

Family Guides to Support Learning

ABOUT THIS GUIDE

Parents and caregivers want their teens to succeed in school – to be engaged and excited about learning; to build strong relationships with their teachers and peers; and to learn each year the knowledge and skills they need to be successful academically.

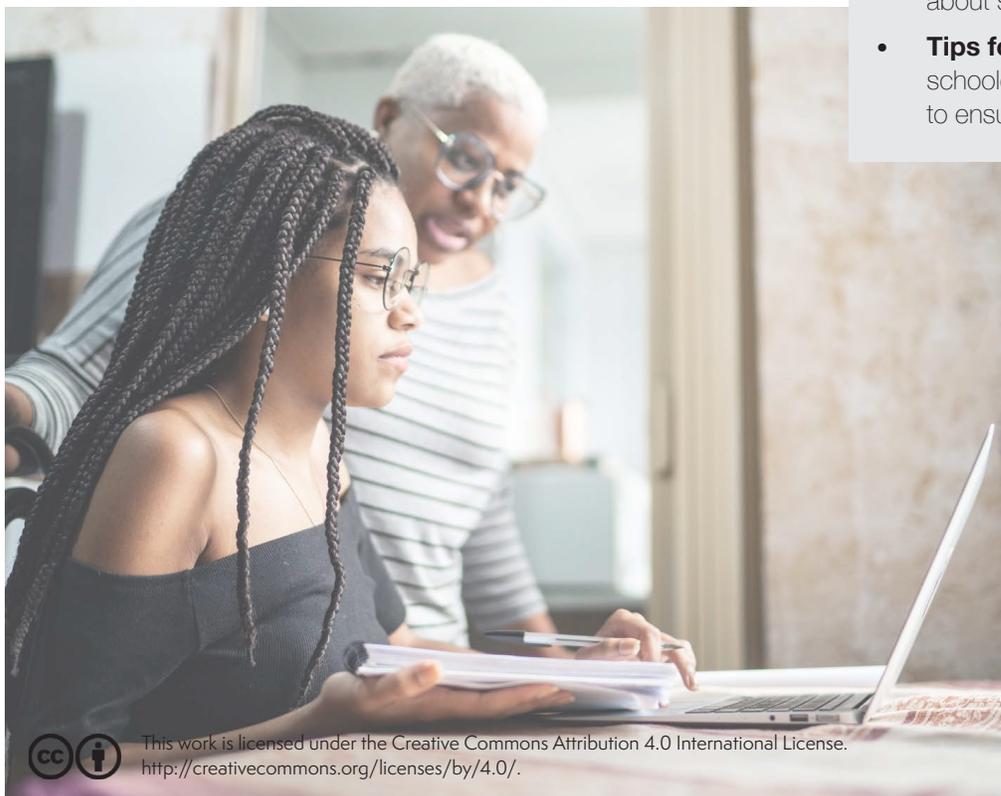
But it hasn't always been easy for parents and caregivers to figure out what teens should know and be able to do by the end of each grade – and how to discuss these topics with their children and their teachers.

Moreover, while families are usually able to help if kids get stuck in the early grades, the content gets more challenging as students get older, and students gain more ownership over their learning. Suddenly, parents and caregivers may feel like they don't have much help to offer. But that's not the case. Research confirms that families still have a big role to play in helping students learn. It's just a different role.

In addition to providing encouragement, a study of more than 50,000 students found that relating what middle and high school kids are learning in school to their future life goals is one of the most effective ways families can help. What doesn't work? Trying to be directly involved with schoolwork. It can feel to high school students like you're interfering or even confusing them. And this IS the time to encourage students to take more responsibility and be more independent; helping them take charge of their learning is important.

This Guide was developed so students and their families understand the most important science content and skills that students should learn in high school.

¹Harvard Graduate School of Education (2009). Hill: Parents need to link schoolwork to future goals. <http://www.gse.harvard.edu/news/09/05/hill-parents-need-link-schoolwork-future-goals>.



HIGH SCHOOL Science



Santa Barbara Unified
Every child, every chance, every day.

THIS GUIDE INCLUDES

- **What High Schoolers Are Learning** – What experts say is the most important content (knowledge and skills) for students to learn in science during high school, and a few internet resources to help learn it.
- **Talking About Science with your High Schooler** – Ideas for families and their teens to talk about school.
- **Tips for Talking with Teachers** – How high schoolers, parents, and teachers can work together to ensure success.

**STUDENT
ACHIEVEMENT
PARTNERS**



CA-NGSS High School 3-Course Model

PHYSICS IN THE UNIVERSE: What High Schoolers are Learning



Physics in the Universe is aligned to the California Next Generation Science Standards (CA NGSS) and the California Science Framework High School Three Course Model. Students in this course will build upon TK-8 learning in the three-dimensions of CA NGSS science: Science and Engineering practices (SEPs), Disciplinary Core Ideas (DCIs), and Crosscutting Concepts (CCCs). The Physics in the Universe course integrates topics in Physical Science, Earth Science, and Engineering by using phenomena to engage students with the guiding concepts of forces and motion, impulse and momentum, energy, electricity and magnetism, and waves. Students engage in a culminating unit on cosmology, applying concepts of physics to understand the relationships between planet Earth and the formation of the Universe. Students who demonstrate understanding of the guiding concepts in this course will be able to:

- Analyze data to support the claim that Newton’s second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. (HS-PS2-1)
- Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects). (HS-PS3-2)
- Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter. (HS-PS4-4)
- Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. (HS-ESS1-5)

PHYSICS IN THE UNIVERSE: Tools and Resources to Help



- NGSS Parent Guide: Preparing Students for a Lifetime of Success
<https://www.nextgenscience.org/sites/default/files/ParentGuide%20Grades%209to12%20-%20General.pdf>
- Beyond “misconceptions”: How to recognize and build on Facets of student thinking (STEM Teaching Tools)
<http://stemteachingtools.org/brief/37>
- CK-12 Science Simulations and Interactive Reading
<https://www.ck12.org/student/>
- The American Museum of Natural History - Science Topics
<https://www.amnh.org/explore/science-topics>
- PBS Learning Media: Science
<https://ca.pbslearningmedia.org/subjects/science/>



CA-NGSS High School 3-Course Model

CHEMISTRY OF THE EARTH SYSTEM: What High Schoolers are Learning



Chemistry in the Earth System is aligned to the California Next Generation Science Standards (CA NGSS) and the California Science Framework High School Three Course Model. Students in this course will build upon TK through 9th grade learning in the three-dimensions of CA NGSS science: Science and Engineering practices (SEPs), Disciplinary Core Ideas (DCIs), and Crosscutting Concepts (CCCs). The Chemistry in the Earth System course integrates topics in Physical Science, Earth Science, and Engineering by using phenomena to engage students with the guiding concepts of foundational chemistry, then applying these concepts to the global issue of climate change. Students who demonstrate understanding of the guiding concepts in this course will be able to:

- Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the process of fission, fusion, and radioactive decay. (HS-PS1-8)
- Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. (HS-PS-1-1)
- Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). (HS-PS3-4)
- Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. (HS-ESS3-5)

CHEMISTRY OF THE EARTH SYSTEM: Tools and Resources to Help



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- The American Museum of Natural History - Science Topics
<https://www.amnh.org/explore/science-topics>
- PBS Learning Media: Science
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CA-NGSS High School 3-Course Model

BIOLOGY: THE LIVING EARTH: What High Schoolers are Learning



The Living Earth is aligned to the California Next Generation Science Standards (CA NGSS) and the California Science Framework High School Three Course Model. Students in this course will build upon previous TK through 10th grade learning in the three-dimensions of CA NGSS science: Science and Engineering practices (SEPs), Disciplinary Core Ideas (DCIs), and Crosscutting Concepts (CCCs). The Living Earth course integrates topics in Life Science, Earth Science, and Engineering by using phenomena to engage students with the guiding concepts of the study of matter and energy flow, the interaction between Earth's atmosphere and biosphere, and structure and function as it relates to the process of molecular biosystems, biological organisms, and evolution. Students who demonstrate understanding of the guiding concepts in this course will be able to:

- Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. (HS-LS1-1)
- Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. (HS-LS3-2)
- Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. (HS-LS4-2)
- Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.* (HS-ESS3-4)

BIOLOGY: THE LIVING EARTH: Tools and Resources to Help



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TALKING ABOUT SCIENCE WITH YOUR HIGH SCHOOLER:

High school is an opportunity for students to take more ownership of their learning. The content students learn will become increasingly sophisticated. Acknowledging your teen's interests throughout this time can help to engage them in the study of mathematics.

Below are a few tips on how parents can encourage teens to engage with high school science:

- Encourage your student to talk to you about the science they feel they can successfully do. Which new phenomena are they learning about in class? What are some recent activities they have engaged in to make sense of the phenomena?
- Help your high schooler find resources that they feel are relevant and helpful. Ask them to talk to their teachers about the resources and extensions related to the current science topics being investigated in their class.
- Have your student think about how the current science topic might be directly relevant to their world.
- Encourage your student to think about everyday phenomena in the world around them. Help them be curious about what they see and experience in the natural world by using the question, "What do you notice?" and listening to their observations.
- Encourage students to think about careers they might like to have when they are an adult. Help them learn about how science is a part of these jobs.





TIPS FOR TALKING WITH TEACHERS

All students, particularly high schoolers who are engaged in more complex and sophisticated areas of study, should feel empowered to engage in conversation with their teachers about their progress and the content they are learning. Throughout the school year, students can use the following questions to ask teachers about their performance and self-assess:

- How can I apply what I already know to the content in this course?
- What are the expectations for success in this class? How do these criteria balance between effort and achievement?
- What do you see as areas of strength for me as a scientist?
- Are there specific resources that I should be aware of to support my learning this year?

Families can also inquire about the content students will learn in class and how to provide support:

- Ask for specific updates on how your student is progressing in their understanding of the key content and science practices for their grade level.
- Which phenomena is your student learning about in science? What are the related science concepts student will be using to make sense of the phenomena?
- Is my high schooler able to demonstrate to you that they understand what they are learning? If not, what challenges are they facing?

