NOEO SCIENCE PHYSICS 1

INSTRUCTOR'S GUIDE

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noeo science
MOSCOW, IDAHO

Noeo Science Packages

GRADES 1–3 / AGES 5–8	GRADES 4–6 / AGES 9–12	GRADES 7–8 / AGES 12–15
Biology 1	Biology 2	Chemistry 3
Chemistry 1	Chemistry 2	Physics 3
Physics 1	Physics 2	

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Introduction: Welcome to Noeo

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 experiments 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 and we're always open to your comments and suggestions.

Our Instructor's Guides provide a logical, focused progression through the books and experiments. Each week you will find an overview of what your student will learn as well as an answer key for the student lab manual reading and experiment questions. 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 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 tests, 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	• Emphasizes vocabulary development, especially in the younger years. • Develops critical thinking skills and logic through the use of the scientific method. • Incorporates the classical stages of learning, i.e., the Trivium (grammar, logic, and rhetoric).
Charlotte Mason	• Provides the best books available (including "living books"). • Utilizes a child's natural curiosity to acquire knowledge. "Studies serve for delight". • Uses narration and notebooks rather than worksheets, tests, or repetitive drills 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.

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 instructors 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.

NOEO COURSE	APPROXIMATE AGES	GRADE EQUIVALENT	CLASSICAL TRIVIUM STAGE
Biology I Chemistry I Physics I	5–8	1–3	Early Grammar
Biology II Chemistry II Physics II	9–12	4–6	Late Grammar or Early Logic
Chemistry III Physics III	12–15	7–9	Late Logic or Early Rhetoric

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 will be 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 Experiment Guide

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 know that this is one of the most dreaded parts of science for many homeschool families; that's why we were determined to put together high quality, but straightforward experiments.

Noeo provides a strong foundation in science without wreaking havoc on your daily schedule. Each experiment and activity builds on the material that you cover in the week's readings, but don't worry—at the end of each experiment there is a section that explains what should have happened, and *why* it happened. So, if you decide to change things up, it won't be an issue.

The experiment kits come with any items that are normally difficult—or just plain inconvenient–to find. Both the Experiment Guide and Instructor's Manual have a complete supply list at the back, showing you which materials we're providing, and which materials you'll need from home. And yes, the home materials are real, honest-to-goodness, *home materials*—things for school, from your cabinets, and your pantry. Watch as your student progresses through these well organized, fully explained experiment kits, while actually having fun learning science.

You might notice that in between the Experiments there are some Activities and Optional Activities. Activities include the supplies you'll need, but they don't require as much explanation as Experiments, and your student won't be answering questions about them. Optional Activities are fun, optional things to do related to the reading of the week—most of the time they're outings or family activities, or they need materials that we didn't want to require you to buy.

Experiment Kits

There are 4 experiment kits, including all of the wild and wacky materials that you would normally spend hours (and let's face it: way too much money) sourcing on Amazon. Each kit lists its contents sorted by what you'll need for each week's experiments. Why 4 kits? It's much less overwhelming than opening a box full of loose food dye and pipettes. But there is an even better reason: say your child opens their Noeo box, and sees a toy car for an experiment 20 weeks away. Realistically, that car is toast. With the materials sorted into kits, the materials are a little easier to manage–and you only have a few weeks to make sure you don't lose that car, instead of 36.

Student Lab Manual

In the Student Lab Manual, your student will answer questions about key points both from their reading and experiments. The experiment questions in particular are centered around drawing results, making observations, asking questions, and making connections—all things that will slowly introduce your student to the scientific method and lab reports.

Younger students may need to "narrate" their descriptions and observations to you or an older sibling. It's completely up to you to determine the length and amount of detail you expect from your student, but we do encourage you to increase this expectation over time.

Instructor's Guide

Schedules, answers keys, lists of books and home supplies—it's all here. Everything you need to make Noeo work for you is right here in the Instructor's Guide. A list of the supplied books is provided, so that you can keep an eye on exactly which books you need for the course.

Lists of both home and included supplies are at the back of the book. The materials list is organized by weeks; so, if an experiment calls for a carrot, you won't be stuck with a slowly decomposing root vegetable in your fridge until you need it thirty weeks later.

Every week, you can refer to our provided schedule (flexible enough that you could do it all in one day if you've got an enthusiastic scientist, or stretch it out as much as you need), overview of the week's subject matter, and answers to both reading and experiment questions. If your student ends up begging to do more, no need to worry–you don't work for your curriculum, Noeo works for you.

Resource List

Books

- *Alexander Graham Bell (National Geographic Reader: Level 2),* by Barbara Kramer
- *First Flight: The Story of Tom Tate and the Wright Brothers*, by George Shea
- *How Do You Lift a Lion?* by Robert E. Wells
- *Little Kids First Big Book of Space,* by Catherine D. Hughes (National Geographic Kids)
- Max Axiom, Super Scientist Series, by Emily Sohn
    - *Adventures in Sound*
    - *The Attractive World of Magnetism*
    - *A Crash Course in Forces and Motion*
    - *The Illuminating World of Light*
- *Newton's Rainbow: The Revolutionary Discoveries of a Young Scientist*, by Kevin Hawkes
- *Now & Ben: The Modern Inventions of Benjamin Franklin*, by Gene Barretta
- *The Story of Inventions*, by Anna Claybourne & Adam Larkum
- *Who Was Albert Einstein?*, by Jess Brallier
- *Who Was Galileo?,* by Patricia Brennan Demuth

Experiment Kits

- *Simple Machines*, by Thames and Kosmos
- *Noeo Experiment Kits 1-4*

DAILY LESSON PLANS FOR READING & EXPERIMENTS

unit 1:
FORCE AND MOTION

Week 1: Forces That Move Us

Schedule

	DAY 1	DAY 2	DAY 3	DAY 4
Forces and Motion with Max Axiom	pp. 4–5			pp. 6–7
Experiment Guide		Gravity Pulls the Same Objects	Gravity Pulls Different Objects	Gravity Trick

Overview

Begin this year by finding out what two things we mean by science: 1) science is the process we use to answer questions about the physical world we see around us (testing with experiments), and 2) science is the body of knowledge other people (scientists) have collected by using the scientific process (or scientific method). This year, in Noeo Physics 1, you will be using both these kinds of science to learn about matter when it moves, and about the concepts of motion, energy, and force. Specifically, you'll be studying light, machines, inventions, magnetism, sound, space, and more. The first key idea is force, so that's what you'll be studying in this first unit.

Reading Questions

DAY 1

1. What is force? **Force is any push or pull on an object.**
2. What does gravity do? **Gravity pulls objects toward each other and keeps us on earth.**

DAYS 2–3

Experiments

DAY 4

1. What is Newton's first law of motion? **A still object needs a force to get it moving, and a moving object needs a force to change its direction, slow it down, or make it stop.**
2. What example does Max give of inertia? **Inertia keeps a stroller rolling until a force stops it.**

Experiment: Gravity Pulls the Same Objects

MATERIALS

From Home

- 2 plastic water bottles, with lids
- water

EXPERIMENT QUESTIONS

1. Did one of the bottles fall faster than the other? **No, the bottles both fell at the same time.**
2. Why did that happen? **The bottles fell at the same time because gravity affects all objects the same.**
3. What famous scientist discovered this rule? **The famous scientist that discovered this rule was Galileo.**

Experiment: Gravity Pulls Different Objects

MATERIALS

From Home

- plastic water bottles, with lid
- piece of paper or a feather

EXPERIMENT QUESTIONS

1. Did the paper or the bottle fall faster? **The bottle fell faster than the paper.**
2. Did the paper fall slower because it is lighter? **No.**
3. Why did the paper fall slower? **The paper fell slower because the force of air resistance pushing against it is greater.**

Experiment: Gravity Trick

MATERIALS

From Home

- penny

EXPERIMENT QUESTIONS

1. Could someone guess which hand was holding the penny? **Answers will vary, but most likely yes.**
2. What made it easy to guess? **It was easy to guess because the penny was in the hand that was paler.**
3. Why was your hand pale? **Your hand was pale because blood couldn't flow into it as well when it was working against gravity.**

Week 2: More about Force

Schedule

	DAY 1	DAY 2	DAY 3	DAY 4
Forces and Motion with Max Axiom	pp. 8–9		pp. 10–11	
Experiment Guide	Momentum	Moving Pennies		Build a Ramp

Overview

The word *physics* comes from the Greek word for nature, but really physics is about how and why objects move the way they do when force is applied. This second week you'll continue to do experiments to learn about force and motion.

Reading Questions

DAY 1

1. What is speed? **Speed is how fast we go at any given moment.**
2. What is acceleration? **Acceleration is how much speed we pick up.**

DAY 2

Experiment

DAY 3

1. What causes friction? **Friction happens when two surfaces rub against each other.**
2. Where is there no friction? **There is no friction in space.**

DAY 4

Experiment

Experiment: Momentum

MATERIALS

Included in Kit

- 2 chopsticks
- string (6 feet)
- 4 push pins
- 4 rubber balls

From Home

- 4 objects 8 inches in height (water bottles, glasses, books, or 4 shorter objects stacked on top of books to equal 8 inches in height)
- tape
- scissors
- ruler

EXPERIMENT QUESTIONS

1. What is the force of something that is moving? **The force of something that is moving is momentum.**
2. What happened when you pulled back the last ball, and bounced it on the others? **The ball at the front of the line bounced forwards.**
3. How did momentum make the balls move? **The momentum transferred from the last ball all the way to the front.**

Experiment: Moving Pennies

MATERIALS

From Home

- 5 pennies (or other coins that are all the same)

EXPERIMENT QUESTIONS

1. What law says that an object will stay still until something else moves it? **Newton's first law of motion.**
2. What happened when you slid a penny into the line of pennies? **When you slid a penny into the line of pennies, a penny at the opposite end slid away.**

3. What happened when you slid two pennies into the line of pennies? **When you slid two pennies into the line of pennies, two pennies at the opposite end slid away.**

Experiment: Build a Ramp

MATERIALS

Included in Kit

- 2 toy cars (save with your kit supplies to use in future experiments)
- piece of sandpaper

From Home

- cardboard or wood planks to make 2 ramps (shipping boxes work well, but you could also use cereal boxes)
- stacks of books or a chair, to prop up one end of the ramp
- dishcloth
- duct tape

EXPERIMENT QUESTIONS

1. Which surface made your cars roll the fastest? **Answers will vary.**
2. Which surface made your cars roll the slowest? **The dishcloth made your cars roll the slowest.**
3. What force made your cars slow down? **The force that made your cars slow down is gravity.**