

Unit 6: The Sun and Stars

Content Area: **Science**
Course(s):
Time Period: **Marking Period 2**
Length: **8**
Status: **Published**

Summary

In this unit, students will learn about the sun, its formation and current structures, and how other stars formed and are classified.

Introduction: The Sun is the largest feature of our solar system, and it is essential to most life on Earth. Solar flares, sunspots, and other phenomena influence human activities on Earth. Other stars are similar in some ways to our Sun, but differences in size can have dramatic effects on the appearance and life cycles of those other stars.

Revision Date: July 2019

LA.RST.9-10	Reading Science and Technical Subjects
LA.WHST.9-10	Writing History, Science and Technical Subjects
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.
CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP11	Use technology to enhance productivity.
SCI.HS-ESS1-1	Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.
SCI.HS-ESS1-3	Communicate scientific ideas about the way stars, over their life cycle, produce elements.
SCI.HS-ESS1-4	Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

SCI.HS-PS3-5	Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.
SCI.HS-PS2-1	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.
SCI.HS-PS4-1	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
SCI.HS-PS1-8	Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.
SCI.HS-PS3-1	Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
SCI.HS-PS2-2	Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.
SCI.HS-PS2-4	Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.
SCI.HS-PS3-2	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 position of particles (objects).
WRK.9.1.2.CAP.1	Make a list of different types of jobs and describe the skills associated with each job.
9-12.HS-ESS1-3	Communicate scientific ideas about the way stars, over their life cycle, produce elements.
9-12.HS-ESS1-1	Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.
9-12.HS-ESS1-4	Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.
9-12.HS-PS3-1	Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
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9-12.HS-PS2-4	Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.
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9-12.HS-PS2-2	Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.
9-12.HS-PS4-1	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
9-12.HS-PS1-8	Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.
9-12.HS-PS3-5	Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.
TECH.9.4.2.CI.1	Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2).

TECH.9.4.2.CT.1	Gather information about an issue, such as climate change, and collaboratively brainstorm ways to solve the problem (e.g., K-2-ETS1-1, 6.3.2.GeoGI.2).
TECH.9.4.2.CT.3	Use a variety of types of thinking to solve problems (e.g., inductive, deductive).
TECH.9.4.2.GCA.1	Articulate the role of culture in everyday life by describing one's own culture and comparing it to the cultures of other individuals (e.g., 1.5.2.C2a, 7.1.NL.IPERS.5, 7.1.NL.IPERS.6).

Essential Questions/Enduring Understandings

How is our star, the Sun, different from other stars? How is it similar?

Objectives

Students will know the structure of a typical star.

Students will know how the H-R Diagram is used to measure properties of stars.

Students will know how stars produce energy and light.

Students will know how stellar mass controls stellar luminosity.

Students will know how stellar mass controls its death.

Students will know how stellar temperatures control stellar color.

Students will be skilled at calculating stellar distances based on luminosity.

Students will know how stellar luminosities are calculated.

Students will be skilled at sequencing the life cycle of an average star.

Students will know the properties of white dwarfs, neutron stars, and black holes.

Students will recognize the enormous energy generated in nuclear fusion.

Students will know why massive stars end their lives in a supernova explosion or a black hole.

Students will be skilled at analysis on the various types of stars.

Students will be skilled at analysis of the electromagnetic spectrum.

Students will be skilled at using the spectroscope to determine spectral signature of elements.

Students will be skilled at studying the nature of light and Kirchoff's Laws.

Students will know how to measure a star's distance in parsecs and using the standard-candles method.

Learning Plan

Investigation: Measuring how far away the stars are using parallax.

Star in a Box Activity

Graphing activity: H-R Diagram and interpretations.

Classifying stars activity

Video: Cosmos Episode 8 - Sisters of the Sun about Annie Jump Cannon and Cecilia Payne

Assessment

Formative Assessment: Star in a Box

Quizzes

Summative Assessment:

Chapter Test

Alternative: Classify Stars Activity

Materials

-
quantitative/qualitative lab equipment for activities, experiments
related astronomy maps, charts
supplementary interactive multimedia, internet websites, videos
Foundations of Astronomy Textbook

Integrated Accommodation and Modifications

https://docs.google.com/spreadsheets/d/1243s4Clz7zHx_VnPe-hYDP06QSoHb0jKJY2NuNYySSc/edit?usp=sharing