Township of Ocean Schools

Assistant Superintendent
Office of Teaching and Learning

SPARTAN MISSION:
Meeting the needs of all students with a proud tradition of academic excellence.

Curriculum Documents

School: Ocean Township High School

Course: Astronomy

Department: Science

Supervisor: Patrick Sullivan

Board Approval	Supervisor	Notes
August 2011	Patrick Sullivan	Update Standards
August 2013	Patrick Sullivan	Update Standards
December 2017	Patrick Sullivan	Update Standards

Department Science **Course** Astronomy

Timeline					
	Week			**Week**	
1	**1**	**History of Astronomy**	**3**	**11**	**The Gas Giants: Jupiter and Saturn**
	2	**History of Astronomy**		**12**	**The Ice Giants: Uranus and Neptune**
	3	**The Moon**		**13**	**Asteroids, Meteoroids and Comets**
	4	**The Moon**		**14**	**Projects + Winter Break**
	5	**The Earth**		**15**	
2	**6**	**The Earth**	**4**	**16**	**Asteroids, Meteoroids and Comets**
	7	**The Sun**		**17**	**Telescope Design**
	8	**The Sun**		**18**	**The Telescope: It's History and It's Future**
	9	**The Inner Planets: Mercury, Venus and Mars**		**19**	**Birth, Life and Death of Stars**
	10	**Mars Landing Project**		**20**	**Final Exam**

Department Science **Course** Astronomy

Time Frame	2 weeks

Topic

Science Revises the Heavens: The History of Astronomy

Essential Questions

- Why should students study astronomy?
- What is the history of the discovery of the sun centered universe?
- Who were the important figures in the early years of astronomical discovery?
- What is the importance of revealing scientific breakthroughs to the general public?

Enduring Understandings

- Students should study astronomy because it plays an integral part of their understanding of the universe around them.
- Having students learn the history behind the acceptance of the sun centered universe will help them to develop an appreciation that astronomy is not only a science but a sociological component of our lives.
- Students will be able to detail the developments that led to Newton's Universal Gravitation.

Alignment to NJSLS-S

HS-ESS1-1 HS-ESS1-2 HS-ESS1-3 HS-ESS1-4 HS-ESS1-6	

- Identify the concepts of Aristotelian astronomy.
- Describe the events that led to the Papal Council at Trento.
- List the changes the Roman Catholic Church instituted to respond to the Protestant Revolution.
- Explain the basic faults of the geocentric universe.
- Explain the meaning of the word "planet".
- Describe why Copernicus' discoveries were censured by the Catholic Church.
- Explain what role the defining of gravity played in the understanding of celestial motion.
- Identify the contributions Galileo and Newton made to the reversal of the churches positions on the heavens.
- Describe the importance of Haley's Comet in the final chapter of the understanding of orbital and elliptical motion.
- Explain how Kepler's Laws redefined our understanding of the clockwork universe.

Learning Activities

- Lecture and classroom discussion
- Computer Research projects
- Astronomy Journal
- Current Events

Videos

- Infinitely Reasonable – James Burke

Assessments

- Video Quizzes
- WebQuest Reports

- Quizzes
- Tests
- Projects
- Inquiry Based Activities
- Homework

21st Century Skills

X	Creativity	**X**	Critical Thinking	**X**	Communication	**X**	Collaboration
X	Life and Career Skills	**X**	Information Literacy	**X**	Media Literacy		

Interdisciplinary Connections

- Math
- Social Studies: All Lecture/Discussions Require the Historical Development of the Specific Topic Being Studied.
- Language Arts: There is a writing component to each unit in the form of lab reports. Additionally, each test includes an essay section.
- Fine Arts

Technology Integration

- PowerPoint Presentations
- Data Projector
- Elmo Incorporation
- DVD/VHS/Disc Demonstration
- YouTube Content Shorts
- Each Class Has 13 Student Computers and the Use of Lap Top Computer Carts
- Microsoft Office Suite 2013
- Integration of Cell Phone Usage by Students to Access Internet During Lecture/Discussions
- All Laboratory Equipment is Technology

Department Science **Course** Astronomy

Time Frame	**2 Weeks**

Topic

The Moon

Essential Questions

- How did the falling apple inspire Newton's understanding of the moon and the universal nature of gravity?
- Exactly how many men have landed on the moon and how much lunar material has been brought back to earth?
- Why do we see only one side of the moon?
- How does the moon's rotation and revolution affect its shape?
- What are some of the distinguishing characteristics of the moon as it relates to other moons in our solar system?
- How are the phases of the moon related to "Neap" and "Spring" tides?
- How does the moon create the tides?
- What Moon-Earth-Sun relative positions account for the various phases of the moon?
- In what alignment of Sun, Moon and Earth does a solar and lunar eclipse occur?
- What do the terms "totality and corona" refer to?
- Why does the moon appear "red" during a lunar eclipse?
- What is meant by the terms "Umbra" and "Penumbra"?
- What planetary alignment makes eclipses so rare?
- What are a "Ring of Fire", "Super Moon", "Blue Moon" and "Harvest Moon"?
- How did the "Cold War" fuel the race to the moon?
- What were the objectives and accomplishments of the "Mercury", "Gemini" and "Apollo" missions?
- What are some of the scientific facts that support the veracity of the moon landings?
- What are some of the theories that explain the origin of the moon?
- How does the moon's low density and lack of iron help support the accepted theory of its origin?
- How does the lack of iron explain why the moon has no magnetic field?
- Why does the moon lack an atmosphere and how does that account for its crater covered surface?
- How did the impact with meteoroids create the moon's highlands, rills and Maria (seas)?
- What is the new evidence that indicates that water does exist on the moon?
- What future plans does mankind have in relation to lunar exploration?
- What are the most current probes doing to expand our understanding of the moon?

Enduring Understandings

- Students should have a basic understanding of the Moon, its origins, characteristics and effect on the Earth's oceans.
- Students will able to explain the appearance of the Moon in its different phases relative to the position of the Earth and Sun.
- Students will able to explain the appearance of the moon and sun during solar and lunar eclipses.
- Students will able to account for the infrequency of eclipses.
- Students will able to explain the forces that allow us to only see one side of the moon.
- Students will able to understand the political dynamics that led to the race to the moon.
- Students will able to list scientific evidence that verifies the moon landings.

- Students will able to identify and explain the accepted view of the moon's origin.
- Students will able to explain the topography of the moon in terms of impacts with meteoroids and other space rocks.
- Students will able to explain the most up to date information on the moon.
- Students will able to identify any future plans for a return to the moon.

Alignment to NJSLS-S

HS-ESS1-1 HS-ESS1-2 HS-ESS1-3 HS-ESS1-4 HS-ESS1-6	

Key Concepts and Skills

- Identify the characteristics of the Moon and how it creates tides on Earth.
- Describe the events that generate the different phases of the Moon.
- Understand the positions and appearance of the sun, moon and earth during eclipses.
- Define the most common terms related to the appearance of the moon during its various phases and eclipses.
- Identify the angle and tilt of the moon that creates phases and makes eclipses a regular but rare occurrence.
- Understand why the moon's football shape is related to gravity lock and the torque created by the earth
- Explain the "Moon Race" in terms of the Cold War.
- Identify scientific facts that prove that the moon landings were not a "hoax".
- Understand and explain why the moon was created by an off center collision with another heavenly body the size of Mars.
- Explain the formation of Maria, highlands and rills on the lunar surface.
- Identify the current knowledge concerning the presence of water on the moon.
- Describe the future plans regarding a return to the moon by either probes or humans.

Learning Activities

- Lecture and classroom discussion
- Computer Research projects
- Astronomy Journal
- Current Events
- Textbook assignments (Conceptual Physical Science – Hewitt) Ch. 4 & Ch28.

Videos

- A & E: The Planets – " The Moon"
- A & E: The Planets – "Atmosphere"
- The Universe: Secrets of the Moon
- The Lunar Hoax Debunked

Assessments

- Video Quizzes
- WebQuest Reports
- Quizzes
- Tests
- Projects
- Inquiry Based Activities
- Homework

21st Century Skills

X	Creativity	**X**	Critical Thinking	**X**	Communication	**X**	Collaboration
X	Life and Career Skills	**X**	Information Literacy	**X**	Media Literacy		

Interdisciplinary Connections

- Math:
- Social Studies: All Lecture/Discussions Require the Historical Development of the Specific Topic Being Studied.
- Language Arts: There is a writing component to each unit in the form of lab reports. Additionally, each test includes an essay section.
- Fine Arts:

Technology Integration

- PowerPoint Presentations
- Data Projector
- Elmo Incorporation
- DVD/VHS/Disc Demonstration
- YouTube Content Shorts
- Each Class Has 13 Student Computers and the Use of Lap Top Computer Carts
- Microsoft Office Suite 2013
- Integration of Cell Phone Usage by Students to Access Internet During Lecture/Discussions
- All Laboratory Equipment is Technology

Department Science **Course** Astronomy

Time Frame	**2 Weeks**

Topic

The Earth

Essential Questions

- How was the size of the earth determined by the Greeks? How was the size of the earth determined by the British?
- By using Newton's gravity formula what properties of the earth where the British able to determine?
- What is the origin of the Earth's magnetic field?
- How does the Earth's magnetic field protect us from the solar wind?
- What visual evidence do we have of the solar wind's existence? How is skylight generated?
- How does the Earth's atmosphere generate the colorful sunrises and sunsets? Why do the oceans appear blue?
- Why are clouds white and rain clouds gray?
- Why do distant mountains appear blue or yellow?
- What role does the ozone layer play in protecting life on Earth?
- How is the ozone layer destroyed and how is it regenerated?
- Why is ultraviolet light so dangerous to life on earth?
- Why is the regulation of Freon so important to the ozone layer?
- How does the Earth's tilt affect the seasons?
- What makes the Earth's atmosphere unique?
- How does the strength of the Moon's gravitational pull affect the tides on Earth? What is procession and how does the moon affect it?
- How was the age of the earth determined?
- Where were the oldest rocks on Earth found?
- During its formation why did heavier elements sink to the core of the Earth?
- Early lava rock formations called Amphibolites gave us what estimate for the thickness of the early crust?
- Banded Iron Formations gave us what clues to the existence of early oceans on Earth?
- What important compounds did meteorites bring to the earth's surface?
- Modern Stromatolites are the home for cyanobacteria that produce what essential gas?
- The oxygen-rich atmosphere poisoned sulfur-based organisms and made way for what chemical process that dominates the present earth?

Enduring Understandings

- Students will use their knowledge of the Earth to describe the phenomenon associated with its atmosphere: sunrises, sunsets, skylight and UV protection.
- Students will use their knowledge of the Earth to describe the phenomenon associated with its magnetic field: the solar wind and the Northern Lights.
- Students should have a basic understanding of the tides as it relates to the position of the Sun, Moon and Earth.
- Students will be able to explain how the Greeks to British determine the size and shape of the earth.
- Students should have a basic understanding of the importance of ozone to life on our planet.
- Students will understand that the Earth wobbles on its axis and that the moon regulates this motion.

- Students will understand how the Earth's atmosphere creates red sunrises and sunsets.
- Student should have a basic understanding of how the atmosphere creates skylight, the blue oceans, white and gray clouds, and the appearance of distant mountains.
- Students will have a basic understanding of how the age of the earth was determined.
- Students will be able to explain how the presence of stromatolites, amphibolites, banded iron formations and cyanobacteria provided clues to the presence of a continents, oceans and early life forms

Alignment to NJSLS-S

HS-ESS1-1 HS-ESS1-2 HS-ESS1-3 HS-ESS1-4 HS-ESS1-6	

Key Concepts and Skills

- Explain how the size of the Earth was determined List the phenomenon created by the Earth's atmosphere.
- Explain how the magnetic field is generated and how it produces the Northern Lights.
- Explain how the magnetic field protects us from the solar wind.
- Describe how important the ozone layer is to life on earth.
- Describe how ozone is destroyed and replenished.
- Explain how the age of the earth was determined.
- List the rock formations that gave us clues to the formation of the early Earth.
- Describe how the presence of oxygen made way for the development of photosynthesis and respiration.

Learning Activities

- Lecture and classroom discussion
- Computer Research projects
- Astronomy Journal
- Current Events
- Textbook assignments (Conceptual Physical Science – Hewitt) Ch. 4 & Ch28

Videos

- "How the Earth was Made"
- A & E: The Planets – "Terra Ferma"
- A & E: The Planets – "Atmosphere"

Assessments

- Video Quizzes
- WebQuest Reports
- Quizzes
- Tests
- Projects
- Inquiry Based Activities
- Homework

21st Century Skills

X	Creativity	**X**	Critical Thinking	**X**	Communication	**X**	Collaboration

Department Science **Course** Astronomy

X	Life and Career Skills	**X**	Information Literacy	**X**	Media Literacy

Interdisciplinary Connections

- Math:
- Social Studies: All Lecture/Discussions Require the Historical Development of the Specific Topic Being Studied.
- Language Arts: There is a writing component to each unit in the form of lab reports. Additionally, each test includes an essay section.
- Fine Arts:

Technology Integration

- PowerPoint Presentations
- Data Projector
- Elmo Incorporation
- DVD/VHS/Disc Demonstration
- YouTube Content Shorts
- Each Class Has 13 Student Computers and the Use of Lap Top Computer Carts
- Microsoft Office Suite 2013
- Integration of Cell Phone Usage by Students to Access Internet During Lecture/Discussions
- All Laboratory Equipment is Technology

Department Science **Course** Astronomy

Time Frame	**2 Weeks**

Topic

The Sun

Essential Questions

- Approximately how old is the sun?
- How much longer will the sun with live?
- How large is the sun relative to other stars in our universe?
- How would your sun be described in relation to other stars?
- How much of the sun's mass is converted to energy every second?
- What happens to the Sun's mass as it burns?
- What new evidence did Skylab reveal about the sun?
- What evidence do we have that the sun is a relatively young star?
- What nuclear reaction takes place at the Sun's core?
- What are the names of the various layers of the sun?
- Why have the suns layers acquired these names?
- How does the Sun's photosphere and chromosphere differ?
- How are elements heavier than hydrogen and helium formed?
- What is the solar wind?
- How long does it take charged particles from the sun's core to reach the earth?
- What evidence on earth proves the existence of the solar wind?
- How far from the sun does the influence of the solar wind end?
- Where does interstellar space begin?
- How is the Voyager spacecraft helping scientists determine the beginning of interstellar space?
- Is the sun's surface stationary like the earth or mobile?
- Why does the Sun have multiple magnetic poles?
- Why doesn't the sun have a unified magnetic field?
- How does magnetic activity on the sun's surface create sunspots?
- How large are sunspots and how long do they last?
- What does the term Solar Max referred to and how is it related to sunspot activity?
- What is the relationship between the Solar Max and the greenhouse effect?
- What are prominences and coronal mass ejections?
- Why is the position and time of coronal mass ejections important to life on earth?
- What historical evidence do we have about the effect of CMEs here on earth?
- How could the" power grid" be affected by the CME?
- What effect would a CME have on satellites and radio communications here on earth?
- Could a supermassive CME have lethal effects to life on earth?
- What are the current satellites and probes studying the sun and what new evidence have they provided us?

Enduring Understandings

- Students will be able to describe the composition of the Sun, the nuclear reaction at its core and its relative age.
- Students will have a basic understanding of the layers of the Sun and how its magnetic field creates sunspots.
- Students were able to describe the effects of CMEs on our planet.
- Students will be able to explain how the sun generates solar wind.

- Students will be able to describe where interstellar space begins based on the influence of the solar wind.
- Students will be able to list the current satellites and probes studying the sun and what information they provide.
- Students will be able to explain the relationship between Solar Max and the Greenhouse Effect

Alignment to NJSLS-S

HS-ESS1-1 HS-ESS1-2 HS-ESS1-3 HS-ESS1-4 HS-ESS1-6	

Key Concepts and Skills

- Describe the basic characteristics of the Sun and the nuclear reaction at its core.
- Describe the relative age of the sun and how much longer it will live.
- Explain the evidence that tells us that our sun is a relative newcomer to the universe.
- Explain the relative size of the sun in relation to other stars.
- Describe the term Yellow Dwarf in relation to our sun.
- Explain the movement of materials at the surface of the sun.
- Explain the nature and relationship between the Sun's magnetic field and sunspots.
- Describe the layers of the Sun and the importance of the Corona.
- Explain how heavy elements are created in the Sun's core.
- Describe the nature of the Solar Wind and how the limit of its influence can be detected.
- Explain the phenomenon of Coronal Mass Ejections and how they can affect the Earth.

Learning Activities

- Lecture and classroom discussion
- Computer Research projects
- Astronomy Journal
- Current Events
- Textbook assignments (Conceptual Physical Science – Hewitt) Ch. 4 & Ch28

Videos

- A & E: The Planets – " Star"
- A & E: The Planets – "Destiny"
- The Universe – "The Secrets of the Sun"

Assessments

- Video Quizzes
- WebQuest Reports
- Quizzes
- Tests
- Projects
- Inquiry Based Activities
- Homework

21st Century Skills

X	Creativity	**X**	Critical Thinking	**X**	Communication	**X**	Collaboration

Department Science **Course** Astronomy

X	Life and Career Skills	**X**	Information Literacy	**X**	Media Literacy

Interdisciplinary Connections

- Math:
- Social Studies: All Lecture/Discussions Require the Historical Development of the Specific Topic Being Studied.
- Language Arts: There is a writing component to each unit in the form of lab reports. Additionally, each test includes an essay section.
- Fine Arts:

Technology Integration

- PowerPoint Presentations
- Data Projector
- Elmo Incorporation
- DVD/VHS/Disc Demonstration
- YouTube Content Shorts
- Each Class Has 13 Student Computers and the Use of Lap Top Computer Carts
- Microsoft Office Suite 2013
- Integration of Cell Phone Usage by Students to Access Internet During Lecture/Discussions
- All Laboratory Equipment is Technology

Department Science **Course** Astronomy

Time Frame	**1 Week**

Topic

The Inner Planets: Mercury, Venus, Mars

Essential Questions

- How old is our Universe?
- What is the Big Bang Theory?
- What is most of "Space" made of?
- Why is our solar system in a flat disc formation?
- How did the planets form?
- Into what two major groups are the planets divided and why?
- Which of the inner planets have atmospheres and what are they composed of?
- What is the Asteroid Belt, where is it located and what is believed to be its origin?
- What are the Kuiper Belt and the Ort Cloud and where are they located?
- Why is Mercury the most cratered planet in the solar system?
- What is Mercury's relative size to the rest of the planets in the solar system?
- What is a "Temporary Atmosphere" and described how this affects Mercury?
- How are a planet's size, its gravity and the density of the gases it can hold to its surface related?
- What is unusual about the length of Mercury's day and year?
- Mercury processes around the sun in an elliptical orbit. How did Einstein make sense of this strange phenomenon?
- What is a temperature range between night and day on Mercury?
- What is the name of the only spacecraft to visit Mercury?
- Are there any moons orbiting Mercury?
- Are there any moons orbiting Venus?
- What is the relative size of Venus to the other planets in our solar system?
- Why Venus is considered Earth's twin?
- Which planet has the most volcanoes than any other in the universe?
- What is the source of Venus is extra thick atmosphere?
- Why do astronomers use the term "Runaway Greenhouse Effect" when referring to temperatures on Venus?
- Unlike Mercury, Venus has a permanent atmosphere. What is it mainly composed of?
- Besides Venus there is only one other planet in our solar system that rotates in the opposite direction of all the others. Which is it?
- What is the relative size of Mars compared to the other planets in our solar system?
- What is the surface of Mars appear red?
- Astronomers are aware of frequent dust storms on Mars. Are they able to engulf the entire planet?
- What is the composition of Mars atmosphere?
- Olympus Mons is considered the largest volcano in our solar system. How does it compare to Mount Everest here on earth?
- Recently, water ice has been discovered just under the surface on Mars. Astronomers predict approximately how much of it is there?
- Mars has two moons that are considered to be captured asteroids. What are their names and relative sizes?
- What was the fate of the Spirit and Opportunity rovers on Mars?
- What new information has the Curiosity rover provided scientists?

Enduring Understandings

- Students should have an understanding of the origin of the universe and our solar system.
- Students will be able to describe the nature and arrangement of the planets in order.
- Students will be able to distinguish between the inner and outer planets.
- Student will understand the nature and locations of the Asteroid and Kupier Belts, and the Ort Cloud.
- Students will be able to describe Mercury in terms of its size, geography, temperature and unique orbiting characteristics.
- Students will be able to understand the nature of Mercury's temporary atmosphere.
- Students will be able to explain the usual day/year relationship of Mercury.
- Students will be able to explain the unusual orbit of Mercury around the sun.
- Students will be able to understand the concept of the temporary atmosphere.
- Students will understand that Mercury and Venus are the only planets in the solar system without moons.
- Students will be able to explain why Venus is considered Earth's twin.
- Students will be able to understand the cause of Venus's extra thick atmosphere.
- Students will be able to explain the term runaway greenhouse effect.
- Students will understand that other than Neptune, Venus is the only planet in our solar system that rotates in the opposite direction.
- Students will be able to explain why Mars appears red.
- Students will be able to describe Olympus Mons and compare it to Mount Everest here on earth.
- Students will be able to list the moons of Mars.
- Students will be able to explain why Martian moons are considered captured asteroids.
- Students will be able to explain the faith of the Spirit and opportunity rovers on Mars.
- Students will be able to describe the new information that the curiosity rover has provided for scientists.

Alignment to NJSLS-S

HS-ESS1-1 HS-ESS1-2 HS-ESS1-3 HS-ESS1-4 HS-ESS1-6	

Key Concepts and Skills

- Explain the concept of a temporary atmosphere.
- Identify which planets have moons.
- Explain how a planet can capture an asteroid.
- List the forces that create a runaway greenhouse effect.
- Explain the existence of the extra thick atmosphere on Venus.
- Describe the temperature ranges of Mercury Venus and Mars
- Identify Venus as one of only two planets in the solar system that rotates in the opposite direction

- Explain why Mars appears red.
- List the latest discoveries about Mars provided by the curiosity rover.

Learning Activities

- Lecture and classroom discussion
- Computer Research projects
- Textbook assignments (Conceptual Physical Science – Hewitt) Ch28
- Astronomy Journal
- Current Events **Videos**
- A & E: The Planets – " Different Worlds"
- A & E: The Planets – " Giants"
- The Universe – "The Inner Planets"
- The Universe – "Mars-The New Evidence"

Assessments

- Video Quizzes
- WebQuest Reports
- Quizzes
- Tests
- Projects
- Inquiry Based Activities
- Homework

21st Century Skills

X	Creativity	**X**	Critical Thinking	**X**	Communication	**X**	Collaboration
X	Life and Career Skills	**X**	Information Literacy	**X**	Media Literacy		

Interdisciplinary Connections

- Math:
- Social Studies: All Lecture/Discussions Require the Historical Development of the Specific Topic Being Studied.
- Language Arts: There is a writing component to each unit in the form of lab reports. Additionally, each test includes an essay section.
- Fine Arts:

Technology Integration

- PowerPoint Presentations
- Data Projector
- Elmo Incorporation
- DVD/VHS/Disc Demonstration
- YouTube Content Shorts
- Each Class Has 13 Student Computers and the Use of Lap Top Computer Carts
- Microsoft Office Suite 2013
- Integration of Cell Phone Usage by Students to Access Internet During Lecture/Discussions
- All Laboratory Equipment is Technology

Department Science **Course** Astronomy

Time Frame	**1 Week**

Topic

The Gas Giants: Jupiter and Saturn

Essential Questions

- Why Jupiter and Saturn are called the gas giants?
- Which gases is Jupiter composed of?
- What is the name of the space probe currently studying Jupiter?
- Why Jupiter is considered a failed star?
- What is responsible for its enormous magnetic field?
- Who discovered Jupiter's red spot?
- How long have astronomers been observing the red spot and is there a larger storm in the solar system?
- What are the unique characteristics of the red spot?
- Currently how wide is the red spot and is it shrinking or gaining size?
- In which direction do the storms on Jupiter travel above and below the equator?
- Which Planets have rings and why are Saturn's rings different from the other planets?
- Which of the Gas Giants have moons and what are their relative numbers?
- Which of Jupiter's moons are the most well-known and who were they named after?
- How does Jupiter serve as a guardian for the inner solar system?
- What is an oblate spheroid and why is pleasing to the eye?
- Who named the dark areas in Saturn's giant rings?
- What is the name of the space probe currently studying Saturn?
- Is there a gap between the rings and Saturn surface?
- What are Saturn's rings composed of?
- What do scientists believe is the fate of Saturn's rings?
- According to Kepler's law, what area of the rings travel faster?
- What is a Shepherd Moon and how does it make debris follow them?
- Saturn's outermost rings should not be there according to Newton's law, what is the explanation for their existence?
- Although they are 100 million miles wide, how thick our Saturn's rings?
- Would Saturn float in the bathtub?
- What is the shape of the huge storm found at the north pole of Saturn?
- What is the size of the enormous hurricane like storm in the South Pole of Saturn?
- Which moons do scientists find most interesting for the discovery of life?
- Why did scientists choose Titan instead of Jupiter's Europa to search for life?
- Upon landing what did the space probes discover about its Titan's surface?
- Titan is the only moon in our solar system with an atmosphere. What is it composed of?

Enduring Understandings

- Students will have a basic understanding of why Jupiter and Saturn are called gas giants.
- Students will be able to explain why Jupiter is considered a failed star.
- Students will understand the source of Jupiter's enormous magnetic field.
- Students will have a basic understanding of Jupiter's atmosphere, moons and its magnetic field.
- Students will be able to explain the history and nature of Jupiter's red spot.
- Students will understand the dynamics of Jupiter's atmosphere above and below the equator.
- Students will be able to explain the origin of the names given to Jupiter's four most important moons.
- Students will be able to explain why Jupiter is considered the guardian of the inner solar system.
- Students will understand the nature of Saturn's rings.
- Students will be able to explain the speed at which the inner and outer rings move according to Kepler's

laws.
- Students will be able to explain the nature of a shepherd moon.
- Students will understand the existence of Saturn's outer most rings.
- Students will be able to identify and explain the size and shape of the storms at Saturn's north and south poles.
- Students will be able to explain why scientists chose Titan instead of Europa to search for life.
- Students will understand the nature of Titan according to the information returned by probes that have landed there.
- Students will use their knowledge of the conditions that promote life to identify the moons that scientists want to investigate.

Alignment to NJSLS-S

HS-ESS1-1
HS-ESS1-2
HS-ESS1-3
HS-ESS1-4
HS-ESS1-6

Key Concepts and Skills

- Explain why Jupiter and Saturn are considered gas giants.
- Explain why Jupiter is considered a failed star.
- Describe the atmospheres of the Jupiter and Saturn, and how it affects their appearance.
- Identify the planets with a ring system and explain Saturn's unique place among them.
- Identify the source of Jupiter's anonymous magnetic field.
- Describe the unique characteristics of Jupiter's red spot.
- List the number of moons that Jupiter and Saturn have respectively.
- Identify by name the four moons of Jupiter that are the most famous.
- Describe the nature of Jupiter storms above and below the equator.
- Explain how Jupiter can be considered the guardian of the inner solar system.
- Explain why Saturn shape is pleasing to the eye.
- Identify the astronomer who first discovered the gap in Saturn's rings.
- Identify the substances that Saturn's rings are composed of.
- Describe the orbital speed of Saturn's inner and outer rings in terms of Kepler's law.
- Describe the width and unique thickness of Saturn's rings.
- Explain why Saturn would float in a bathtub.
- Identify the size and shape of the enormous storms found at the North and South Pole of Saturn.
- Explain the existence of Saturn's outer rings in terms of Newton's laws.
- Describe the effect of a shepherd moon on Saturn's inner rings.
- Explain why astronomers chose Titan instead of Europa to search for life in our solar system.
- What information did the Titan lander relay back to astronomers about this it's surface and atmosphere?

Learning Activities

- Lecture and classroom discussion

- Computer Research projects
- Textbook assignments (Conceptual Physical Science – Hewitt) Ch28
- Astronomy Journal
- Current Events **Videos**
- A & E: The Planets – " Different Worlds"
- A & E: The Planets – " Giants"
- A & E: The Planets – " Life Beyond the Sun"

Assessments

- Video Quizzes
- WebQuest Reports
- Quizzes
- Tests
- Projects
- Inquiry Based Activities
- Homework

21st Century Skills

X	Creativity	**X**	Critical Thinking	**X**	Communication	**X**	Collaboration
X	Life and Career Skills	**X**	Information Literacy	**X**	Media Literacy		

Interdisciplinary Connections

- Math:
- Social Studies: All Lecture/Discussions Require the Historical Development of the Specific Topic Being Studied.
- Language Arts: There is a writing component to each unit in the form of lab reports. Additionally, each test includes an essay section.
- Fine Arts:

Technology Integration

- PowerPoint Presentations
- Data Projector
- Elmo Incorporation
- DVD/VHS/Disc Demonstration
- YouTube Content Shorts
- Each Class Has 13 Student Computers and the Use of Lap Top Computer Carts
- Microsoft Office Suite 2013
- Integration of Cell Phone Usage by Students to Access Internet During Lecture/Discussions
- All Laboratory Equipment is Technology

Department Science **Course** Astronomy

Time Frame	**1 Week**

Topic

The Ice Giants: Uranus and Neptune

Essential Questions

- Why are Uranus and Neptune considered Ice Giants
- How does the methane and Uranus atmosphere account for its soft blue color?
- What is the source of the smog on Uranus?
- Uranus spins on its side at a 90° tilt. What do astronomers believe is the cause for this?
- Uranus is not a "naked eye" planet. Which of the other planets were discovered only by telescope?
- Why is there no wind or weather on Uranus?
- How many rings does Uranus have?
- What do scientists believe is the source of Uranus' rings?
- What makes Uranus the coldest planet in our solar system?
- How did the study of Uranus lead to the discovery of Neptune?
- What is unique about Neptune's axis of rotation and what do scientists believe caused it?
- Because of the lack of friction in Neptune's atmosphere it produces the strongest winds in the solar system. What are they?
- Why Neptune is considered an unfinished planet?
- What is the nature of the possible heat source on Neptune?
- What is the nature of Neptune's giant dark spot?
- By what new method was Pluto discovered?
- What does the term perturbation mean?
- Why is Pluto sometimes closer to the Earth than Neptune?
- How did the last three planets get their names?
- Why Pluto is no longer considered a Planet?
- How many moons are orbiting Pluto?
- Name at least two minor planets larger than Pluto in the Kuiper belt?

Enduring Understandings

- Students will be able to explain why Neptune and Uranus are considered ice giants?
- Students will be able to describe how the methane in Uranus atmosphere creates its soft blue color.
- Students will be able to describe why Uranus is tilted 90° and its orbit.
- Students will be able to explain why Neptune and Uranus are not considered "naked eye" planets.
- Students will be able to explain the source and number of Uranus rings.
- Students will be able to explain why Uranus is the coldest planet in our solar system.
- Students will be able to describe the discovery of Neptune as a result of the study of Uranus.
- Students will understand the nature of Neptune's unique axis of rotation and describe what caused it.
- Students will understand why Neptune produces the strongest winds in our solar system.
- Students will understand why Neptune is considered an unfinished planet.
- Students will be able to understand the possible heat source at Neptune's core.
- Students will be able to explain the strange nature of Neptune's dark spot.
- Students will be able to understand how Pluto was discovered.

- Students will be able to explain why Pluto is closer to the Earth than Neptune sometimes.
- Students will understand how the last three planets got their names. Students will understand why Pluto is no longer considered a planet.
- Students will understand the nature of other minor planets in the Kuiper belt.
- Students will be able to explain the unique nature of the orbit and spin axis of Pluto and Neptune.

Alignment to NJSLS-S

HS-ESS1-1 HS-ESS1-2 HS-ESS1-3 HS-ESS1-4 HS-ESS1-6	

Key Concepts and Skills

- Explain why Uranus and Neptune are considered gas giants.
- Describe how methane creates Uranus soft blue color.
- Explain why your status on its side at 90°.
- Describe why Uranus and Neptune are not considered naked eye planets.
- Explain how Neptune and Pluto were discovered.
- Explain the nature of Neptune's great dark spot.
- Explain how Uranus Neptune Pluto got their names.
- Describe why Neptune's atmosphere produces the strongest winds in the solar system.
- Describe what astronomers believe is the cause of Neptune's retrograde rotation.
- Describe the new scientific methods that led to the discovery of Neptune and Pluto
- Explain how Pluto's orbit and Neptune's axis of rotation are unique in our universe.
- Explain why Pluto is no longer considered a planet.
- Describe other minor planets in the Kuiper belt that are larger than Pluto
- Explain how Pluto's new moons got their names.

Learning Activities

- Lecture and classroom discussion
- Computer Research projects
- Textbook assignments (Conceptual Physical Science – Hewitt) Ch28
- Astronomy Journal
- Current Events

Videos

- A & E: The Planets – " Different Worlds"
- The Universe- The Outer Planets

Assessments

- Video Quizzes
- WebQuest Reports
- Quizzes
- Tests
- Projects
- Inquiry Based Activities
- Homework

Department Science **Course** Astronomy

21st Century Skills

X	Creativity	**X**	Critical Thinking	**X**	Communication	**X**	Collaboration
X	Life and Career Skills	**X**	Information Literacy	**X**	Media Literacy		

Interdisciplinary Connections

- Math:
- Social Studies: All Lecture/Discussions Require the Historical Development of the Specific Topic Being Studied.
- Language Arts: There is a writing component to each unit in the form of lab reports. Additionally, each test includes an essay section.
- Fine Arts:

Technology Integration

- PowerPoint Presentations
- Data Projector
- Elmo Incorporation
- DVD/VHS/Disc Demonstration
- YouTube Content Shorts
- Each Class Has 13 Student Computers and the Use of Lap Top Computer Carts
- Microsoft Office Suite 2013
- Integration of Cell Phone Usage by Students to Access Internet During Lecture/Discussions
- All Laboratory Equipment is Technology

Department Science **Course** Astronomy

Time Frame	**1 Week**

Topic

Asteroids, Meteorites and Comets

Essential Questions

- What distinguishes asteroids, meteoroids and comets?
- Where do most asteroids reside?
- What is the composition of the three major types of asteroids?
- What is the difference between a meteoroid, meteor and meteorite?
- What is a falling star?
- Approximately how many objects strike the earth every year?
- What is the nature and mechanism of an "air burst"?
- Where do most comets reside?
- What is the composition of a comet?
- Why do the tails of comets point away from the sun?
- Why do most comets have two tails?
- What are comet tails composed of?
- What would happen if a comets tail swept across the earth?
- How many comets are believed to be currently circling the sun?
- A meteor is visible only once, but a comet may be visible at regular intervals throughout its lifetime. Why?
- Why does a comet eventually burn out?
- Why meteorites are more easily found in the artic regions than any other continents?
- What methods do astronomers use to detect comets and meteoroids?
- Why the Earth is no longer covered with impact craters like Barringer Crater in Arizona?
- What do scientists believe caused the Tonguska Event in the Soviet Union?
- What evidence exists that indicates an impact was responsible for the extinction of the dinosaurs?
- What efforts are currently underway to detect impacts by comets and meteoroids?
- What is "Apophysis"?
- What would be the consequences of a direct strike of a comet or meteor on the earth surface?
- Why would mankind want to visit or capture an asteroid or comet?
- What precautions can be taken to prevent an extinction of mankind in the event of a comet strike?
- What new information have astronomers learned from the most recent airburst over the Soviet Union?

Enduring Understandings

- Students will able to explain the difference between an asteroid, meteoroid and comet.
- Students will able to explain the appearance of "Falling Stars"
- Students will use their knowledge of comets to explain their composition and the nature of their tails.
- Students will be able to describe the celestial interactions that create the different comet tails.
- Students will be able to explain why comet tails change positions as it circles the sun.
- Students will have a basic understanding of the methods used to identify meteoroids and comets.
- Students will define the meteoroid, meteor and meteorite.
- Students will be able to describe the events that lead to the eventual "burn out" of a comet.
- Students will understand why there are so few impact craters visible on the Earth's surface.
- Students will be able to explain how an impact could have caused the extinction of the

dinosaurs.

- Students can explain how to detect "Near Earth" objects.
- Students will demonstrate an understanding of the physical and sociological results of an impending impact on the earth.
- Students will use their knowledge of the effects of an impact to explain what steps can be taken to preserve life on earth.
- Students will explain what possible actions can be taken to prevent impact from occurring.

Alignment to NJSLS-S

HS-ESS1-1 HS-ESS1-2 HS-ESS1-3 HS-ESS1-4 HS-ESS1-6	

Key Concepts and Skills

- Identify the characteristics of asteroids, meteoroids and comets.
- Describe the composition of a comet.
- List the phenomenon that creates the two tails of a comet.
- Explain how the direction of the comet tails change as it circles the sun.
- Explain why comets will eventually "burn out".
- Describe the events that led to the extinction of the dinosaurs.
- Explain the methods used to detecting "Near Earth" objects.
- Describe the sequence of events that would follow an impact in the ocean or on the earth's surface.
- Explain how an impact might be avoided in the future.
- Describe the precautions that might preserve life on the planet in the event of an impact.

Learning Activities

- Lecture and classroom discussion
- Computer Research projects
- Astronomy Journal
- Current Events
- Textbook assignments (Conceptual Physical Science – Hewitt) Ch28

Videos

- "Deep Impact"
- The Universe –" Asteroid Attack"
- The Universe –" Preventing Armageddon"

Assessments

- Video Quizzes
- WebQuest Reports
- Quizzes
- Tests
- Projects
- Inquiry Based Activities
- Homework

21st Century Skills

Department Science **Course** Astronomy

X	Creativity	**X**	Critical Thinking	**X**	Communication	**X**	Collaboration
X	Life and Career Skills	**X**	Information Literacy	**X**	Media Literacy		

Interdisciplinary Connections

- Math:
- Social Studies: All Lecture/Discussions Require the Historical Development of the Specific Topic Being Studied.
- Language Arts: There is a writing component to each unit in the form of lab reports. Additionally, each test includes an essay section.
- Fine Arts:

Technology Integration

- PowerPoint Presentations
- Data Projector
- Elmo Incorporation
- DVD/VHS/Disc Demonstration
- YouTube Content Shorts
- Each Class Has 13 Student Computers and the Use of Lap Top Computer Carts
- Microsoft Office Suite 2013
- Integration of Cell Phone Usage by Students to Access Internet During Lecture/Discussions
- All Laboratory Equipment is Technology

Department Science **Course** Astronomy

Time Frame	**1Week**

Topic

Telescope Design

Essential Questions

- How did increase the literacy in Western Europe lead to the development of better lenses and the telescope?
- What are some of the basic characteristics of the refractor telescope?
- What are some of the drawbacks of using lenses for deep space observation?
- What is chromatic aberration and how can it be corrected using multiple lenses?
- What a spherical aberration and how can it be corrected?
- Why were extremely large focal lengths necessary to correct spherical aberration?
- How did Newton's reflector design revolutionize the field of astronomy?
- What is the nature of a parabolic mirror?
- Why does increased aperture greatly improve the effectiveness of a reflector telescope?
- What problems limit the size and construction of larger parabolic mirrors?
- How are binoculars and the Muskutov telescope design similar in nature?
- What is the basic design of the Hubble space telescope?
- What advantage does photographic film have over the naked eye?
- What special film must be used for photographing the heavens?
- Why is a manual camera best for photographing the heavens?
- What are the different kinds of telescope mounts available today?
- How does an Alt-Azimuth mount work?
- What is the function of alignment star?
- How does an Equatorial mount work?
- What is the advantage of a computerized Go to Mount?
- What time of year is the best for observing the heavens?
- How does atmospheric turbulence affect telescope clarity?
- What is the advantage of building observatories on mountain tops?
- What is light pollution and how does it affect telescope clarity?
- How can digital cameras be used to aid in astrophotography?

Enduring Understandings

- Students will be able to explain why literacy led to the telescope.
- Students should have a basic understanding of the designs of the common telescopes in use today.
- Students will be able to explain the advantages and disadvantages of the refractor and reflector telescope.
- Students will understand the basic function of the parabolic mirror as it relates to telescope design.
- Students will understand why aperture is a key factor in the light gathering capabilities of the reflector telescope.
- Students will understand the advantage of shorter tube length in the Muskutov design telescope.
- Students will understand the advantage photography has over the human eye when observing the heavens.
- Students will understand why a manual camera is required for astrophotography.
- Students will be able to explain the nature of film required for astrophotography.
- Students will be able to describe the three basic types of telescope mounts.

- Students will be able to explain the function of alignment star.
- Students will be able to understand the advantages of a go to telescope mount.
- Students will understand the importance of avoiding light pollution when observing the heavens.
- Students will be able to explain how atmospheric turbulence affects telescope clarity.
- Students will understand why most observatories are built on mountain tops high above the clouds.

Alignment to NJSLS-S

HS-ESS1-1 HS-ESS1-2 HS-ESS1-3 HS-ESS1-4 HS-ESS1-6	

Key Concepts and Skills

- Identify the problems associated with the optical lens telescope.
- Describe the design of Newton's reflector telescope and explain its revolutionary concept.
- List the most common designs of reflector telescopes.
- Describe the advantage and disadvantage of the reflector and refractor telescope.
- Explain the function of the parabolic mirror.
- Identify the similarities between binoculars and Muskutov telescope design.
- Describe the design of the Hubble space telescope.
- Explain the advantage of photographic film over the naked eye when observing the heavens.
- Identify the special kind of film required for astrophotography.
- Explain why a manual camera is required for astrophotography.
- List the most common types of telescope mounts.
- Describe the function of the Equatorial mount.
- Explain the function and alignment star.
- Describe the function of the Alt-Azimuth mount.
- Identify the advantages of a Go to Mount.
- Explain how light pollution and atmospheric turbulence can affect telescope clarity.
- Identify the best places on earth to build an observatory.
- Explain how digital cameras can be used in astrophotography.

Learning Activities

Activities

- Lecture and classroom discussion
- Computer Research projects
- Astronomy Journal
- Current Events
- Textbook assignments (Conceptual Physical Science – Hewitt) Ch. 4 & Ch. 28

Videos

- Orion Telescope video tutorials
- NOVA - "Return to Palomar"

Assessments

- Video Quizzes
- WebQuest Reports

- Quizzes
- Tests
- Projects
- Inquiry Based Activities
- Homework

21st Century Skills

X		Creativity	**X**	Critical Thinking	**X**	Communication	**X**	Collaboration
X		Life and Career Skills	**X**	Information Literacy	**X**	Media Literacy		

Interdisciplinary Connections

- Math
- Social Studies: All Lecture/Discussions Require the Historical Development of the Specific Topic Being Studied.
- Language Arts: There is a writing component to each unit in the form of lab reports. Additionally, each test includes an essay section.
- Fine Arts

Technology Integration

- PowerPoint Presentations
- Data Projector
- Elmo Incorporation
- DVD/VHS/Disc Demonstration
- YouTube Content Shorts
- Each Class Has 13 Student Computers and the Use of Lap Top Computer Carts
- Microsoft Office Suite 2013
- Integration of Cell Phone Usage by Students to Access Internet During Lecture/Discussions
- All Laboratory Equipment is Technology

Department Science **Course** Astronomy

Time Frame	**1 Week**

Topic

The Telescope: It's History and it's Future

Essential Questions

- When did lens quality become good enough for the development of the telescope? Why is the inventor of the telescope so controversial?
- How did Galileo's improved telescope change astronomy forever?
- How did Galileo's observations of Jupiter, Venus, the moon and the sun challenge church authority?
- Aside from having huge focal lengths what was the other drawback of using larger and larger lenses?
- By using mirrors how did Newton revolutionize astronomy?
- What was the secret to the reflector telescopes light gathering ability?
- Why did metal mirrors immediately present a problem for reflector telescopes?
- What was the advantage to the development of silver coated glass mirrors?
- How did photographic film reveal amazing detail of distant faint objects never seen before?
- Why was the Hooker 100 inch mirror telescope the pinnacle of telescope design for its day?
- Using the Hooker 100 inch Edwin Hubble was able to discover two things about the universe unknown up to that point .What were they?
- How did Hubble determine that the Andromeda galaxy was outside the Milky Way?
- What principle of physics proved that the universe was expanding?
- What is spectroscopy and how does it reveal a stars composition?
- What is the Doppler Effect and explain the meaning of the Red Shift?
- Explain how distant galaxies appear to be moving away faster in light of a uniformly expanding universe?
- The Palomar 200 inch reflector dominated astronomy for over 20 years. What cutting edge features does it incorporate?
- How did the" honeycomb" method of mirror fabrication solve the problems of weight and distortion for large parabolic mirrors?
- What is an" actuator" and how did eliminate distortion of large parabolic mirrors?
- How did actuators lead to be multi-mirror design and increase aperture size?
- How did computers lead to interferometry and what is its advantage?
- By replacing the human operator with computers what kind of unprecedented information were they able to collect?
- How did computers lead to the elimination of atmospheric turbulence when observing the heavens?
- How do sodium lasers create a false star in the night sky?
- What made the Hubble Space Telescope and enormous leap forward in man's ability to observe the heavens?
- What problems were encountered before Hubble became completely functional as a spacebased observatory?
- What's startling discovery did the HST reveal about the expanding universe?
- Why did astronomers suggest Einstein's Cosmological Constant as the source for this accelerated expansion?
- Much larger ground-based telescopes are planned for the future. What relative sizes are under construction?
- Large arrays of radio telescopes appear to be the future of astronomy. Explain their advantage

in terms of detection and EMS gathering ability?

Enduring Understandings

- Students will be able to understand how lens development led to the invention of the telescope.
- Students will be able to explain why the inventor of the telescope is so controversial.
- Students will understand how Galileo's observations change the face of astronomy forever.
- Students will be able to explain why larger lenses posed great problems for early astronomers.
- Students will understand how Newton's invention of the reflector telescope revolutionized astronomy.
- Students will be able to understand why Newton's invention of the reflector telescope is still used today over 500 years later.
- Students will understand why metal mirrors were immediately replaced by silver coated glass mirrors.
- Students will be able to explain why replacing the naked eye with photographic film greatly advanced astronomy.
- Students will understand how Hubble was able to discover the Andromeda galaxy and the expanding universe using the 100 inch Hooker telescope.
- Students will understand the concept of spectroscopy and how reveals a stars composition.
- Students will be able to explain the Doppler Effect and how the Red Shift led to the discovery of the expanding universe.
- Students will understand the cutting edge innovations that led to the dominance of the 200 inch Palomar telescope.
- Students will understand the honeycomb method of mirror fabrication.
- Students will understand the ability of the "actuator" to eliminate distortion of large parabolic mirrors.
- Students will be able to understand how computers replaced the human eye, the human operator and led to the multi mirror design.
- Students will be able to understand how to create a false star in night sky.
- Students will be able to understand how this false star can be used to eliminate atmospheric turbulence with computers.
- Students will be able to understand the advantage of a space-based observatory.
- Students will understand why it took over seven years for the Hubble space telescope to become fully operational.
- Students will be able to understand how the Hubble discovered the accelerating expansion of the universe.
- Students will understand nature of Einstein's cosmological constant and how astronomers used it to explain the expansion.
- Students should have a basic understanding that the technology available to the general public far surpasses that of early astronomers.
- Students will be able to describe advantage of using radio and x-rays to observe the stars.
- Students will have a basic understanding of the new and innovative observatories in the future.

Alignment to NJSLS-S

HS-ESS1-1 HS-ESS1-2 HS-ESS1-3 HS-ESS1-4 HS-ESS1-6	

Department Science **Course** Astronomy

Key Concepts and Skills

- Explain how better lenses led to the invention of the telescope.
- Describe the observations made by Galileo that change the face of astronomy.
- Explain how larger lenses became unusable for you early astronomers.
- Describe the basic design of the new reflector telescope. Describe the disadvantages of the metallic mirror.
- Explain the advantages of the silver coated glass mirror.
- Explain why photographic film greatly advanced astronomy.
- List the great discoveries made by Hubble using the hooker 100 inch telescope.
- Describe the concept of spectroscopy and its uses.
- Explain how the expanding universe was discovered by the red shift.
- Explain the advantages of the honeycomb fabrication method for giant glass mirrors.
- List of the advantages computers provide by replacing human eye and human operator when observing the heavens.
- Explain how using a false star can eliminate atmospheric turbulence using computers.
- Explain the setbacks that led to the delay of the deployment of the Hubble space telescope.
- Explain how scientists account for the accelerated expansion of the universe. Describe Einstein's cosmological constant in terms of the accelerated expansion of the universe.
- Explain the advantages of using EM waves rather than light in observing the heavens.
- List the major telescope projects underway for the next several years.
- Describe the design of the replacement for the Hubble space telescope.

Learning Activities

- Lecture and classroom discussion
- Computer Research projects
- Astronomy Journal
- Current Events
- Textbook assignments (Conceptual Physical Science – Hewitt) Ch. 4 & Ch28

Videos

- Nova – "500 years of the Telescope"
- "Return to Palomar"

Assessments

- Video Quizzes
- WebQuest Reports
- Quizzes
- Tests
- Projects
- Inquiry Based Activities
- Homework

21st Century Skills

X	Creativity	**X**	Critical Thinking	**X**	Communication	**X**	Collaboration
X	Life and Career Skills	**X**	Information Literacy	**X**	Media Literacy		

Interdisciplinary Connections

- Math:
- Social Studies: All Lecture/Discussions Require the Historical Development of the Specific Topic Being Studied.
- Language Arts: There is a writing component to each unit in the form of lab reports. Additionally, each test includes an essay section.
- Fine Arts:

Technology Integration

- PowerPoint Presentations
- Data Projector
- Elmo Incorporation
- DVD/VHS/Disc Demonstration
- YouTube Content Shorts
- Each Class Has 13 Student Computers and the Use of Lap Top Computer Carts
- Microsoft Office Suite 2013
- Integration of Cell Phone Usage by Students to Access Internet During Lecture/Discussions
- All Laboratory Equipment is Technology

Department Science **Course** Astronomy

Time Frame	1 Week

Topic

Birth, Life and Death of Stars

Essential Questions

- What is a protostar?
- What process changes a protostar to s full-fledged star?
- What are the inward and outward forces acting on a star?
- What do the inward and outward forces acting on a star have to do with its size?
- Where did the elements heavier than helium come from?
- How is a stars mass related to its lifespan?
- How is a stars color related to its temperature and spin rate?
- What is the color is a very low mass stars?
- How common are binary stars in the universe?
- What measurements of binaries provide data for measuring their masses?
- What is the companion star to the theoretical star "Nemesis"?
- What is the theory that associates nemesis with periodic extinction events on earth?
- How is angular momentum related to planetary systems?
- How does the Doppler Effect and the Red Shift account for the dark sky between stars?
- What event marks the death of a star?
- When will our sun reach the "Red Giant" stage?
- What conditions at the core of a low mass star create planetary nebula?
- After all the gases have peeled away what is left of the original star?
- Why a white dwarf is no longer considered a star and instead called a stellar remnant?
- What color changes does a stellar remnant go through before it is completely dead?
- What special circumstances create a Nova event between a white wharf and its companion star?
- How often can nova events take place?
- What circumstances lead to a type IA supernova?
- How are type IA supernova used to measure distances in the cosmos?
- When stars have enough mass and gravitational contraction they can produce this next critical element in its core, are what is it?
- Why is Iron the ultimate element able to be produced at the core of a star?
- What event's lead to the creation of a supernova?
- How are elements heavier than iron created during the supernova phase?
- Why are elements heavier than iron less abundant in our universe?
- After the explosion, what special conditions create what astronomers call a neutron star?
- What is the density of a neutron star compared to that of a white dwarf?
- Neutron stars spin at fantastic speeds and some of them radiate x-rays. What term do astronomers use to describe them?
- Approximately how many pulsars have been discovered?
- How is it possible that many neutron stars are pulsars that have not been identified?

Enduring Understandings

- Students will understand how a Star is formed.
- Students will understand the event that changes a protostar to a full-fledged star.
- Students will understand how the size of the star is determined.
- Students will understand how a star's mass is related to its lifespan.
- Students will understand how stars color is related to its temperature.
- Students will understand that stars come in either a binary or multiple star system.
- Students will understand how to use Kepler's Law to determine the mass of a star in a binary system.
- Students will understand the theory of our son's companion star nemesis.
- Students will understand why the night sky appears dark between stars.
- Students will understand what events lead to the red giant stage.
- Students will understand the origin of planetary nebula.
- Students will understand the nature of a white dwarf.
- Students will understand the circumstances that create a nova event.
- Students will understand the circumstances that lead to a type IA supernova.
- Students will understand how type IA super nova is used to measure distances in the cosmos.
- Students will understand why iron is the ultimate element that can be created at the core of a star.
- Students will understand how the production of iron leads to the supernova explosion and the death of a star.
- Students will understand how elements heavier than iron are produced during the supernova event.
- Students will understand why elements heavier than iron are less abundant in our universe.
- Students will understand how a neutron star is created after a supernova.
- Students will understand the relationship between a pulsar and a neutron star.

Alignment to NJSLS-S

HS-ESS1-1
HS-ESS1-2
HS-ESS1-3
HS-ESS1-4
HS-ESS1-6

Key Concepts and Skills

- Describe the events that lead to the formation of a star.
- List the forces that determine a star's size.
- Explain the basic nature of binaries and how they are used to determine the size of stars.
- Explain what event indicates the death of a star.
- Describe a red giant and explain what effect it will have on the planets in our solar system.
- Describe the appearance and basic nature of planetary nebula.
- Explain how color and temperature are related in the appearance of a star.
- Identify the pathway taken by high and low mass stars.
- Describe the circumstances that lead to a nova.
- Describe the circumstances that lead to a type IA supernova.
- Explain how type IA supernova can be used to determine distances in the cosmos.
- Describe why the production of carbon is critical in taking the next step of the stars lifecycle.
- Explain why iron is the ultimate element that can be produced in the core of a star.

- Describe the events leading to a supernova and what effects it has on the entire universe.
- Explain how a neutron star is formed after a supernova event.
- Explain how the spin rate of the neutron star can produce a beam of x-rays.
- Describe the nature of a pulsar.
- Explain why some neutron stars could be pulsars without astronomers knowing.

Learning Activities

- Lecture and classroom discussion
- Computer Research projects
- Textbook assignments (Conceptual Physical Science – Hewitt) Ch28
- Astronomy Journal
- Current Events

Videos

- The Universe: Life and Death of Stars

Assessments

- Video Quizzes
- WebQuest Reports
- Quizzes
- Tests
- Projects
- Inquiry Based Activities
- Homework

21st Century Skills

X	Creativity	**X**	Critical Thinking	**X**	Communication	**X**	Collaboration
X	Life and Career Skills	**X**	Information Literacy	**X**	Media Literacy		

Interdisciplinary Connections

- Math:
- Social Studies: All Lecture/Discussions Require the Historical Development of the Specific Topic Being Studied.
- Language Arts: There is a writing component to each unit in the form of lab reports. Additionally, each test includes an essay section.
- Fine Arts:

Technology Integration

- PowerPoint Presentations
- Data Projector
- Elmo Incorporation
- DVD/VHS/Disc Demonstration
- YouTube Content Shorts
- Each Class Has 13 Student Computers and the Use of Lap Top Computer Carts
- Microsoft Office Suite 2013
- Integration of Cell Phone Usage by Students to Access Internet During Lecture/Discussions
- All Laboratory Equipment is Technology

Department Science **Course** Astronomy