

Unit 2: Space Systems

Driving Question: Why is Earth so unique?

Anchor Phenomenon: The movie “Contact” Opening Scene










Duration: 35-40 days



Unit Overview: In this unit, students will explore the origins and mechanics of the universe and how they affect life on Earth. Topics include the Big Bang, nuclear fusion, and stellar nucleosynthesis, which explain how the universe and elements were formed. Students will then study orbital motions and how they produce predictable patterns, including tides and seasons. Through models, data analysis, and simulations, students will understand the relationships between celestial motions and Earth systems.

Performance Expectations [PE]:

- 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-ESS1-7: Construct an explanation using evidence to support the claim that the phases of the moon, eclipses, tides and seasons change cyclically.

	Identifying the Driving Question	Unit 2: Space Systems						
		Fueling Fusion	Star Story	Cooking Up the Cosmos	Big Bang Theory	Orbital Motions	Cyclic Changes	
Anchor Phenomenon Activity	Why is Earth so unique?	How do stars provide energy in the Universe?	How do stars form, live, and die in our Universe?	Where do elements originate?	What evidence supports the Big Bang Theory?	What governs the way celestial objects move?	How do the motions of Earth create repeating patterns?	Anchor Phenomenon Activity
Contact Video Clip	Driving question board.	How the Universe Works	How the Universe Works	Quick Read Karl Sagan	Spectral Lines and Spectroscopes	Famous Astronomers	Bay of Fundy Tidal Changes	Contact Video Clip
								
Short-form Video	Driving Question Board Activity	Short-form Video	Short-form Video	Short-form Video	Demo Activity	Internet Research	Short-form Video	Short-form Video
State Investigation — Unearthing Mars								

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Anchor Phenomenon Activity

Why is Earth so unique?

Scope and Sequence of Activities

Opening scene for the movie "Contact".



Short-form Video

Parts of Earth Artifact Walk



Station Rotation Activity

Student Lead Question Creation



Driving Question Board Activity

Identifying the Driving Question



Driving Question Board Activity

Resources and Links

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Fueling Fusion

How do stars provide energy in the Universe?







Key Concepts

1. The Sun
2. Sunspot Cycle
3. Process of Nuclear Fusion

Performance Expectations

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.

Scope and Sequence of Activities

Introduction	Discovery	Notes	Revisit	Practice	Evaluate
					
Short-form Video Fusion	Investigation Sunspot Activity	Keynote w/ Class Notes	Wrap-up Sunspot Activity	Question Clusters	Assessment [10 question]

Supplemental Materials

Video - Link					
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Resources and Links

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Star Story

How do stars form, live, and die in our Universe?







Key Concepts

1. Stellar Evolutions of Stars
2. Electromagnetic Energy

Performance Expectations

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-ESS1-3: Communicate scientific ideas about the way stars, over their life cycle, produce elements.

Scope and Sequence of Activities

Introduction	Discovery	Notes	Revisit	Practice	Evaluate
					
Short-form Video Supernova	Exploration ESSRT	Keynote w/ Class Notes	Investigation Wrap-up	Question Clusters	Assessment [10 question]

Supplemental Materials

Video - Link					
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Resources and Links

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Cooking Up the Cosmos

Where do elements originate?

Key Concepts

1. Stellar Nucleosynthesis as a Function of Mass
2. ESSRT: Generalized Nucleosynthesis in a Massive Star
3. Extrapolating and Predicting data

Performance Expectations

HS-ESS1-3: Communicate scientific ideas about the way stars, over their life cycle, produce elements.

Scope and Sequence of Activities

Introduction



Quick Read
Karl Sagan Quote

Discovery



Investigation
Stellar Nucleosynthesis

Notes



Keynote w/
Class Notes

Revisit



Investigation
Wrap-up

Practice



Question
Clusters

Evaluate



Assessment
[10 question]

Supplemental Materials

Exploration
ESRT

Resources and Links

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Big Bang Theory

What evidence supports the Big Bang Theory?

Key Concepts

1. Motions of the Galaxies Evidence
2. Background Radiation Evidence
3. Composition of Matter Evidence

Performance Expectations

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.

Scope and Sequence of Activities

Introduction



Demo Spectral Lines
and Spectroscopes

Discovery



Investigation
Spectral Lines

Notes



Keynote w/
Class Notes

Revisit



Investigation
Wrap-up

Practice



Question
Clusters

Evaluate



Assessment
[10 question]

Supplemental Materials

Resources and Links

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Orbital Motions

What governs the way celestial objects move?







Key Concepts

1. Newtonian Laws
2. Kepler's Laws
3. Parts of an Ellipse

Performance Expectations

HS-ESS1-4: Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

Scope and Sequence of Activities

Introduction	Discovery	Notes	Revisit	Practice	Evaluate
					
Research Famous Astronomers	Investigation Orbital Motions	Keynote w/ Class Notes	Investigation Wrap-up	Question Clusters	Assessment [10 question]

Resources and Links

	Exploration Orbital Motions				
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Resources and Links

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Cyclic Changes

How do the motions of Earth create repeating patterns?

Key Concepts

1. Phases of the Moon and Tides
2. Solar and Lunar Eclipses
3. Seasonal Changes

Performance Expectations

HS-ESS1-7: Construct an explanation using evidence to support the claim that the phases of the moon, eclipses, tides and seasons change cyclically.

Scope and Sequence of Activities

Introduction



Keynote Indiana Jones
and NYC's Oculus

Discovery



Investigation
Cyclic Changes

Notes



Keynote w/
Class Notes

Revisit



Investigation
Wrap-up

Practice



Question
Clusters

Evaluate



Assessment
[8 question]

Supplemental Materials

Resources and Links

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Synthesizing the Driving Question

Why is Earth so unique?

Scope and Sequence of Activities

Revisit the
Driving Question



Driving Question
Board Activity

Answering the
Question



Socratic Seminar
Discussion

Write and defend your argument
based gained knowledge



Synthesizing the
Driving Question Argument

Resources and Links

Investigation: Unearthing Mars — A Historical Perspective

Why is Earth so unique?

Performance Expectations

HS-ESS1-4: Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

Resources

Secure documentation provided by director.