	2
Piece of cardboard	4, 27
Scalpel or sharp knife (adult supervision)	4, 30, 32
Crayons or colored pencils	8, 25, 26, 27, 28, 29
Eggs (at least 2 raw and 2 hard-boiled)	13
Salt	13
Wide-necked bottle (egg-sized opening)	13
Food coloring	13, 32
2 jars with lids	13
Matches (adult supervision required)	13
Baking soda	13
Light source (e.g. desk lamp)	13
Flashlight	13
2-liter plastic bottle with cap	13
Feather	14
Scissors	20, 25, 26, 27, 28, 29
Glue	20, 25, 26, 27, 28, 29
Newspaper	20
Bleach	20
Paper towel	20
2 cups	20
Cotton swabs	24
Tape	25, 26, 27, 28, 29
Plastic wrap	25
Brads	27
Mirror	27
String	28
Empty paper towel tube	28
Onion	30
Celery	32
Variety of leaves	33
Flowers with stems (1 or more types)	34
Variety of fruits and vegetables	35
Garlic clove	35
Large glass jar (e.g. pasta sauce jar)	35
Ruler	35
Mushroom	36
Pond or lake water (optional)	36

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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 1333 978">• Emphasizes vocabulary development, especially in the younger years.<li data-bbox="586 1020 1230 1094">• Develops critical thinking skills and logic through the use of the scientific method.<li data-bbox="586 1136 1312 1209">• Incorporates the classical stages of learning, i.e. the “Trivium” (grammar, logic, and rhetoric).
Charlotte Mason	<ul style="list-style-type: none"><li data-bbox="586 1339 1360 1371">• Provides the best books available (“living books”).<li data-bbox="586 1413 1273 1486">• Utilizes a child’s natural curiosity to acquire knowledge. “Studies serve for delight.”<li data-bbox="586 1528 1235 1602">• Uses narration and notebooks rather than worksheets, or tests to evaluate learning.

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.

	Approximate Ages	Grade Equivalent	Classical Trivium Stage
Biology 1 Chemistry 1 Physics 1	5-8	1-3	Early Grammar
Biology 2 Chemistry 2 Physics 2	9-12	4-6	Late Grammar or Early Logic
Biology 3 Chemistry 3 Physics 3	12-15	7-9	Late Logic or Early Rhetoric

Our curriculum is designed on a four-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:

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

Noeo Notebooks

Included in this Guide are 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.

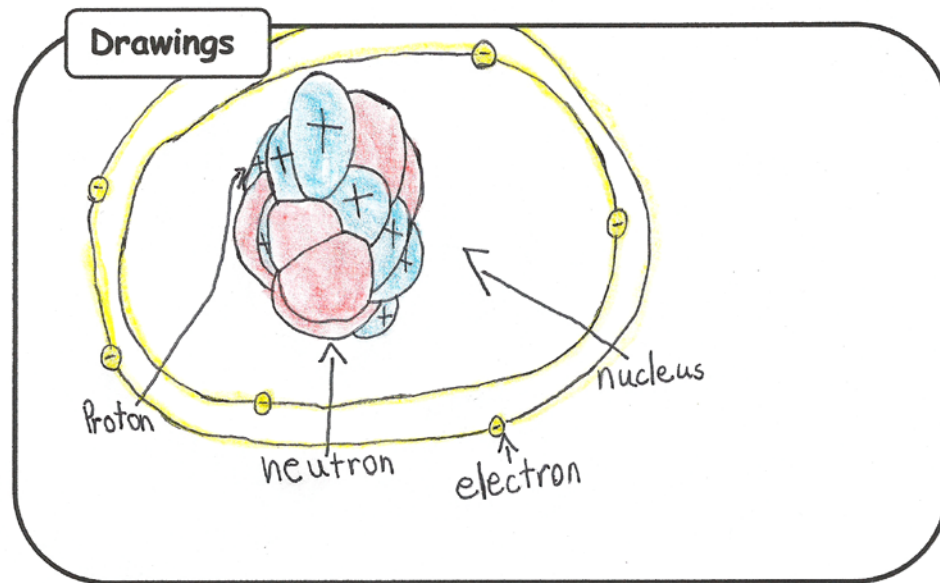
Lab Experiments

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. A supply list for each week of the year is part of the weekly lesson plans as well as 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 2 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 CO₂ that the yeast makes

What happened? (results)

the balloon inflated.

Why do you think this happened? (conclusion)

The balloon catches the CO₂.

Reproducibles

Science & Lab Notebook Pages

The following pages are provided for your convenience. They may also be found on our website (www.logospressonline.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.

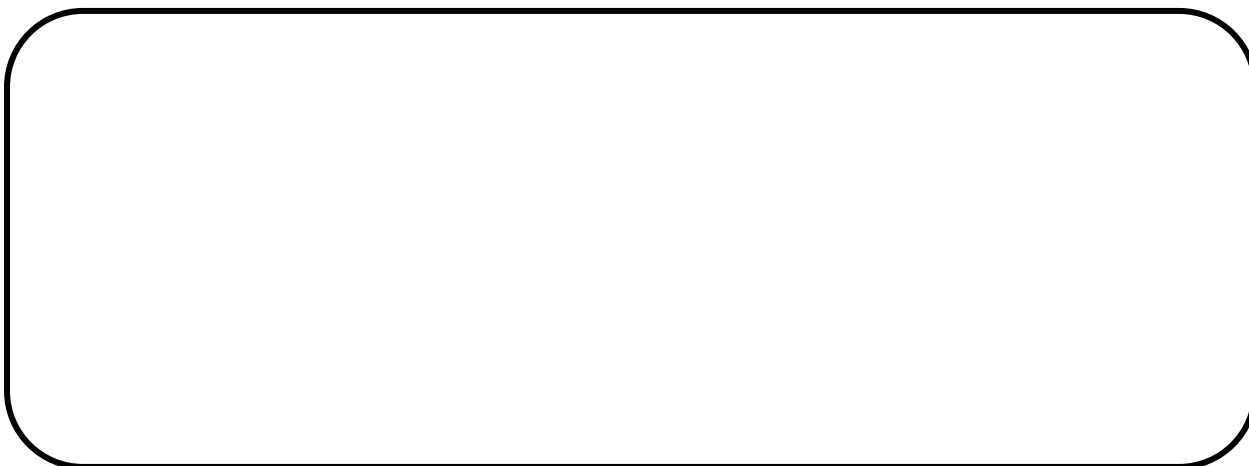
Reading Notes

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

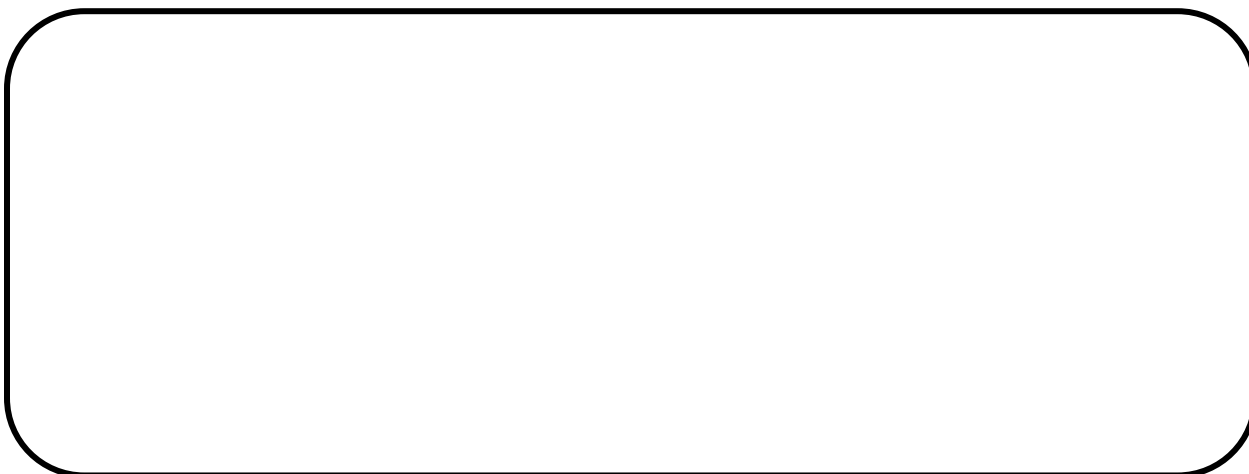
Date _____

Lab Experiment _____

What I did:



What I saw:



I think this happened because...

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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Week 1 - Microscopic World				
	Day 1	Day 2	Day 3	Day 4
<i>Complete Book of the Microscope</i>	pp. 79-81	pp. 82-84	pp. 5-7	pp. 8-9
Experiment	Optional: Make a Waterscope, p. 81			
Optional Internet Links*	<i>Microscope</i> pp. 80-81	<i>Microscope</i> pp. 83-84	<i>Microscope</i> p. 7	<i>Microscope</i> pp. 8-9

*See p. 4 of *The Usborne Complete Book of the Microscope* for information about the optional Internet links.

Supply List:

none

Assignments:

Day 1 – Read the assigned pages, summarize and/or sketch what you learned in your science notebook. Define **cell** using the *Usborne Complete Book of the Microscope* glossary.

Day 2 – Read the assigned pages, summarize and/or sketch what you learned in your science notebook. Define **germs**, **bacteria**, and **virus** using the *Usborne Complete Book of the Microscope* glossary.

Day 3 – Read the assigned pages, summarize and/or sketch what you learned in your science notebook. Define **atom** and **pollen** using the *Usborne Complete Book of the Microscope* glossary.

Day 4 – Read the assigned pages, summarize and/or sketch what you learned in your science notebook. Define **optical microscope** and **electron microscope** using the *Usborne Complete Book of the Microscope* glossary.

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Week 2 - Microscopic World				
	Day 1	Day 2	Day 3	Day 4
<i>Complete Book of the Microscope</i>	pp. 10-11	pp. 12-13	pp. 14-15	pp. 16-17
Experiment	<i>Microscope</i> p.11	<i>Microscope</i> p. 13		<i>Microscope</i> p.16
Optional Internet Links	<i>Microscope</i> p. 11	<i>Microscope</i> p. 12	<i>Microscope</i> p. 15	<i>Microscope</i> p. 17

Supply List:

Illumax 100X Slide Microscope and slides
sugar
various kinds of paper (paper towel, magazine pages, colored paper, etc.),
adhesive bandage (e.g. Band-Aid®)

Assignments:

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

- Set up your microscope and view the sugar crystals. Move the focus knob up and down very gently for depth of vision. Sketch what you see. You may also want to look at other small objects with your microscope.

Day 2 – Read the assigned pages, summarize and/or sketch what you learned in your science notebook.

- Set up your microscope and view various kinds of paper (NOTE: paper is viewed best along a torn edge). Sketch what you see.

Day 3 – Read the assigned pages, summarize and/or sketch what you learned in your science notebook.

Day 4 – Read the assigned pages, summarize and/or sketch what you learned in your science notebook.

- Remove the protective netting from above the gauze pad of an adhesive bandage. View the netting with your microscope and sketch what you see.

