

Environmental Science: Origin of the Universe



Essential Understanding:

ESS1.A: The Universe and Its Stars

- The star called the sun is changing and will burn out over a lifespan of approximately 10 billion years. (HSESS1-1)
- The study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth. (HS-ESS12) (HS-ESS1-3)
- The Big Bang theory is supported by observations of distant galaxies receding from our own, of the measured composition of stars and non-stellar gases, and of the maps of spectra of the primordial radiation (cosmic microwave background) that still fills the universe. (HS-ESS1-2)
- Other than the hydrogen and helium formed at the time of the Big Bang, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electromagnetic energy. Heavier elements are produced when certain massive stars achieve a supernova stage and explode.
- (HS-ESS12) (HS-ESS1-3)

ESS1.B: Earth and the Solar System

- Kepler's laws describe common features of the motions of orbiting objects, including their elliptical paths around the sun. Orbits may change due to the gravitational effects from, or collisions with, other objects in the solar system. (HS-ESS1-4)

PS3.D: Energy in Chemical Processes and Everyday Life

- Nuclear Fusion processes in the center of the sun release the energy that ultimately reaches Earth as radiation. (secondary to HS - ESS1 - 1)

PS4.B Electromagnetic Radiation

- Atoms of each element emit and absorb characteristic frequencies of light. These characteristics allow identification of the presence of an element, even in microscopic quantities. (secondary to HS - ESS1 - 2)



“The brain weighs only three pounds, yet is the most complex object in the solar system.” -Michio Kaku

Overview

Students examine the processes governing the formation, evolution, and workings of the solar system and universe. Some concepts studied are fundamental to science, such as understanding how the matter of our world formed during the Big Bang and within the cores of stars. Other concepts are practical, such as understanding how short-term changes in the behavior of our sun directly affect humans. Engineering and technology play a large role here in obtaining and analyzing the data that support the theories of the formation of the solar system and universe. The crosscutting concepts of patterns, scale, proportion, and quantity, energy and matter, and

stability and change are called out as organizing concepts for these disciplinary core ideas. In the Students are expected to demonstrate proficiency in developing and using models, using mathematical and computational thinking, constructing explanations and designing solutions, engaging in argument, and obtaining, evaluating and communicating information; and to use these practices to demonstrate understanding of the core ideas.

(<https://www.nextgenscience.org/sites/default/files/HS%20ESS%20DCI%20combined%206.13.13.pdf>)

Guiding question: What are the predictable patterns caused by Earth’s movement in the solar system?

Individual work

_____ Read Study Guide (08/26) (08/27)

_____ Participate in the lessons:

- Origin of the Universe (09/02) (09/03)
- Size and Scale of the Solar System (09/09) (09/10)
- Stars (09/16) (09/17)

_____ Make vocabulary cards for the vocabulary in your Vocabulary List (as needed, vocabulary card will not be allowed on quizzes or tests) (08/29) (08/30)

_____ Reflect on the answer to Guiding Question 1 (09/23) (09/24)

Group work/ Lab Work

Labs will be done in groups of 4 or 5.

Lab Handouts: There will be a pre-lab for students to complete before the lab experiment, during the lab the students will gather the necessary data to complete the lab and answer the questions associated with the topic. After the necessary data is collected students will work on completing their lab notebook.

Lab Notebook: Every student is required to keep a lab notebook. The lab notebook will be each student’s personal “copy”. **You will receive specific instructions on the lab notebook requirements.**

This notebook will be graded on proper usage and completeness. *The lab notebook will be checked once a unit on the day of the assessment.*

Formal Laboratory Report: Each quarter students will put together a formally written laboratory report. This laboratory report is done individually (plagiarism is not allowed). The

report must be typed and include; Title, Purpose, Procedure, Materials, Observations, Data, Results, Conclusion and Citations.

How do I put it altogether?

___ Origin of the Universe: Current Event (09/23) (09/24)

___ Review for your self-assessment (09/26) (09/27)

___ Group project: Choose one of the following options (09/19) (09/20)

- a. 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.
- b. Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.
- c. Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

Assessment

1. Vocabulary Assessment (10/01) (10/02)
2. Testing your Knowledge: Self-Assessment (10/01) (10/02)

Links:

- Origins of the Universe 101- National Geographic
<https://www.youtube.com/watch?v=HdPzOWILrbE>
- The Universe: Big Bang to Now in 10 Easy Steps
<https://www.space.com/13320-big-bang-universe-10-steps-explainer.html>
- Big History Project <https://www.bighistoryproject.com/chapters/1#intro>

NOTE: Work will not be graded if you do not have a notebook that is only used for Environmental Science. Please do not use your Environmental Science notebook for another class, and make sure you come prepared with a pen/pencil.

