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	Big Bang Theory	Cooking Up the Cosmos	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?	What evidence supports the Big Bang Theory?	Where do elements originate?	What governs the way celestial objects move?	How do the motions of the Universe affect Earth?	Anchor Phenomenon Activity
Contact Video Clip	Driving question board.	How the Universe Works	How the Universe Works	Expanding Red Ballon	TedEd Video	Sun and Moon Size Comparison	Bay of Fundy Tidal Changes	Contact Video Clip
Short-form Video	Driving Question Board Activity	Short-form Video	Short-form Video	Demo Activity	Short-form Video	Think/Pair/Share Activity	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”.	Parts of Earth Artifact Walk	Student Lead Question Creation	Identifying the Driving Question
			
Short-form Video	Station Rotation Activity	Driving Question Board Activity	Driving Question Board Activity

Resources and Links

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Fueling Fusion

How do stars provide energy in the Universe?

Key Concepts	Performance Expectations
1. The Sun 2. Sunspot Cycle 3. Process of Nuclear Fusion	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					

Resources and Links

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Star Story

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

Key Concepts	Performance Expectations
1. Stellar Evolutions of Stars 2. Electromagnetic Energy	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					

Resources and Links

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Big Bang Theory

What evidence supports the Big Bang Theory?

Key Concepts	Performance Expectations
1. Motions of the Galaxies Evidence 2. Background Radiation Evidence 3. Composition of Matter Evidence	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	Discovery	Notes	Revisit	Practice	Evaluate
Demo Red Balloon	Investigation Spectral Lines	Keynote w/ Class Notes	Investigation Wrap-up	Question Clusters	Assessment [10 question]

Supplemental Materials

Resources and Links

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Cooking Up the Cosmos

Where do elements originate?

Key Concepts	Performance Expectations
1. Stellar Nucleosynthesis as a Function of Mass 2. ESSRT: Generalized Nucleosynthesis in a Massive Star 3. Extrapolating and Predicting data	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 Origin of Gold	Investigation Stellar Nucleosynthesis	Keynote w/ Class Notes	Investigation Wrap-up	Question Clusters	Assessment [10 question]

Supplemental Materials

	Exploration ESRT				

Resources and Links

Video - Link					

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Orbital Motions

What governs the way celestial objects move?

Key Concepts	Performance Expectations
1. Newtonian Laws 2. Kepler's Laws 3. Parts of an Ellipse	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
Think / Pair / Share Moon v. Sun Sizes	Investigation Constructing Ellipses	Keynote w/ Class Notes	Investigation Wrap-up	Question Clusters	Assessment [10 question]

Resources and Links

Resources and Links

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Cyclic Changes

How do the motions of the Universe affect Earth?

Key Concepts	Performance Expectations
1. Phases of the Moon and Tides 2. Solar and Lunar Eclipses 3. Seasonal Changes	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	Discovery	Notes	Revisit	Practice	Evaluate
Short-form Video Bay of Fundi	Investigation Seasonal Temperatures	Keynote w/ Class Notes	Investigation Wrap-up	Question Clusters	Assessment [10 question]

Supplemental Materials

	Simulations				

Resources and Links

Video - Link					

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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	Resources
HS-ESS1-4: Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.	Secure documentation provided by director.