Unit 4: The Sun/Moon/Earth System

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

Summary

The Sun/Moon/Earth system and the changes in appearance it undergoes have influenced human life for millennia. Calendars have been based on the Moon's phases, and tides on Earth are caused by gravitational interactions between the Moon, Sun, and Earth. In this unit, students will learn about mapping & navigation on Earth, theories about the formation of the moon, how the moon's presence causes the tides on Earth, and what happens during lunar & solar eclipses.

Revision Date: July 2024

MATH.K-12.1	Make sense of problems and persevere in solving them
MATH.K-12.2	Reason abstractly and quantitatively
MATH.K-12.3	Construct viable arguments and critique the reasoning of others
MATH.K-12.4	Model with mathematics
MATH.K-12.5	Use appropriate tools strategically
MATH.K-12.6	Attend to precision
MATH.K-12.7	Look for and make use of structure
MATH.K-12.8	Look for and express regularity in repeated reasoning
ELA.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.
ELA.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.
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-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-PS2-3	Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.
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-ESS1-4	Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.
SCI.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.
SCI.HS-ETS1-1	Analyze a major global challenge to specify qualitative and quantitative criteria and

	constraints for solutions that account for societal needs and wants.
SCI.HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
SCI.HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
SCI.HS-ETS1-4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
WRK.K-12.P.1	Act as a responsible and contributing community members and employee.
WRK.K-12.P.3	Consider the environmental, social and economic impacts of decisions.
WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.6	Model integrity, ethical leadership and effective management.
WRK.K-12.P.7	Plan education and career paths aligned to personal goals.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
TECH.9.4.12.CI	Creativity and Innovation
TECH.9.4.12.CT	Critical Thinking and Problem-solving

Essential Questions/Enduring Understandings

Essential Questions:

How is the measured angle of the sun & moon in the sky used in nautical navigation?

How has the Moon influenced human history and Earth’s cycles?

How do the Moon's properties affect its current appearance and position?

How do solar & lunar eclipses occur and why are observations such fascinating phenomena?

Enduring Understandings:

Latitude & longitude coordinates affect the angle, amount & duration of exposed sunlight during each season.

Historical significance of the moon's influence on human society.

How lunar observations in the sky help with timekeeping & navigation.

Objectives

Students will know key terms: maria, waxing, waning, gibbous, crescent, eclipse, umbra, penumbra, neap, spring, Apollo, lunar/command module.
Students will know how craters are formed.

Students will know the details of the Moon's orbit and compare the lunar calendar to the Gregorian calendar.
Students will know how the Moon causes tides on Earth.
Students will know why tidal effects are seen elsewhere in the solar system.
Students will know how lunar/solar eclipses occur & draw comparisons between each other.

Students will be skilled at identifying how the Earth and Moon affect one another.

Students will be skilled at identifying the position of the Moon, Sun, and Earth during lunar phases.

Learning Plan

Mapping of features on earth

Identifying reasons for specific latitude lines on earth for each season

Model lunar phases and lunar eclipses

ISLE cycle: Formation of Moon

History of theories of tides

Engineering Project: Lunar Lander

Assessment

Formative Assessment:

Do Now &/or Start-Up Questions, Discussions

Understanding during ISLE Cycle activities

Coordinate identification on earth

Earth's orbital positioning for each season

Comparisons of observed lunar phases

Lunar Lander Assessment

History of NASA: Mercury, Gemini, Apollo space programs

Exit Ticket Submission

Alternative Assessment:

Computer website interactive illustrating lunar phases.

Website interactive comparisons of lunar & solar eclipses.

Lab activity: construction of eclipse shadows

Mathematical calculations of lunar orbits in efforts for timekeeping.

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