



The Founders Academy High School Curriculum
9th Grade Physical Science
Updated September 2nd, 2015

“Science is a system for exploring, and for innovation. It can fuel our nation’s economic growth. It can form a path for our young people in a competitive global marketplace. And it can fire our imagination”

Marriette DiChristina, 2014, Editor in Chief of Scientific American

Course Description

In conjunction with the mission of the school, the 9th grade Integrated Physical Science course invites students to explore their physical world by asking three central questions:

What do we know about the universe that we live in?

Through discussion, observation, and experimentation, and by using the language of mathematics, students will explore the physical laws that govern our universe.

How do we know what we know?

This question explores the philosophy of science and challenges students to look beyond the subject matter itself to explore the way in which scientific knowledge is created. More than simply memorizing facts, this question asks students to become scientifically literate citizens.

Who are the men and women who have made key scientific discoveries?

Exploring the successes and failures of great men and women encourage students to model their own thinking on the lessons they have learned from history.

Using these three questions as a lense to frame the course, students will explore the fields of physics, chemistry, astronomy, and earth science.

Course Objectives:

By the end of this course, students will understand that:

1. A good leader knows **when** and **how** to apply the principles of the scientific method when approaching a problem that requires a solution.
2. The language of mathematics provides a logical framework for creating models and explanations of observations.
3. Scientific progress is advanced just as much by creativity and individual force of will as it is through mathematics.
4. Studying the personal and professional lives of historical scientists allows us to explore the nature of character, ethics, and responsibility and provides inspiration for modern-day leadership in a technological world.

Unit Descriptions:

PHYSICS - UNIT 1

In the physics unit, students will be introduced to the language of mathematics as a tool for describing and explaining the physical world. Through lecture, observation and hands-on research, students will learn how mathematical equations can be used to support scientific theories. Major topics that will be studied include motion in 1- and 2- dimensions, force, energy, momentum, electricity, and magnetism.

CHEMISTRY - UNIT 2

In the chemistry unit, students will learn about the basic building blocks of the universe. Through lecture, observation, and hands-on research, students will explore the dynamic nature of the particles that make up our universe and allow for the existence of life on earth. Major topics that will be studied include atomic and nuclear structure, the formation of ions and molecules, IUPAC nomenclature, physical and chemical properties, the periodic table, chemical reaction types, solubility, and thermodynamics.

ASTRONOMY - UNIT 3

While the chemistry unit explored the smallest particles in the universe, the astronomy unit takes a broader perspective and explores the formation of the universe itself. Students will study the events surrounding the creation of the universe, stellar birth and evolution, dark energy and dark matter, and the conditions necessary to support life on earth as well as the potential for life on other planets.

EARTH SCIENCE - UNIT 4

The earth science unit takes a closer look at our own home within the universe and explores the formation of our solar system, earth and its moon, and the physical processes at work within our planet. Major topics that students will study include climate, geology, natural disasters, stable ecosystems, and the effect of greenhouse gasses.

The Scientific Method

Throughout each unit, students will focus on the particular aspects that correspond with the scientific method of acquiring knowledge. This includes the formation of questions, careful observation, the development of hypotheses and theories, the collection of data, the application of mathematics, and the ability to communicate results. Students will expand on the skills and knowledge they have gained during middle school as they focus on building their scientific literacy.

Course Supplies

A scientific calculator (a graphing calculator also works well, but is not necessary)

College-ruled notebook for taking notes during lecture

Composition book for recording laboratory data

3-ring binder with two separate tabs

Assignment book/Planner

Pens, pencils, and a highlighter

Late Work Policy

It is important that assignments are turned in on time. An assignment that is turned in late will receive a 10% penalty for each day that it is late. Assignments will not be accepted that are handed in more than 1 week late. If you are absent from class, you are still expected to complete your work and return it by the next day you attend class. I hold high expectations for my students, but they are no higher than the expectations you should hold for yourself.

Extra Credit and Makeups

I do not give extra credit assignments. Our focus in class will be on learning science, not achieving grades. Therefore, if you do not understand a concept and score a low grade, I will meet with you outside of our scheduled class time. We will work together to build your understanding and you will have an opportunity to re-complete the assignment after that.

Typical Course Assignments

Homework/Classwork Most weeks will be accompanied by problems, questions, or assignments that you will need to complete by the end of the week. These will be turned in and graded.

Quizzes Short quizzes will be given throughout each unit. These are meant as practice for the end of unit exam and will build upon the knowledge you have gained during recent weeks. These will most likely occur on a bi-weekly basis and will be open note.

Unit Exams Each unit will culminate with a comprehensive exam of the material covered during the unit. Although the exam is closed-note, you will often have the use of one or two approved handouts during the exam, on which additional notes may be written.

Laboratory Notebook You will be expected to record all observations and data related to laboratory experiments in your lab notebook. These will be periodically collected and graded to ensure their consistent use.

Laboratory Reports. Learning science is just as important as doing science. You will complete several research experiments associated with each unit. At the end of each experiment, you will be expected to write a laboratory report detailing your use and understanding of the scientific method of gathering knowledge. We will work together in class to develop your report-writing skills. .

Research Project. During the course, each student will choose a scientist from history who succeeded in changing our understanding of a particular scientific concept in some significant way. The student will research the scientist and present their life and accomplishments by the end of the year. More details regarding this assignment will be provided during the first week of school.

Grading System

Each assignment will be accompanied by a particular point value, based upon the length of the assignment and the amount of work required to complete it successfully. At the end of each quarter, an overall grade will be calculated based upon the total points earned by the student divided by the total points assigned during that quarter.

Laboratory Safety

The Founders Academy has designed laboratory facilities for the physical and biological sciences which meet mandated federal and state guidelines.

All students will be instructed in the safe operation of equipment and safe handling and disposal of chemicals. Teachers will provide lectures, demos, and videos to reinforce safety in the laboratory. All students and their parents will be required to read, understand and sign a safety contract. Students must pass a written safety test before being allowed to work in the laboratory area.

Appropriate attire is mandatory on laboratory days. Appropriate attire includes closed toe shoes, long pants or skirts to cover legs, no dangling jewelry or scarves, hair must be pulled or tied back, goggles must be worn at all times unless instructed otherwise by the teacher. Failure to come properly dressed will result in being barred from the lab.

There will be zero tolerance for horseplay as this will jeopardize not only the individual initiating the horseplay but also innocent bystanders and may result in an injury and/or damage to school property. Unauthorized science experiments are not allowed. Horseplay will result in exclusion of the student from the lab area and will require a student-parent-teacher-administrator meeting to determine appropriate disciplinary and remedial action.

Schedule	Topic of Study
September 8 - 11	Measurements, Data Collection, and 1-Dimensional Motion
September 14 - 18	2-Dimensional Motion
September 21 - 25	Force
September 28 - October 2	Energy
October 5 - 9	Momentum
October 12 - 16	Rotational motion
October 19 - 23	Inverse square laws
October 26 - 30	Electricity and Magnetism
November 2 - 6	Heat and Waves
November 9 - 13	Atoms and energy levels

November 16 - 20	Nuclear forces
November 23, 24	Ionic structure
November 30 - December 4	Molecular structure
December 7 - 11	IUPAC nomenclature
December 14 - 18	Properties of matter
January 4 - 8	The Periodic Table
January 11 - 15	Chemical reaction types
January 19 - 22*	Chemical reaction types
January 25 - 29	Formation of the universe
February 1 - 5	Instrumentation
February 8 - 12	Star formation and evolution
February 15 - 19	Dark matter and dark energy
February 29 - March 4	Discovery of planets outside our solar system
March 7 - 11	Formation of solar system
March 14 - 18	Conditions for life
March 21 - 24	Formation of Earth and moon
March 28 - April 1*	Presentations of Historical Research
April 4 - 8	Forces at work on Earth
April 11 - 15	Climate
April 18 - 22	Stable ecosystems
May 2 - 6	Disaster prediction
May 9 - 13	Reducing greenhouse gasses
May 16 - 20	TFA Science Fair
May 23 - 27	Science Course Field Trip
May 31 - June 3	Reviews

June 6 - 10*	Final Exams
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