The Homeschool High School Science Journey

Why Physics?

By Mr. Dan Martin, Apologia Online Academy

Science, by definition, is a methodical study. It's an intellectual activity that involves observation and experimentation. It is a system that we use to acquire new knowledge which describes and explains natural phenomena.

Often, we associate the term *science* with specific scientific courses, but did you know that splitting science into divisions such as biology, chemistry, and physics is, in fact, an artificial process? Because there is so much knowledge already discovered, we divide that knowledge into comprehensible portions that we call courses. In reality, the entirety of scientific knowledge is interconnected.

The interconnectivity of the sciences can make planning a course of study confusing. What courses should our students take in high school? This question has a lot riding on it and is a challenging one for many of us in the home school world. On what criteria should we base our decisions?

As homeschooling parents, we often take more time in deciding the pathways our students will travel. We want purpose in our choices because our choices influence who our children become. In high school, students should have scientific courses that expand their knowledge of their world. There are 3 main branches of science that students should explore to get a glimpse of the universe in which they exist.

Physics explains motion and energy. Chemistry explains how matter changes due to the movement of molecules, collisions, and subsequent energy transfer. Biology explains how chemical interactions in the body run our metabolism and other processes in our bodies.

In America, we structure the order of science courses based on math course prerequisites. Physics requires a student to have prior exposure to geometry, which is typically taken the sophomore year of high school. Therefore, most students take physics their junior year, after successful completion of geometry.

A typical high school student will take science courses in the following order:

- Freshmen year: Biology (no math requirement)
- Sophomore year: Chemistry (algebra is required)

- Junior year: Physics (geometry is required)
- Senior year: Some science elective usually for college credit (CLEP/AP compatible courses)

Too often students will stop after taking just 2 science courses in high school because it is the minimum requirement for some colleges. This isn't recommended as many colleges require 3 – 4 science courses with labs. But beyond the college requirements, it is important to understand that students should continue in their scientific studies because it gives them a greater understanding. Should our students take physics in high school? You may have heard people say some of the following things:

- Physics is too hard. Avoid it.
- Physics doesn't really add to your education.
- Physics won't help you get a good job.

In fact, these statements are common **MYTHS** about physics highlighted on the American Physical Society website (APS, Popkin, et al). You may have heard a few of these myths before, usually from someone who had a bad physics experience in their own education. We should not base our students' education on another individual's bad experience! For our students, we must strive to make the scientific experience insightful, interesting, and better than our own.

If your students are nearing the completion of chemistry and are on the proper mathematical level, we highly recommend that you consider having your students take a physics course with Apologia or elsewhere. Doing so will be very beneficial for their own understanding of how our world, how God's Creation functions, as well as, benefits as you look toward college.

The American Physical Society website has a list of facts published outlining why a high school education in physics is important. That list is provided below for your reference (APS, Popkin, et al).

Fact #1: Colleges want to see that students have taken challenging courses such as physics.
At more selective schools, physics in high school is often expected, if not required. For example, over three-quarters of incoming Wesleyan freshmen have taken physics in high school; at Caltech, physics is a requirement for admission

FACT #2:
Physics answers questions about the world and opens doors to potential careers.
Have you ever wondered why the sky is blue, or why the earth is warming? Only physics can tell you the answer! And if you've ever thought about being a doctor, engineer, or patent attorney, you will need physics.

FACT #3:
Physics can be taught at a variety of levels.

According to American Institute of Physics (AIP) data, national enrollments have been growing rapidly in high school courses taught at both conceptual and advanced levels.

- AIP: Physics Enrollments in U.S. High Schools by Type of Course, 1987--2009

FACT #4:
Girls take physics, too.
AIP data also show that for the past decade and a half, nearly half (47%) of US high school physics students have been female. However, considerably less than 40% of advanced placement high school physics students are female, meaning there is still plenty of room for improvement.

- AIP: Female Enrollment in High School Physics

FACT #5:
Students who have taken high school physics do better in college physics courses.
Research published in Science shows that students who had taken high school physics got significantly higher grades in college physics than those who hadn't.

- The Two High-School Pillars Supporting College Science, Philip M. Sadler and Robert H. Tai

FACT #6:
Physics is fundamental to other sciences and technological innovations; physics teaches critical thinking and problem-solving skills.
Physics underpins almost every other science. Anyone thinking of studying chemistry, biology, geology, or astronomy will need a strong a background in physics.

Physics also teaches problem a wide range of skills that are applicable no matter what you end up doing. Physics majors working in computer science or engineering reported that they made frequent use of problem-solving, teamwork, programming, and technical writing skills they learned studying physics.

APS's "Why Study Physics" web page offers more information on the advantages of being a physicist.

- Why Study Physics

FACT #7:
Physics opens doors to many careers; physics majors have high employment rates and are well paid.
Did you know that only around a third of physics majors go on to graduate school in physics or astronomy? The rest go on to study other subjects, or become doctors, lawyers, engineers, teachers, or a wide variety of other careers. The unemployment rate of physics majors is far lower than that of the general population.

Best of all, physics majors tend to make salaries in the $40,000 - $60,000 range after college – higher than almost any other major!

The APS website has many physics career resources for students.

- Physicists Profiles (https://www.aps.org/careers/physicists/profiles/index.cfm)
- Middle/High School Preparation for Physics
- Careers in Physics – Statistical Data
- Becoming a Physicist

Source:

Popkin, Gabriel, et al. “Seven Myths About High School Physics.” Edited by Krystal Ferguson, *American Physical Society*, American Physical Society, www.aps.org/programs/education/highschool/teachers/7myths.cfm.

Ensure your students have the knowledge they need by exploring more about physics at ApologiaOnlineAcademy.com. Mr. Dan Martin has been an Apologia Online Academy instructor since 2014. He teaches chemistry, physics, advanced chemistry, and advanced physics.