Unit 1: The Cosmic Landscape

Content Area: **Science**
Course(s):
Time Period: **Marking Period 1**
Length: **2 weeks**
Status: **Published**

Summary

Students explore the vastness of the universe and are given a brief overview of its structure. Metric units, & other units specific to astronomy, inclusive to the use of scientific notation are described to illustrate the relative size of things in the universe. This unit also focuses on the appearance of the night sky and how it is influenced dramatically by the simple fact that Earth is a planet in motion. Students will learn the information necessary to describe & locate constellations, stars, and other objects in the night sky.

Revision Date: July 2024

1	Make sense of problems and persevere in solving them
9.4.12.CI	Creativity and Innovation
P.1	Act as a responsible and contributing community members and employee.
HS-PS1	Matter and Its Interactions
P.3	Consider the environmental, social and economic impacts of decisions.
2	Reason abstractly and quantitatively
P.4	Demonstrate creativity and innovation.
P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
3	Construct viable arguments and critique the reasoning of others
P.6	Model integrity, ethical leadership and effective management.
P.7	Plan education and career paths aligned to personal goals.
4	Model with mathematics
9.4.12.CT	Critical Thinking and Problem-solving
P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
5	Use appropriate tools strategically
6	Attend to precision
7	Look for and make use of structure
8	Look for and express regularity in repeated reasoning
RI.MF.9–10.6	Analyze, integrate, and evaluate multiple interpretations (e.g., charts, graphs, diagrams, videos) of a single text or text/s presented in different formats (visually, quantitatively) as well as in words in order to address a question or solve a problem.
HS-PS1-4	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
W.IW.9–10.2	Write informative/explanatory texts (including the narration of historical events, scientific procedures/experiments, or technical processes) to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

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.
HS-ESS1	Earth's Place in the Universe
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.
HS-ESS1-2	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.
HS-ESS1-3	Communicate scientific ideas about the way stars, over their life cycle, produce elements.
HS-ESS1-4	Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.
HS-ESS1-6	Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.

Essential Questions/Enduring Understandings

Essential Questions:

How do scientific practices and methods help astronomers and astrophysicists learn about our universe?

How can the scale of the universe be explained or modeled?

How can the new measurable units in astronomy quantify size, distance, and age of our universe?

Enduring Understandings:

Students will apply knowledge of dimensional analysis & the larger units of measurement to gain comprehension of the size of the universe.

A cosmic map illustrates the location of our solar system within the Milky Way Galaxy and the structure of our known universe.

Objectives

Students will know key terms: astronomy, light year, observable universe, astronomical unit, parsec.

Students will know our cosmic address.

Students will know the varying magnitudes of structures in the universe [i.e. solar system v. galaxy; planets v. stars]

Students will know how to describe the structure of the universe.

Students will know how the speed of light is used as a measuring tool for both distance and time.

Students will be skilled at using scientific notation and the metric system.

Students will be skilled at differentiating planets, moons, asteroids, and meteors.

Learning Plan

Meaningful participation in guided question/answer sessions, individual/group discussions, demonstrating an understanding of the purpose of the unit lesson(s), key terms, and concepts.
Preview the essential questions, provide answers, and connect to learning throughout the unit.
Present and discuss the video “Powers of Ten and the Relative Size of Things in the Universe.”
Illustrate the vastness of the universe through a series of images that gradually step further away from Earth.
Briefly discuss the structure of the universe: planets, moons, stars, solar systems, galaxies, clusters, and superclusters of galaxies.
Discuss the nature and speed of light. Recount the numerous attempts to measure the speed of light.
Explain the use of the metric system and scientific notation and have students practice using both.
Discuss our use of the English system of measurement and compare and contrast with the metric system.
Explain scientific units of measurement that are specific to astronomy.
Discuss look-back time and how it allows us to study the early universe.
Solve mathematical problems using scientific units of measurement specific to astronomy.

Assessment

Formative Assessment:

Do Now &/or Start-Up Questions, Discussions

Student use of scientific notation and SI units

Comparisons between the distance lengths of an astronomical unit, light-year, and parsec

The comparative size & mass of a meteoroid, asteroid, moon, planet, and star

Exit Ticket Submission

Alternative Assessment:

Graphic illustration of linear distances using unit scale conversions

Perform calculations to incorporate elapsed time during distance traveled with conventional technology

Orientation of star maps of the night sky

Identification & locations of constellations

Summative Assessment:

Topic & Vocabulary Quizzes

Unit Tests

Benchmark Assessment:

Final Exam

Materials

quantitative/qualitative lab equipment for activities, experiments

related astronomy maps, charts

supplementary interactive multimedia, internet websites, videos

Textbook: The Cosmic Perspective - 10th Edition

Integrated Accommodation and Modifications

https://docs.google.com/spreadsheets/d/1VPJNV9-GTZxi5VPcYkvEMPdHR8D8wTBI7zIj1BWYpek/edit?usp=drive_link