04 The Solar System

Content Area: **Science**
Course(s): **CP Astronomy**
Time Period: **Marking Period 1**
Length: **3-4 weeks**
Status: **Published**

Course Pacing Guide

Since the dawn of man, humans have been on a quest to understand who we are. At its most basic level, this quest is inextricably linked to a desire to discover how the universe is put together, how it works, and what our place is in it. In this course, we will explore the science that guides the phenomena we observe in the natural world as we stand on our Planet Earth and gaze into the furthest expanses of the universe. As we journey through the cosmos, we will also explore the social, historical, and philosophical impacts of scientific exploration.

Unit	MP/Trimester	Weeks
A Cosmic Perspective	1	4
The Daytime and Nightime Sky	1	4
The Space Program	1-2	2
The Solar System	2	3
The Stars	2	3
The Universe	2	2

Unit Overview

In this unit, we explore the various objects in the Solar System. We develop ways for classifying like objects and examine how Pluto fits into our classification scheme. We study the origin of the Solar System and the evidence that supports the current scientifically accepted theory of formation. We also look beyond our own Solar System to learn about planets around other stars and the implications this may have for life existing elsewhre in the universe.

Enduring Understandings

- As technology improves and we are able to see more, our understanding of the universe changes.
- Solar system objects can be classified into groups according to their many characteristics.
- The meaning of the word "planet" has changed over time.
- The Solar System was formed from a swirling cloud of dust and gas called a nebula 4.6 billion years ago.

- Most stars have planets around them. The planets we find are mostly large planets that are close to the Sun as a result of the inherent bias in the methods of detection.

Students will know:

- Without the greenhouse effect, Earth would be too cold to maintain liquid water.
- Pluto is no longer considered a planet because the majority of its features are characteristic of Kuiper Belt Objects.
- As spinning objects contract, their rotational speed increases.
- The nebular theory of solar system formation is supported by the fact that: (1) all planets orbit in the same plane, (2) all planets orbit counterclockwise, (3) all planets (except Venus) rotate counter clockwise, and (4) the solar system is mostly hydrogen.

Students will be able to:

- Analyze and critique data that leads us to the current scientific understanding of the solar system.
- Define what a planet is and explain why Pluto is no longer considered among them.
- Write a position paper in which they explain the possibility of extraterrestrial life and the difficult involved in detecting it.

Essential Questions

- Is the Solar System an ordered place?
- How has the definition of "planet" changed over time? What does this tell us about the process of science?
- How do we learn about Solar System objects?
- How does the theory of the origin of the Solar System explain its observed properties?
- Does life exist beyond Earth?

New Jersey Student Learning Standards (No CCS)

9-12.HS-ESS1-1.3.1	students understand the significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs. They recognize patterns observable at one scale may not be observable or exist at other scales, and some systems can only be studied indirectly as they are too small, too large, too fast, or too slow to observe directly. Students use orders of magnitude to understand how a model at one scale relates to a model at another scale. They use algebraic thinking to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth).
9-12.HS-ESS1-4.5.1	Use mathematical or computational representations of phenomena to describe explanations.
9-12.HS-ESS1-2.6.1	Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.
9-12.HS-ESS1-1.ESS1.A.1	The star called the sun is changing and will burn out over a lifespan of approximately 10 billion years.

9-12.HS-ESS1-4.ESS1.B.1	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.

Amistad Integration

Holocaust/Genocide Education

Interdisciplinary Connections

MA.N-Q.A	Reason quantitatively and use units to solve problems.
LA.RST.11-12.2	Determine the central ideas, themes, or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
LA.SL.9-10.1	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

Technology Standards

List specific standards that are relevant
No general statements

TECH.8.1.12.A.CS1	Understand and use technology systems.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.
TECH.8.1.12.E.CS2	Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
TECH.8.1.12.E.CS3	Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.

21st Century Themes/Careers

CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP11	Use technology to enhance productivity.

Financial Literacy Integration

Instructional Strategies & Learning Activities

1. Introduce a Solar System Object: Activity
2. What Is a Planet?: Graphing Activity and Questions
3. The Plight of Pluto: Lecture and Discussion
4. Meteoroid, Meteor, Meteorite: Article and Questions
5. Meteoroid, Meteor, Meteorite: Comic Strip
6. Solar System Formation: Guided Notes
7. Solar System Formation: Article and Questions
8. The Habitable Zone: Simluation and Questions
9. Finding Exoplanets: Notes and Discussion
10. Life in the Universe: Guided Notes, Discussion, and Writing Prompt
11. Study Guide
12. Jeopardy Review
13. Unit Test

Differentiated Instruction

Examples may include:

- Inquiry/Problem-Based Learning
- Variety of learning preferences (visual, auditory, kinesthetic)
- Meaningful Student Voice & Choice
- Self-Directed Learning
- Debate
- LMS use
- The Hot Seat/Role-Play
- Mastery Learning (feedback toward goal)
- Simulation-Based Learning
- Grouping
- Socratic Seminar
- Rubrics
- Concept Attainment
- Assessment Design & Backwards Planning

Formative Assessments

- Various Do-Now Activities
- Observation
- Question and answer
- Informal check-ins

Summative Assessment

Writing Prompt

Unit test

Benchmark Assessments

Alternate Assessments

Resources & Technology

- Astronoy Picture of the Day
- Unviersity of Nebraska Lincoln Astronomy Simulations
- Google Sheets for graphing
- Internet for research
- Comic strip materials

BOE Approved Texts

none

Closure

Such as:

- Gallery Walk - On chart paper, small groups of students write and draw what they learned. After the completed works are attached to the classroom walls, others students affix post-its to the posters to extend on the ideas, add questions.
- Low-Stakes Quizzes - Give a short quiz using technologies like Kahoot or a Google form.
- Have students write down three quiz questions (to ask at the beginning of the next class).
- Question Stems - Have students write questions about the lesson on cards, using question stems framed

around Bloom's Taxonomy. Have students exchange cards and answer the question they have acquired.
- Kids answer the following prompts: "What takeaways from the lesson will be important to know three years from now? Why?
- Ask a question. Give students ten seconds to confer with peers before you call on a random student to answer. Repeat.
- Have kids orally describe a concept, procedure, or skill in terms so simple that a younger student would understand it.
- Kids write notes to peers describing what they learned from them during class discussions.

ELL

Such as:

- Alternate Responses
- Advance Notes
- Extended Time
- Teacher Modeling
- Simplified Written and Verbal Instructions
- Frequent Breaks
- E-Dictionaires
- Google Translate

Special Education

List is not inclusive but may include examples such as:

- Shorten assignments to focus on mastery of key concepts.
- Specify and list exactly what the student will need to learn to pass.
- Evaluate the classroom structure against the student's needs (flexible structure, firm limits, etc.).
- Keep the classroom quiet during intense learning times.
- Provide a computer for written work.
- Seat the student close to the teacher or a positive role model.
- Provide an unobstructed view of the chalkboard, teacher, movie screen, etc.
- Keep extra supplies of classroom materials (pencils, books) on hand.
- Give directions in small steps and in as few words as possible.
- Number and sequence the steps in a task.
- Have student repeat the directions for a task.
- Provide visual aids.
- Go over directions orally.
- Provide a vocabulary list with definitions.
- Permit extra time as indicated in IEP.
- Allow tests to be taken in a room with few distractions (e.g., the library).
- Have test materials read to the student, and allow oral responses.
- Divide tests into small sections of similar questions or problems.

- Show a model of the end product of directions (e.g., a completed math problem or finished quiz).
- Stand near the student when giving directions or presenting a lesson.

504

Examples of accommodations in 504 plans include but are not limited to:

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits
- occupational or physical therapy

At Risk

Examples may include:

- Use of mnemonics
- Have student restate information
- Concrete examples
- Weekly home-school communication tools (notebook, daily log, phone calls or email messages)
- No penalty for spelling errors or sloppy handwriting
- Teach time management skills
- Verbal and visual cues regarding directions and staying on task
- Adjusted assignment timelines
- Immediate feedback
- Work-in-progress check
- Pace long-term projects
- Preview test procedures
- Cue/model expected behavior

Gifted and Talented

Focus on effort and practice

Offer the Most Difficult First

Offer choice

Speak to Student Interests

Allow G/T students to work together

Encourage risk taking